Document Object Model (DOM) Level 3 Validation Specification

1.0

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Abstract

This specification defines the Document Object Model Validation Level 3, a platform- and language-neutral interface. This module provides the guidance to programs and scripts to dynamically update the content and the structure of documents while ensuring that the document remains valid, or to ensure that the document becomes valid.

Status of this document

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the W3C technical reports index at http://www.w3.org/TR/.

This is the Recommendation of "DOM Level 3 Validation". No changes were done to this specification since the Proposed Recommendation version.

Comments on this document should be sent to the public mailing list www-dom@w3.org. An archive is available at http://lists.w3.org/Archives/Public/www-dom/.

An implementation report, along with the test suite, is also available.

This is a stable document and has been endorsed by the W3C Membership and the participants of the DOM working group. The English version of this specification is the only normative version. Information about translations of this document is available at http://www.w3.org/2004/01/DOM-Level-3-translations.

The list of known errors in this document is available at http://www.w3.org/2004/01/DOM-Level-3-errata.

This document has been produced as part of the W3C DOM Activity. The authors of this document are the DOM Working Group participants.

Patent disclosures relevant to this specification may be found on the Working Group's patent disclosure page.

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1. Validation

Ben Chang, Oracle; Joe Kesselman, IBM (until September 2001); Rezaur Rahman, Intel Corporation (until July 2001)

1.1. Overview

This chapter describes the optional DOM Level 3 Validation feature. This module provides Application Programming Interfaces (APIs) to guide construction and editing of XML documents. Examples of such guided editing are queries like those that combine questions like "what does the schema allow me to insert/delete here" and "if I insert/delete here, will the document still be valid."

To aid users in the editing and creation of XML documents, other queries may expose different levels of details, e.g., all the possible children, those which would be valid given what precedes this point, lists of defined symbols of a given kind. Some of these queries would prompt checks and warn users if they're about to conflict with or overwrite such data.

Finally, users would like to validate an edited or newly constructed document before serializing it or passing it to other users. They may edit, come up with an invalid document, then edit again to result in a valid document. During this process, these APIs can allow the user to check the validity of the document or subtree on demand. If necessary, these APIs can also require that the document or subtree remain valid during this editing process via the `DocumentEditVal.continuousValidityChecking` flag.

A DOM application can use the `hasFeature(feature, version)` method of the `DOMImplementation` interface to determine with parameter values `"Validation"` and `"3.0"`, respectively, whether or not these interfaces are supported by the implementation. This implementation is dependent on [DOM Level 2 Core] and the [DOM Level 3 Core] `DOMConfiguration` interface.

This chapter focuses on the editing aspects used in the XML document editing world and usage of such information. The appendix describes in detail all the possible outcomes of the validation operations on the different node types.

1.2. Exceptions

This section describes the "VAL-DOC-EDIT" exceptions.

1.3. Document Editing Interfaces

This section contains "Document Editing" methods as described in the `DocumentEditVAL`, `NodeEditVAL`, `ElementEditVAL`, and `CharacterDataEditVAL` interfaces. References to new [DOM Level 3 Core] interfaces such as `DOMStringList` and `NameList` also exist. With the latter interface, if the schema is a DTD, the element information item names are simply local names; if the schema is a W3C XML schema, the names are qualified names, which may contain namespace prefixes.

Appendix A. Validation Outcomes

Ben Chang, Oracle

A.1. The nodeValidity and validateDocument methods

The following table describes all possible validation outcomes of the `NodeEditVAL.nodeValidity(valType)` method.

Validation Type	Validity outcome		
	VAL_TRUE	**VAL_FALSE**	**VAL_UNKNOWN**
`VAL_WF`	The node is well-formed.	The node is not well-formed.	Not applicable.
`VAL_NS_WF`	The node is well-formed. Processor must take into account all the in-scope namespace declarations.	The node is not namespace well-formed. Processor must take into account all the in-scope namespace declarations.	Not applicable.
`VAL_NS_WF`	The node is well-formed. Processor must take into account all namespace declarations in scope.	The node is not namespace well-formed. Processor must take into account all the in-scope namespace declarations.	Not applicable.
`VAL_SCHEMA`	The node is valid: it complies with all the constraints expressed in the schema.	The node fails to comply to all the constraints expressed in the schema.	If the schema is an XML Schema, PSVI [validity] property value is unknown.
`VAL_INCOMPLETE`	The node is valid: it complies with the `VAL_INCOMPLETE` definition.	The node is invalid with regard to the `VAL_INCOMPLETE` definition.	If the schema is an XML Schema, PSVI [validity] property value is unknown.

