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XML

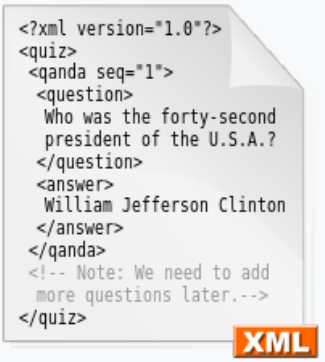
From Wikipedia, the free encyclopedia

In computing, **Extensible Markup Language** (**XML**) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. The W3C's XML 1.0 Specification[2] and several other related specifications[3]—all of them free open standards—define XML.[4]

The design goals of XML emphasize simplicity, generality, and usability across the Internet.[5] It is a textual data format with strong support via Unicode for different human languages. Although the design of XML focuses on documents, the language is widely used for the representation of arbitrary data structures[6] such as those used in web services.

Several schema systems exist to aid in the definition of XML-based languages, while programmers have developed many application programming interfaces (APIs) to aid the processing of XML data.

XML



Filename extension	`.xml`
Internet media type	`application/xml` `text/xml` [1]
Uniform Type Identifier (UTI)	public.xml
UTI conformation	public.text
Developed by	World Wide Web Consortium
Type of format	Markup language
Extended from	SGML
Extended to	Numerous languages, including XHTML · RSS · Atom · KML
Standard	1.0 (Fifth Edition) (November 26, 2008; 9 years ago) 1.1 (Second Edition) (August 16, 2006; 11 years ago)
Open format?	Yes

Extensible Markup Language (XML)

Status	Published
Year started	1996; 22 years ago
Editors	Tim Bray Jean Paoli C. M. Sperberg-McQueen Eve Maler François Yergeau John Cowan
Related standards	XML Schema
Domain	Data serialization
Abbreviation	XML
Website	XML 1.0

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The essence of why extensible markup languages are necessary is explained at *Markup language* (for example, see *Markup language § XML*) and at *Standard Generalized Markup Language*.

Hundreds of document formats using XML syntax have been developed,[7] including RSS, Atom, SOAP, SVG, and XHTML. XML-based formats have become the default for many office-productivity tools, including Microsoft Office (Office Open XML), OpenOffice.org and LibreOffice (OpenDocument), and Apple's iWork[*citation needed*]. XML has also provided the base language for communication protocols such as XMPP. Applications for the Microsoft .NET Framework use XML files for configuration. Apple has an implementation of a registry based on XML.[8]

Most industry data standards, e.g. HL7, OTA, NDC, FpML, MISMO etc. are based on XML and the rich features of the XML schema specification. Many of these standards are quite complex and it is not uncommon for a specification to comprise several thousand pages.

In publishing, DITA is an XML industry data standard. XML is used extensively to underpin various publishing formats.

XML is widely used in a Services Oriented Architecture (SOA). Disparate systems communicate with each other by exchanging XML messages. The message exchange format is standardised as an XML schema (XSD). This is also referred to as the canonical schema.

XML has come into common use for the interchange of data over the Internet. IETF RFC:3023, now superseded by RFC:7303, gave rules for the construction of Internet Media Types for use when sending XML. It also defines the media types `application/xml` and `text/xml`, which say only that the data is in XML, and nothing about its semantics. The use of `text/xml` has been criticized[i] as a potential source of encoding problems and it has been suggested that it should be deprecated.[9]

RFC 7303 also recommends that XML-based languages be given media types ending in `+xml`; for example `image/svg+xml` for SVG.

Further guidelines for the use of XML in a networked context appear in RFC 3470, also known as IETF BCP 70, a document covering many aspects of designing and deploying an XML-based language.

Key terminology [edit]

The material in this section is based on the XML Specification. This is not an exhaustive list of all the constructs that appear in XML; it provides an introduction to the key constructs most often encountered in day-to-day use.

Character

An XML document is a string of *characters*. Almost every legal Unicode character may appear in an XML document.

Processor and application

The *processor* analyzes the markup and passes structured information to an *application*. The specification places requirements on what an XML processor must do and not do, but the application is outside its scope. The processor (as the specification calls it) is often referred to colloquially as an *XML parser*.

Markup and content

The characters making up an XML document are divided into *markup* and *content*, which may be distinguished by the application of simple syntactic rules. Generally, strings that constitute markup either begin with the character `<` and end with a `>`, or they begin with the character `&` and end with a `;`. Strings of characters that are not markup are content. However, in a CDATA section, the delimiters `<![CDATA[` and `]]>` are classified as markup, while the text between them is classified as content. In addition, whitespace before and after the outermost element is classified as markup.

Tag

A *tag* is a markup construct that begins with `<` and ends with `>`. Tags come in three flavors:

- *start-tag*, such as `<section>`;
- *end-tag*, such as `</section>`;
- *empty-element tag*, such as `<line-break />`.

