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Industrial automation systems and integration — COLLADA™ digital asset schema specification for 3D visualization of industrial data

Systèmes d'automatisation industrielle et intégration — Spécifications du schéma des actifs numériques COLLADA™ pour la visualisation 3D des données industrielles

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

This first edition cancels and replaces ISO/PAS 17506:2012, which has been technically revised.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document describes the COLLADA™[1] schema. COLLADA is a COLLAborative Design Activity that defines an XML-based schema to enable 3D authoring applications to freely exchange digital assets without loss of information, enabling multiple software packages to be combined into extremely powerful tool chains.

The purpose of this document is to provide a specification for the COLLADA schema in sufficient detail to enable software developers to create tools to process COLLADA resources. In particular, it is relevant to those who import to or export from digital content creation (DCC) applications, 3D interactive applications and tool chains, prototyping tools, real-time visualization applications such as those used in the video game and movie industries, and CAD tools.

This document covers the initial design and specifications of the COLLADA schema, as well as a minimal set of requirements for COLLADA exporters. A short example of a COLLADA instance document is presented in Annex A.

[1] COLLADA is the trademark of a product supplied by the Khronos Group Inc.(http://khronos.org) This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

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Industrial automation systems and integration — COLLADA™ digital asset schema specification for 3D visualization of industrial data

1 Scope

This document describes the COLLADA™ schema. COLLADA is a Collaborative Design Activity that defines an XML-based schema to enable 3D authoring applications to freely exchange digital assets without loss of information, enabling multiple software packages to be combined into extremely powerful tool chains.

The purpose of this document is to provide a specification for the COLLADA schema in sufficient detail to enable software developers to create tools to process COLLADA resources. In particular, it is relevant to those who import to or export from digital content creation (DCC) applications, 3D interactive applications and tool chains, prototyping tools, real-time visualization applications such as those used in the video game and movie industries, and CAD tools.

This document covers the initial design and specifications of the COLLADA schema, as well as a minimal set of requirements for COLLADA exporters.

This document covers the following information:

- initial design and specifications of the COLLADA schema;
- requirements of COLLADA tools and a minimal set of requirements for COLLADA exporters;
- detailed explanations for COLLADA programming;
- core elements that describe geometry, animation, skinning, assets, and scenes;
- physics model, visual effects (FX), boundary representation (B-rep) of animation, kinematics.

The document does not specify the implementation of, or definition of a run-time architecture for viewing or processing of COLLADA data.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

XML, Extensible Markup Language (XML) 1.0 (Fifth Edition), W3C Recommendation, 26 November 2008 [viewed 2020-09-01]. Available at https://www.w3.org/TR/2008/REC-xml-20081126/

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XPath, XML Path Language (XPath) Version 1.0, W3C Recommendation, 16 November 1999 [viewed 2020-09-01]. Available at https://www.w3.org/TR/1999/REC-xpath-19991116/

XPointer, XML Pointer Language (XPointer) 1.0, W3C Recommendation, January 2001 [viewed 2020-09-01]. Available at https://www.w3.org/TR/2001/WD-xptr-20010108/

IETF RFC 3986, Uniform Resource Identifier (URI), January 2005 [viewed 2020-09-01]. Available at https://datatracker.ietf.org/doc/html/rfc3986

3 Terms and definitions

3.1 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
COLLADA
digital asset XML schema for 3D visualization

Note 1 to entry: COLLADA is an abbreviation of Collaborative Design Activity.

3.1.2
COLLADA document
DAE file
file containing COLLADA XML elements that describe certain digital assets

3.1.3
COLLADA schema
XML schema document that defines all valid COLLADA elements

3.1.4
profile
<COLLADA> structure in which to gather effects information for a specific platform or environment

3.1.5
instance
<COLLADA> occurrence of an object, the result of instantiating a copy or version of the object

3.1.6
instance document
COLLADA document

3.1.7
instantiation
creation of an instance of an object

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3.1.8
node
<COLLADA> point of information within a scene graph

Note 1 to entry: COLLADA uses node to refer to interior (branch) nodes rather than to exterior (leaf) nodes.

3.1.9
path
<COLLADA> connection between nodes

3.1.10
shorthand pointer
<COLLADA> value of the id attribute of an element in an instance document

Note 1 to entry: This is a URI fragment identifier that conforms to XPointer 1.0 syntax.

3.1.11
animation curve
function curve
<COLLADA> 2D function defined by a set of key frames and the interpolation among them

3.1.12
effect scope
<COLLADA> declaration space that is inside an <effect> element but not within any specific profile

3.1.13
FX runtime
<COLLADA> library of code that handles the creation, use, and management of shaders, source code, parameters, and other effects properties

3.1.14
morph target
<COLLADA> mesh that can be blended with other meshes

3.1.15
multiple render target
MRT
<COLLADA> rendering to multiple drawing buffers simultaneously

3.1.16
scene graph
<COLLADA> hierarchical structure of a scene represented

Note 1 to entry: scene graph is defined by the scene element contents in a COLLADA document.

Note 2 to entry: scene graph is a directed acyclic graph or tree data structure that contains nodes of visual information and related data.

3.1.17
tone mapping
<COLLADA> combination of spectral sampling and dynamic range remapping which is performed as the last step of rendering.

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3.1.18
viewing frustum
<COLLADA> region of space that appears in a camera's view

Note 1 to entry: In this document, frustum means viewing frustum.

3.1.19
shader
<COLLADA> user defined program executed in graphics pipeline

Note 1 to entry: shader is programmed with shading language.

Note 2 to entry: According to profile, number and kind of shader are varying.

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

API	Application Programming Interface
COLLADA	Collaborative Design Activity
CTS	Conformance Test Suite
CV	Control Vertex
DAG	Directed Acyclic Graph
DCC	Digital Content Creation
DAE	Digital Asset Exchange
ID	Identifier
IDREF	Reference to an ID
HDR	High Dynamic Range
LOD	Level Of Detail
SID	Scoped Identifier
SIDREF	Reference to an SID
URI	Uniform Resource Identifier
MRT	Multiple Render Targets
XML	eXtended Markup Language

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