The following table describes the outcome of the `DocumentEditVAL.validateDocument()` and `NodeEditVAL.nodeValidity(valType)` methods, with the latter called on the `DocumentEditVAL` node with validationType `NodeEditVAL.VAL_SCHEMA`.

Methods	Validity outcome		
	VAL_TRUE	VAL_FALSE	VAL_UNKNOWN
`validateDocument` and `nodeValidity`, called on the `Document` node with validationType `VAL_SCHEMA`.	If the schema is a DTD, then the document valid constraint is satisfied. If the schema is an XML Schema, then the document validity is the same as the validity of the validation root, i.e., `documentElement`: PSVI [validity] valid.	Fails to satisfy the constraints defined.	If the schema is an XML Schema, then schema is not found or the declaration for the validation root is not found: PSVI [validity] unknown.

The following table describes outcomes for the `NodeEditVAL.nodeValidity(valType)` method called with the validationType `NodeEditVAL.VAL_SCHEMA`:

Node types	Validity outcome		
	VAL_TRUE	VAL_FALSE	VAL_UNKNOWN
`Element`	If the schema is a DTD, then element and attribute validity constraints, including attribute validity constraint defined below are satisfied. If the schema is an XML Schema, then PSVI [validity] valid.	Fails to satisfy the constraints defined.	If the schema is an XML Schema, then PSVI [validity] unknown.
`Attr`	If the schema is a DTD, then all validity constraints defined in section 3.3.1, "Attribute Type", required and fixed attribute are satisfied. If the schema is an XML Schema, then PSVI [validity] valid.	Fails to satisfy the constraints defined.	If the schema is an XML Schema, then PSVI [validity] unknown.
`Text`	The node is well-formed.	The node is not well-formed.	If no parent node is found.
`CDATASection`	The node is well-formed.	The node is not well-formed.	If no parent node is found.
`ProcessingInstruction`	The node is well-formed.	The node is not well-formed.	If no parent node is found.
`Comment`	The node is well-formed.	The node is not well-formed.	If no parent node is found.
`EntityReference`	Entity is declared.	Entity is not declared.	Not applicable.
`Entity`	Implementation-specific.	Implementation-specific.	Implementation-specific.
`Notation`	Implementation-specific.	Implementation-specific.	Implementation-specific.
`DocumentType`	Implementation-specific.	Implementation-specific.	Implementation-specific.
`DocumentFragment`	Not applicable.	Not applicable.	Not applicable.

A.2. Other validation operations

The table below describes validation outcomes from `can*` validation operations, such as `NodeEditVAL.canRemoveChild()`, or `ElementEditVAL.canSetAttributeNS`, `CharacterDataEditVAL.canAppendData()`. All these operations attempt to validate with validityType `NodeEditVAL.VAL_INCOMPLETE`.

VAL_TRUE	VAL_FALSE	VAL_UNKNOWN
If the associated operation is performed, then the node would be valid with regards to the `VAL_INCOMPLETE` definition or if there is no schema found.	If the associated operation is performed, then the node would be invalid with regards to the `VAL_INCOMPLETE` definition.	Not applicable.

Note: If the document includes more than one type of , e.g., DTD and XML Schema, and the `DOMConfiguration` "schema-type" parameter is not specified, the validation outcome for `NodeEditVAL.VAL_INCOMPLETE` and `NodeEditVAL.VAL_SCHEMA` is implementation-specific.

Appendix B. IDL Definitions

This appendix contains the complete OMG IDL [OMG IDL] for the Level 3 Document Object Model Validation definitions.

The IDL files are also available as: http://www.w3.org/TR/2004/REC-DOM-Level-3-Val-20040127/idl.zip

Appendix C. Java Language Binding

This appendix contains the complete Java [Java] bindings for the Level 3 Document Object Model Validation.

