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TECHNICAL REPORT

OPC Unified Architecture – Part 1: Overview and Concepts

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Part 1: Overview and Concepts

FOREWORD

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IEC 62541-1, which is a technical report, 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 technical report is based on the following documents:

Enquiry draft	Report on voting
65E/92/DTR	65E/154/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, 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- withdrawn,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
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A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

This technical report introduces the specification for developers of OPC Unified Architecture applications. This technical report and specification are 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 1: Overview and Concepts

1 Scope

This part of IEC 62541 presents the concepts and overview of the Unified Architecture (OPC UA) specification produced by the OPC Foundation. Reading this report enables the reader to understand the series of IEC 62541 standards. Each of the other parts is briefly explained along with a suggested reading order.

2 Normative references

The following referenced documents are indispensable for the application 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 (all parts), *OPC Unified Architecture*

3 Terms, definitions, abbreviations and conventions

3.1 Document conventions

Throughout this document and the referenced other Parts of the series, certain document conventions are used.

Italics are used to denote a defined term or definition that appears in the “Terms and definition” clause in one of the Parts of the 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 also often 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.

3.2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.2.1
AddressSpace
collection of information that an OPC UA *Server* makes visible to its *Clients*

NOTE See IEC 62541-3 for a description of the contents and structure of the *Server AddressSpace*.

3.2.2
Alarm
type of *Event* associated with a state condition that typically requires acknowledgement

NOTE See IEC 62541-9 or a description of *Alarms*.

3.2.3
Attribute
primitive characteristic of a *Node*

NOTE All *Attributes* are defined by OPC UA, and may not be defined by *Clients* or *Servers*. *Attributes* are the only elements in the *AddressSpace* permitted to have data values.

3.2.4
Certificate
digitally signed data structure that describes capabilities of a *Client* or *Server*

3.2.5
Client
software application that sends *Messages* to OPC UA *Servers* conforming to the *Services* specified in the IEC 62541 series of standards

3.2.6
Condition
generic term that is an extension to an *Event*

NOTE A *Condition* represents the conditions of a system or one of its components and always exists in some state.

3.2.7
Communication Stack
layered set of software modules between the application and the hardware that provides various functions to encode, encrypt and format a *Message* for sending, and to decode, decrypt and unpack a *Message* that was received

3.2.8
Complex Data
data that is composed of elements of more than one primitive data type

3.2.9
Discovery
process by which OPC UA Client obtains information about OPC UA Servers, including endpoint and security information

3.2.10
Event
generic term used to describe an occurrence of some significance within a system or system component

3.2.11
EventNotifier
special *Attribute* of a *Node* that signifies that a *Client* may subscribe to that particular *Node* to receive *Notifications* of *Event* occurrences

3.2.12
Information Model
organizational framework that defines, characterizes and relates information resources of a given system or set of systems

NOTE The core address space model supports the representation of *Information Models* in the *AddressSpace*. See IEC 62541-5 for a description of the base OPC UA *Information Model*.

3.2.13
Message
data unit conveyed between *Client* and *Server* that represents a specific *Service* request or response

3.2.14
Method
callable software function that is a component of an *Object*

3.2.15
MonitoredItem
Client-defined entity in the *Server* used to monitor *Attributes* or *EventNotifiers* for new values or *Event* occurrences and that generates *Notifications* for them

3.2.16
Node
fundamental component of an *AddressSpace*

3.2.17
NodeClass
class of a *Node* in an *AddressSpace*

NOTE *NodeClasses* define the metadata for the components of the OPC UA Object Model. They also define constructs, such as *Views,* that are used to organize the *AddressSpace*.

3.2.18
Notification
generic term for data that announces the detection of an *Event* or of a changed *Attribute* value; *Notifications* are sent in *NotificationMessages*

3.2.19
NotificationMessage
Message published from a *Subscription* that contains one or more *Notifications*

3.2.20
Object
Node that represents a physical or abstract element of a system

NOTE *Objects* are modelled using the OPC UA Object Model. Systems, subsystems and devices are examples of *Objects*. An *Object* may be defined as an instance of an *ObjectType*.

3.2.21
Object Instance
synonym for *Object*

NOTE Not all *Objects* are defined by *ObjectTypes*.

3.2.22
ObjectType
Node that represents the type definition for an *Object*

3.2.23
Profile
specific set of capabilities to which a *Server* may claim conformance; each *Server* may claim conformance to more than one *Profile*

NOTE The set of capabilities are defined in IEC 62541-7.

3.2.24
Program
executable *Object* that, when invoked, immediately returns a response to indicate that execution has started, and then returns intermediate and final results through *Subscriptions* identified by the *Client* during invocation

3.2.25
Reference
explicit relationship (a named pointer) from one *Node* to another

NOTE The *Node* that contains the *Reference* is the source *Node*, and the referenced *Node* is the target *Node*. All *References* are defined by *ReferenceTypes*.

3.2.26
ReferenceType
Node that represents the type definition of a *Reference*

NOTE The *ReferenceType* specifies the semantics of a *Reference*. The name of a *ReferenceType* identifies how source *Nodes* are related to target *Nodes* and generally reflects an operation between the two, such as "A *Contains* B".

3.2.27
RootNode
beginning or top *Node* of a hierarchy

NOTE The *RootNode* of the OPC UA *AddressSpace* is defined in IEC 62541-5.

3.2.28
Server
software application that implements and exposes the *Services* specified in the IEC 62541 series of standards

3.2.29
Service
Client-callable operation in an OPC UA *Server*

NOTE *Services* are defined in IEC 62541-4. A *Service* is similar to a method call in a programming language or an operation in a Web services WSDL contract.

3.2.30
Service Set
group of related *Services*

3.2.31
Session
logical long-running connection between a *Client* and a *Server*.

NOTE A *Session* maintains state information between *Service* calls from the *Client* to the *Server*.

3.2.32
Subscription
Client-defined endpoint in the *Server,* used to return *Notifications* to the *Client*

NOTE "Subscription" is a generic term that describes a set of *Nodes* selected by the *Client* (1) that the *Server* periodically monitors for the existence of some condition, and (2) for which the *Server* sends *Notifications* to the *Client* when the condition is detected.

3.2.33
Variable
Node that contains a value

3.2.34
View
specific subset of the *AddressSpace* that is of interest to the *Client*.