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

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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.

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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/>

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

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

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3.1.2

COLLADA document

DAE file

file containing COLLADA XML elements that describe certain digital assets

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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

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.