The Java files are also available as http://www.w3.org/TR/2004/REC-DOM-Level-3-Val-20040127/java-binding.zip

Appendix D. ECMAScript Language Binding

This appendix contains the complete ECMAScript [ECMAScript] binding for the Level 3 Document Object Model Validation definitions.

Appendix E. Acknowledgements

Many people contributed to the DOM specifications (Level 1, 2 or 3), including participants of the DOM Working Group and the DOM Interest Group. We especially thank the following:

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E.1. Production Systems

This specification was written in XML. The HTML, OMG IDL, Java and ECMAScript bindings were all produced automatically.

Thanks to Joe English, author of cost, which was used as the basis for producing DOM Level 1. Thanks also to Gavin Nicol, who wrote the scripts which run on top of cost. Arnaud Le Hors and Philippe Le Hégaret maintained the scripts.

After DOM Level 1, we used Xerces as the basis DOM implementation and wish to thank the authors. Philippe Le Hégaret and Arnaud Le Hors wrote the Java programs which are the DOM application.

Thanks also to Jan Kärrman, author of html2ps, which we use in creating the PostScript version of the specification.

Appendix F. Glossary

Arnaud Le Hors, W3C; Robert S. Sutor, IBM Research (for DOM Level 1)
Some of the following term definitions have been borrowed or modified from similar definitions in other W3C or standards documents. See the links within the definitions for more information.

16-bit unit

The base unit of a `DOMString`. This indicates that indexing on a `DOMString` occurs in units of 16 bits. This must not be misunderstood to mean that a `DOMString` can store arbitrary 16-bit units. A `DOMString` is a character string encoded in UTF-16; this means that the restrictions of UTF-16 as well as the other relevant restrictions on character strings must be maintained. A single character, for example in the form of a numeric character reference, may correspond to one or two 16-bit units.

ancestor

An *ancestor* node of any node A is any node above A in a tree model, where "above" means "toward the root."

API

An *API* is an Application Programming Interface, a set of functions or methods used to access some functionality.

anonymous type name

An *anonymous type name* is an implementation-defined, globally unique qualified name provided by the processor for every anonymous type declared in a .

bubbling phase

The process by which an can be handled by one of the target ancestors after being handled by the .

capture phase

The process by which an can be handled by one of the target ancestors before being handled by the .

child

A *child* is an immediate descendant node of a node.

client application

A [client] application is any software that uses the Document Object Model programming interfaces provided by the hosting implementation to accomplish useful work. Some examples of client applications are scripts within an HTML or XML document.

COM

COM is Microsoft's Component Object Model [COM], a technology for building applications from binary software components.

content model

The *content model* is a simple grammar governing the allowed types of the child elements and the order in which they appear. See Element Content in XML [XML 1.0].

convenience

A *convenience method* is an operation on an object that could be accomplished by a program consisting of more basic operations on the object. Convenience methods are usually provided to make the API easier and simpler to use or to allow specific programs to create more optimized implementations for common operations. A similar definition holds for a *convenience property*.

cooked model

A model for a document that represents the document after it has been manipulated in some way. For example, any combination of any of the following transformations would create a cooked model:

1. Expansion of internal text entities.
2. Expansion of external entities.
3. Model augmentation with style-specified generated text.
4. Execution of style-specified reordering.
5. Execution of scripts.

A browser might only be able to provide access to a cooked model, while an editor might provide access to a cooked or the initial structure model (also known as the *uncooked model*) for a document.

CORBA

CORBA is the *Common Object Request Broker Architecture* from the OMG [CORBA]. This architecture is a collection of objects and libraries that allow the creation of applications containing objects that make and receive requests and responses in a distributed environment.

cursor

A *cursor*is an object representation of a node. It may possess information about context and the path traversed to reach the node.

data model

A *data model* is a collection of descriptions of data structures and their contained fields, together with the operations or functions that manipulate them.

deprecation

When new releases of specifications are released, some older features may be marked as being *deprecated*. This means that new work should not use the features and that although they are supported in the current release, they may not be supported or available in future releases.

descendant

A *descendant* node of any node A is any node below A in a tree model, where "below" means "away from the root."

document element

There is only one document element in a `Document`. This element node is a child of the `Document` node. See Well-Formed XML Documents in XML [XML 1.0].

document order

There is an ordering, *document order*, defined on all the nodes in the document corresponding to the order in which the first character of the XML representation of each node occurs in the XML representation of the document after expansion of general entities. Thus, the node will be the first node. Element nodes occur before their children. Thus, document order orders element nodes in order of the occurrence of their start-tag in the XML (after expansion of entities). The attribute nodes of an element occur after the element and before its children. The relative order of attribute nodes is implementation-dependent.

