IEC 62541-9

Edition 1.0 2012-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

OPC unified architecture – Part 9: Alarms and conditions

Architecture unifiée OPC – Partie 9: Alarmes et conditions

IEC Central Office
3, rue de Varembé
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.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,…).
It also gives information on projects, replaced and withdrawn publications.

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 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

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 la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

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

La recherche avancée vous permet de trouver des publications CEI 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.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde 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 les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

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 62541-9

Edition 1.0 2012-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

OPC unified architecture – Part 9: Alarms and conditions

Architecture unifiée OPC – Partie 9: Alarmes et conditions

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE XD
CODE PRIX

ICS 25.040.40; 25.100.01

ISBN 978-2-83220-286-9

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPC UNIFIED ARCHITECTURE –

Part 9: Alarms and conditions

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 62541-9 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:

FDIS	Report on voting
65E/243/FDIS	65E/268/RVD

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 *OPC unified architecture*, 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.

INTRODUCTION

This International Standard is a specification intended for developers of OPC UA applications. The specification is a result of an analysis and design process to develop a standard interface to facilitate the development of applications by multiple vendors that inter-operate seamlessly together.

OPC UNIFIED ARCHITECTURE –

Part 9: Alarms and conditions

1 Scope

This part of the IEC 62541 series specifies the representation of *Alarms* and conditions in the OPC unified architecture. Included is the *Information Model* representation of *Alarms* and conditions in the OPC UA address space.

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 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 62541-6, *OPC unified architecture – Part 6: Mappings*

IEC 62541-8, *OPC unified architecture – Part 8: Data Access*

EEMUA 191:2007, *Alarm Systems – A guide to design, management and procurement, available at* <http://www.eemua.co.uk/>

3 Terms, definitions, abbreviations and data types

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62541-1, IEC 62541-3 and IEC 62541-5 as well as the following apply.

3.1.1
Acknowledge
operator action that indicates recognition of a new *Alarm*

Note 1 to entry: As defined in EEMUA, the term “Accept” is another common term used to describe Acknowledge. They can be used interchangeably. This document will use Acknowledge.

3.1.2
Active
state for an *Alarm* that indicates that the situation the *Alarm* represents currently exists

Note 1 to entry: Other common terms defined by EEMUA are “Standing” for an Active Alarm and “Cleared” when the Condition has returned to normal and is no longer Active.

3.1.3
ConditionClass
a *Condition* grouping that indicates in which domain or for what purpose a certain *Condition* is used

Note 1 to entry: Some top-level ConditionClasses are defined in this specification. Vendors or organisations may derive more concrete classes or define different top-level classes.

3.1.4
ConditionBranch
a specific state of a *Condition*

Note 1 to entry: The Server can maintain ConditionBranches for the current state, as well as for previous states.

3.1.5
ConditionSource
element which a specific *Condition* is based upon or related to

Note 1 to entry: Typically, it will be a Variable representing a process tag (e.g. FIC101) or an Object representing a device or subsystem.

In Events generated for Conditions, the SourceNode Property (inherited from the BaseEventType) will contain the NodeId of the ConditionSource.

3.1.6
Confirm
operator action informing the *Server* that a corrective action has been taken to address the cause of the *Alarm*

3.1.7
Disable
system is configured such that the *Alarm* will not be generated even though the base *Alarm Condition* is present

Note 1 to entry: As defined in EEMUA.

3.1.8
Operator
special user who is assigned to monitor and control a portion of the process

Note 1 to entry: A Member of the operations team who is assigned to monitor and control a portion of the process and is working at the control system's Console" as defined in EEMUA. In this specification an Operator is a special user. All descriptions that apply to general users also apply to Operators.

3.1.9
Refresh
an update to an *Event Subscription* that provides all *Alarms* which are considered to be *Retained*

Note 1 to entry: This concept is further described in EEMUA.

