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**OPC unified architecture –
Part 9: Alarms and conditions**

**Architecture unifiée OPC –
Partie 9: Alarmes et conditions**

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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

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Part 9: Alarms and conditions**

**Architecture unifiée OPC –
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OPC UNIFIED ARCHITECTURE –

Part 9: Alarms and conditions

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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.

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Withdrawing

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.



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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.