DOM Level 0

The term "DOM Level 0" refers to a mix (not formally specified) of HTML document functionalities offered by Netscape Navigator version 3.0 and Microsoft Internet Explorer version 3.0. In some cases, attributes or methods have been included for reasons of backward compatibility with "DOM Level 0".

ECMAScript

The programming language defined by the ECMA-262 standard [ECMAScript]. As stated in the standard, the originating technology for ECMAScript was JavaScript [JavaScript]. Note that in the ECMAScript binding, the word "property" is used in the same sense as the IDL term "attribute."

element

Each document contains one or more elements, the boundaries of which are either delimited by start-tags and end-tags, or, for empty elements by an empty-element tag. Each element has a type, identified by name, and may have a set of attributes. Each attribute has a name and a value. See Logical Structures in XML [XML 1.0].

event

An event is the representation of some asynchronous occurrence (such as a mouse click on the presentation of the element, or the removal of child node from an element, or any of unthinkably many other possibilities) that gets associated with an .

event target

The object to which an is targeted.

equivalence

Two nodes are *equivalent* if they have the same node type and same node name. Also, if the nodes contain data, that must be the same. Finally, if the nodes have attributes then collection of attribute names must be the same and the attributes corresponding by name must be equivalent as nodes.

Two nodes are *deeply equivalent* if they are *equivalent*, the child node lists are equivalent are equivalent as `NodeList` objects, and the pairs of equivalent attributes must in fact be deeply equivalent.

Two `NodeList` objects are *equivalent* if they have the same length, and the nodes corresponding by index are deeply equivalent.

Two `NamedNodeMap` objects are *equivalent* if they have the same length, they have same collection of names, and the nodes corresponding by name in the maps are deeply equivalent.

Two `DocumentType` nodes are *equivalent* if they are equivalent as nodes, have the same names, and have equivalent entities and attributes `NamedNodeMap` objects.

information item

An information item is an abstract representation of some component of an XML document. See the [XML Information Set] for details.

logically-adjacent text nodes

Logically-adjacent text nodes are `Text` or `CDATASection` nodes that can be visited sequentially in or in reversed document order without entering, exiting, or passing over `Element`, `Comment`, or `ProcessingInstruction` nodes.

global declaration

A *global declaration* is a schema declaration, usually for an element or an attribute, that is available for use in content models throughout the , i.e. a declaration that is not bound to a particular context.

hosting implementation

A [hosting] implementation is a software module that provides an implementation of the DOM interfaces so that a client application can use them. Some examples of hosting implementations are browsers, editors and document repositories.

HTML

The HyperText Markup Language (*HTML*) is a simple markup language used to create hypertext documents that are portable from one platform to another. HTML documents are SGML documents with generic semantics that are appropriate for representing information from a wide range of applications. [HTML 4.01]

IDL

An Interface Definition Language (*IDL*) is used to define the interfaces for accessing and operating upon objects. Examples of IDLs are the Object Management Group's IDL [CORBA], Microsoft's IDL [MIDL], and Sun's Java IDL [Java IDL].

implementor

Companies, organizations, and individuals that claim to support the Document Object Model as an API for their products.

inheritance

In object-oriented programming, the ability to create new classes (or interfaces) that contain all the methods and properties of another class (or interface), plus additional methods and properties. If class (or interface) D inherits from class (or interface) B, then D is said to be *derived* from B. B is said to be a *base* class (or interface) for D. Some programming languages allow for multiple inheritance, that is, inheritance from more than one class or interface.

initial structure model

Also known as the *raw structure model* or the *uncooked model*, this represents the document before it has been modified by entity expansions, generated text, style-specified reordering, or the execution of scripts. In some implementations, this might correspond to the "initial parse tree" for the document, if it ever exists. Note that a given implementation might not be able to provide access to the initial structure model for a document, though an editor probably would.