3.1.10
Retain
alarm in a state that is interesting for a *Client* wishing to synchronize its state of *Conditions* with the *Server*'s state

3.1.11
Shelving
facility where the *Operator* is able to temporarily prevent an *Alarm* from being displayed to the *Operator* when it is causing the *Operator* a nuisance

Note 1 to entry: A Shelved Alarm will be removed from the list and will not re-annunciate until un-shelved" as defined in EEMUA.

3.1.12
Suppress
logical criterion to determine that the *Alarm* does not occur

Note 1 to entry An Alarm is suppressed when logical criteria are applied to determine that the Alarm should not occur, even though the base Alarm Condition (e.g. Alarm setting exceeded) is present, as defined in EEMUA.

3.2 Abbreviations

A&C Alarms and Conditions

A&E Alarms and Events

DA Data Access

UA Unified Architecture

3.3 Used data types

The following tables describe the data types that are used throughout this document. These types are separated into two tables. Base data types defined in IEC 62541-3 are in Table 1. The base types and data types defined in IEC 62541-4 are in Table 2.

Table 1 – Parameter Types defined in IEC 62541-3

Parameter Type
Argument
BaseDataType
NodeId
LocalizedText
Boolean
ByteString
Double
Duration
String
UInt16
Int32
UtcTime

Table 2 – Parameter Types defined in IEC 62541-4

Parameter Type
IntegerId
StatusCode

4 Concepts

4.1 General

This specification defines an *Information Model* for *Conditions*, Dialog *Conditions*, and *Alarms* including acknowledgement capabilities. It is built upon and extends base eventing which is defined in IEC 62541-3, IEC 62541-4 and IEC 62541-5. This *Information Model* can also be extended to support the additional needs of specific domains.

4.2 Conditions

Conditions are used to represent the state of a system or one of its components. Some common examples are:

- a temperature exceeding a configured limit;
- a device needing maintenance;
- a batch process that requires a user to confirm some step in the process before proceeding.

Each *Condition* instance is of a specific *ConditionType*. The *ConditionType* and derived types are subtypes of the *BaseEventType* (see IEC 62541-3 and IEC 62541-5). This part defines types that are common across many industries. It is expected that vendors or other standardisation groups will define additional *ConditionTypes* deriving from the common base types defined in this part. The *ConditionTypes* supported by a *Server* are exposed in the *AddressSpace* of the *Server*.

Condition instances are specific implementations of a *ConditionType*. It is up to the *Server* whether such instances are also exposed in the *Server's AddressSpace*. Subclause 4.10 provides additional background about *Condition* instances. *Condition* instances shall have a unique identifier to differentiate them from other instances. This is independent of whether they are exposed in the *AddressSpace*.

As mentioned above, *Conditions* represent the state of a system or one of its components. In certain cases, however, previous states that still need attention also have to be maintained. *ConditionBranches* are introduced to deal with this requirement and distinguish current state and previous states. Each *ConditionBranch* has a BranchId that differentiates it from other branches of the same *Condition* instance. The *ConditionBranch* which represents the current state of the *Condition* (the trunk) has a Null BranchId. Servers can generate separate *Event Notifications* for each branch. When the state represented by a *ConditionBranch* does not need further attention, a final *Event Notification* for this branch will have the *Retain Property* set to False. Subclause 4.4 provides more information and use cases. Maintaining previous states and therefore also the support of multiple branches is optional for *Servers*.

Conceptually, the lifetime of the *Condition* instance is independent of its state. However, *Servers* may provide access to *Condition* instances only while *ConditionBranches* exist.

The base *Condition* state model is illustrated in Figure 1. It is extended by the various *Condition* subtypes defined in this specification and may be further extended by vendors or other standardisation groups. The primary states of a *Condition* are disabled and enabled. The disabled state is intended to allow *Conditions* to be turned off at the *Server* or below the *Server* (in a device or some underlying system). The enabled state is normally extended with the addition of sub-states.