

TECHNICAL REPORT



**OPC unified architecture –
Part 1: Overview and concepts**

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OPC UNIFIED ARCHITECTURE –

Part 1: Overview and concepts

FOREWORD

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The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 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/414/DTR	65E/463/RVC

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

This second edition cancels and replaces the first edition of IEC TR 62541-1, published in 2010.

This edition includes no technical changes with respect to the previous edition but includes updates to reflect changes or additions in normative parts of IEC 62541.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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*.

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 website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
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OPC UNIFIED ARCHITECTURE –

Part 1: Overview and concepts

1 Scope

This part of IEC 62541, which is a Technical Report, presents the concepts and overview of the OPC Unified Architecture (OPC UA). Reading this document is helpful to understand the remaining parts of this multi-part document set. Each of the other parts is briefly explained along with a suggested reading order.

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 62541-2, *OPC Unified Architecture – Part 2: Security Model*

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 62541-7, *OPC unified architecture – Part 7: Profiles*

IEC 62541-8, *OPC Unified Architecture – Part 8: Data Access*

IEC 62541-9, *OPC Unified Architecture – Part 9: Alarms and Conditions*

IEC 62541-10, *OPC Unified Architecture – Part 10: Programs*

IEC 62541-11, *OPC Unified Architecture – Part 11: Historical Access*

IEC 62541-13, *OPC Unified Architecture – Part 13: Aggregates*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

AddressSpace

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

Note 1 to entry: See IEC 62541-3 for a description of the contents and structure of the *Server AddressSpace*.

3.1.2

Aggregate

a function that calculates derived values from *Raw data*

Note 1 to entry: *Raw data* may be from a historian or buffered real time data. Common *Aggregates* include averages over a given time range, minimum over a time range and maximum over a time range.

3.1.3

Alarm

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

Note 1 to entry: See IEC 62541-9 for a description of Alarms.

3.1.4

Attribute

primitive characteristic of a Node

Note 1 to entry: 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.

3.1.5

Certificate

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

3.1.6

Client

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

3.1.7

Condition

generic term that is an extension to an *Event*

Note 1 to entry: A *Condition* represents the conditions of a system or one of its components and always exists in some state.

3.1.8

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

3.1.9

Complex Data

data that is composed of elements of more than one primitive data type, such as a structure

3.1.10

Discovery

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

3.1.11

Event

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

3.1.12

EventNotifier

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

3.1.13

Information Model

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

Note 1 to entry: 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.

3.1.14

Message

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

3.1.15

Method

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

3.1.16

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

3.1.17

Node

fundamental component of an *AddressSpace*

3.1.18

NodeClass

class of a *Node* in an *AddressSpace*

Note 1 to entry: *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*.

3.1.19

Notification

generic term for data that announces the detection of an *Event* or of a changed *Attribute* value

Note 1 to entry: *Notifications* are sent in *NotificationMessages*.

3.1.20

NotificationMessage

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

3.1.21

Object

Node that represents a physical or abstract element of a system

Note 1 to entry: *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*.

3.1.22

Object Instance

synonym for *Object*

Note 1 to entry: Not all *Objects* are defined by *ObjectTypes*.

3.1.23

ObjectType

Node that represents the type definition for an *Object*

3.1.24**Profile**

specific set of capabilities to which a *Server* may claim conformance

Note 1 to entry: Each *Server* may claim conformance to more than one Profile.

Note 2 to entry: The set of capabilities are defined in IEC 62541-7.

3.1.25**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

3.1.26**Reference**

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

Note 1 to entry: The Node that contains the Reference is the source Node, and the referenced Node is the target Node. All References are defined by ReferenceTypes.

3.1.27**ReferenceType**

Node that represents the type definition of a Reference

Note 1 to entry: 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".

3.1.28**RootNode**

beginning or top Node of a *hierarchy*

Note 1 to entry: The RootNode of the OPC UA AddressSpace is defined in IEC 62541-5.

3.1.29**Server**

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

3.1.30**Service**

Client-callable operation in an OPC UA *Server*

Note 1 to entry: 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.

3.1.31**Service Set**

group of related *Services*

3.1.32**Session**

logical long-running connection between a *Client* and a *Server*

Note 1 to entry: A Session maintains state information between Service calls from the *Client* to the *Server*.

3.1.33**Subscription**

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