interface

An *interface* is a declaration of a set of methods with no information given about their implementation. In object systems that support interfaces and inheritance, interfaces can usually inherit from one another.

language binding

A programming *language binding* for an IDL specification is an implementation of the interfaces in the specification for the given language. For example, a Java language binding for the Document Object Model IDL specification would implement the concrete Java classes that provide the functionality exposed by the interfaces.

live

An object is *live* if any change to the underlying document structure is reflected in the object.

local name

A *local name* is the local part of a *qualified name*. This is called the local part in Namespaces in XML [XML Namespaces].

method

A *method* is an operation or function that is associated with an object and is allowed to manipulate the object's data.

model

A *model* is the actual data representation for the information at hand. Examples are the structural model and the style model representing the parse structure and the style information associated with a document. The model might be a tree, or a directed graph, or something else.

namespace prefix

A *namespace prefix* is a string that associates an element or attribute name with a *namespace URI* in XML. See namespace prefix in Namespaces in XML [XML Namespaces].

namespace URI

A *namespace URI* is a URI that identifies an XML namespace. This is called the namespace name in Namespaces in XML [XML Namespaces]. See also sections 1.3.2 "DOM URIs" and 1.3.3 "XML Namespaces" regarding URIs and namespace URIs handling and comparison in the DOM APIs.

namespace well-formed

A node is a *namespace well-formed* XML node if it is a node, and follows the productions and namespace constraints. If [XML 1.0] is used, the constraints are defined in [XML Namespaces]. If [XML 1.1] is used, the constraints are defined in [XML Namespaces 1.1].

object model

An *object model* is a collection of descriptions of classes or interfaces, together with their member data, member functions, and class-static operations.

parent

A *parent* is an immediate ancestor node of a node.

partially valid

A node in a DOM tree is *partially valid* if it is (this part is for comments and processing instructions) and its immediate children are those expected by the content model. The node may be missing trailing required children yet still be considered *partially valid*.

qualified name

A *qualified name* is the name of an element or attribute defined as the concatenation of a *local name* (as defined in this specification), optionally preceded by a *namespace prefix* and colon character. See Qualified Names in Namespaces in XML [XML Namespaces].

read only node

A *read only node* is a node that is immutable. This means its list of children, its content, and its attributes, when it is an element, cannot be changed in any way. However, a read only node can possibly be moved, when it is not itself contained in a read only node.

root node

The *root node* is a node that is not a child of any other node. All other nodes are children or other descendants of the root node.

schema

A *schema* defines a set of structural and value constraints applicable to XML documents. Schemas can be expressed in schema languages, such as DTD, XML Schema, etc.

sibling

Two nodes are *siblings* if they have the same parent node.

string comparison

When string matching is required, it is to occur as though the comparison was between 2 sequences of code points from [Unicode].

tag valid document

A document is *tag valid* if all begin and end tags are properly balanced and nested.

target node

The target node is the node representing the to which an is targeted using the DOM event flow.

target phase

The process by which an can be handled by the .

token

An information item such as an XML Name which has been .

tokenized

The description given to various information items (for example, attribute values of various types, but not including the StringType CDATA) after having been processed by the XML processor. The process includes stripping leading and trailing white space, and replacing multiple space characters by one. See the definition of tokenized type.

type valid document

A document is *type valid* if it conforms to an explicit DTD.

uncooked model

See initial structure model.

well-formed

A node is a *well-formed* XML node if its serialized form, without doing any transformation during its serialization, matches its respective production in [XML 1.0] or [XML 1.1] (depending on the XML version in use) with all well-formedness constraints related to that production, and if the entities which are referenced within the node are also well-formed. If namespaces for XML are in use, the node must also be .

XML

Extensible Markup Language (*XML*) is an extremely simple dialect of SGML which is completely described in this document. The goal is to enable generic SGML to be served, received, and processed on the Web in the way that is now possible with HTML. XML has been designed for ease of implementation and for interoperability with both SGML and HTML. [XML 1.0]

XML name

See XML name in the XML specification ([XML 1.0]).

XML namespace

An *XML namespace* is a collection of names, identified by a URI reference [IETF RFC 2396], which are used in XML documents as element types and attribute names. [XML Namespaces]

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