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**Enotna arhitektura OPC - 16. del: Stroji stanj**

OPC unified architecture - Part 16: State machines

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TITLE: <b>OPC Unified Architecture – Part 16: State Machines</b>
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NOTE FROM TC/SC OFFICERS:
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## OPC UNIFIED ARCHITECTURE –

## Part 16: State Machines

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International Standard IEC 62541-16 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 international standard is based on the following documents:

CDV	Report on voting
65E/XX/CDV	65E/XX/RVC

Full information on the voting for the approval of this international 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.

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

145 *Italics* are used to denote a defined term or definition that appears in the “Terms and definition” clause  
146 in one of the parts of the series.

147 *Italics* are also used to denote the name of a service input or output parameter or the name of a structure  
148 or element of a structure that are usually defined in tables.

149 The *italicized terms* and *names* are also often written in camel-case (the practice of writing compound  
150 words or phrases in which the elements are joined without spaces, with each element's initial letter  
151 capitalized within the compound). For example, the defined term is *AddressSpace* instead of Address  
152 Space. This makes it easier to understand that there is a single definition for *AddressSpace*, not  
153 separate definitions for Address and Space.

154 A list of all parts of the IEC 62541 series is included in IEC 62541-1 clause 4 Structure of the OPC UA  
155 series and published under the general title OPC Unified Architecture, can be found on the IEC website.

156 The committee has decided that the contents of this publication will remain unchanged until the stability  
157 date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific  
158 publication. At this date, the publication will be

- 159 • reconfirmed,
- 160 • withdrawn,
- 161 • replaced by a revised edition, or
- 162 • amended.

163

164 A bilingual version of this publication may be issued at a later date.

165

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# OPC Unified Architecture Specification

## Part 16: State Machines

### 1 Scope

This part of the OPC Unified Architecture defines an Information Model. The Information Model describes the basic infrastructure to model state machines.

Note: In the previous version, File Transfer was in IEC 62541-5, Annex B

### 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 and errata) 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 62541-6, *OPC Unified Architecture – Part 6: Mappings*

IEC 62541-7, *OPC Unified Architecture – Part 7: Profiles*

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

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

### 3 Terms, definitions, abbreviated terms, and conventions

#### 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 apply.

### 4 State Machine Model

#### 4.1 General

This document describes the basic infrastructure to model state machines. It defines *ObjectTypes*, *VariableTypes* and *ReferenceTypes* and explains how they should be used.

This document is an integral part of this standard, that is, the types defined in this document shall be used as defined. However, it is not required but strongly recommended that a *Server* uses these types to expose its state machines. The defined types may be subtyped to refine their behaviour.

When a *Server* exposes its state machine using the types defined in this document, it might only provide a simplified view on its internal state machine, hiding for example substates or putting several internal states into one exposed state.

209 The scope of the state machines described in this document is to provide an appropriate  
210 foundation for state machines needed for IEC 62541-9 and IEC 62541-10. It does not provide  
211 more complex functionality of a state machine like parallel states, forks and joins, history states,  
212 choices, and junctions, etc. However, the base state machine defined in this document can be  
213 extended to support such concepts.

214 The following clauses describe examples of state machines, define state machines in the  
215 context of this document and define the representation of state machines in OPC UA. Finally,  
216 some examples of state machines, represented in OPC UA, are given.

## 217 **4.2 Examples of finite state machines**

### 218 **4.2.1 Simple state machine**

219 The following example provides an overview of the base features that the state machines  
220 defined in this specification will support. In the following, a more complex example is given, that  
221 also supports sub-state machines.

222 Figure 1 gives an overview over a simple state machine. It contains the three states "State1",  
223 "State2" and "State3". There are transitions from "State1" to "State2", "State2" to "State2", etc.  
224 Some of the transitions provide additional information with regard to what causes (or triggers)  
225 the transition, for example the call of "Method1" for the transition from "State1" to "State2". The  
226 effect (or action) of the transition can also be specified, for example the generation of an *Event*  
227 of the "EventType1" in the same transition. The notation used to identify the cause is simply  
228 listing it on the transition, the effect is prefixed with a "/". More than one cause or effect are  
229 separated by a ",". Not every transition has to have a cause or effect, for example the transition  
230 between "State2" and "State3".



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**Figure 1 – Example of a simple state machine**

233 For simplicity, the state machines described in this specification will only support causes in form  
234 of specifying *Methods* that have to be called and effects in form of *EventTypes* or *Events* that  
235 are generated. However, the defined infrastructure allows extending this to support additional  
236 different causes and effects.

### 237 **4.2.2 State machine containing substates**

238 Figure 2 shows an example of a state machine where "State6" is a sub-state-machine. This  
239 means, that when the overall state machine is in State6, this state can be distinguished to be  
240 in the sub-states "State7" or "State8". Sub-state-machines can be nested, that is, "State7" could  
241 be another sub-state-machine.