Element

An *element* is a logical document component that either begins with a start-tag and ends with a matching end-tag or consists only of an empty-element tag. The characters between the start-tag and

end-tag, if any, are the element's *content*, and may contain markup, including other elements, which are called *child elements*. An example is `<greeting>Hello, world!</greeting>`. Another is `<line-break />`.

Attribute

An *attribute* is a markup construct consisting of a name–value pair that exists within a start-tag or empty-element tag. An example is `<img src="madonna.jpg" alt="Madonna" />`, where the names of the attributes are "src" and "alt", and their values are "madonna.jpg" and "Madonna" respectively. Another example is `<step number="3">Connect A to B.</step>`, where the name of the attribute is "number" and its value is "3". An XML attribute can only have a single value and each attribute can appear at most once on each element. In the common situation where a list of multiple values is desired, this must be done by encoding the list into a well-formed XML attribute[ii] with some format beyond what XML defines itself. Usually this is either a comma or semi-colon delimited list or, if the individual values are known not to contain spaces,[iii] a space-delimited list can be used. `<div class="inner greeting-box">Welcome!</div>`, where the attribute "class" has both the value "inner greeting-box" and also indicates the two CSS class names "inner" and "greeting-box".

XML declaration

XML documents may begin with an *XML declaration* that describes some information about themselves. An example is `<?xml version="1.0" encoding="UTF-8"?>`.

Characters and escaping [edit]

XML documents consist entirely of characters from the Unicode repertoire. Except for a small number of specifically excluded control characters, any character defined by Unicode may appear within the content of an XML document.

XML includes facilities for identifying the *encoding* of the Unicode characters that make up the document, and for expressing characters that, for one reason or another, cannot be used directly.

Valid characters [edit]

Main article: Valid characters in XML

Unicode code points in the following ranges are valid in XML 1.0 documents:[10]

- U+0009 (Horizontal Tab), U+000A (Line Feed), U+000D (Carriage Return): these are the only C0 controls accepted in XML 1.0;
- U+0020–U+D7FF, U+E000–U+FFFD: this excludes *some* (not all) non-characters in the BMP (all surrogates, U+FFFE and U+FFFF are forbidden);
- U+10000–U+10FFFF: this includes *all* code points in supplementary planes, including non-characters.

XML 1.1[11] extends the set of allowed characters to include all the above, plus the remaining characters in the range U+0001–U+001F. At the same time, however, it restricts the use of C0 and C1 control characters other than U+0009 (Horizontal Tab), U+000A (Line Feed), U+000D (Carriage Return), and U+0085 (Next Line) by requiring them to be written in escaped form (for example U+0001 must be written as `&#x01;` or its equivalent). In the case of C1 characters, this restriction is a backwards incompatibility; it was introduced to allow common encoding errors to be detected.

The code point U+0000 (Null) is the only character that is not permitted in any XML 1.0 or 1.1 document.

Encoding detection [edit]

The Unicode character set can be encoded into bytes for storage or transmission in a variety of different ways, called "encodings". Unicode itself defines encodings that cover the entire repertoire; well-known ones include UTF-8 and UTF-16.[12] There are many other text encodings that predate Unicode, such as ASCII and ISO/IEC 8859; their character repertoires in almost every case are subsets of the Unicode character set.

XML allows the use of any of the Unicode-defined encodings, and any other encodings whose characters also appear in Unicode. XML also provides a mechanism whereby an XML processor can reliably, without any prior knowledge, determine which encoding is being used.[13] Encodings other than UTF-8 and UTF-16 are not necessarily recognized by every XML parser.

Escaping [edit]

XML provides *escape* facilities for including characters that are problematic to include directly. For

example:

- The characters "<" and "&" are key syntax markers and may *never* appear in content outside a CDATA section. It is allowed, but not recommended, to use "<" in XML entity values.[14]
- Some character encodings support only a subset of Unicode. For example, it is legal to encode an XML document in ASCII, but ASCII lacks code points for Unicode characters such as "é".
- It might not be possible to type the character on the author's machine.
- Some characters have glyphs that cannot be visually distinguished from other characters, such as the non-breaking space (` `) " " and the space (`&#x20;`) " ", and the Cyrillic capital letter A (`&#x410;`) "А" and the Latin capital letter A (`&#x41;`) "A".

There are five predefined entities:

- `<` represents "<";
- `>` represents ">";
- `&` represents "&";
- `&apos;` represents "'";
- `&quot;` represents '"'.

All permitted Unicode characters may be represented with a *numeric character reference*. Consider the Chinese character "中", whose numeric code in Unicode is hexadecimal 4E2D, or decimal 20,013. A user whose keyboard offers no method for entering this character could still insert it in an XML document encoded either as `&#20013;` or `&#x4e2d;`. Similarly, the string "I <3 Jörg" could be encoded for inclusion in an XML document as `I <3 J&#xF6;rg`.

`&#0;` is not permitted, however, because the null character is one of the control characters excluded from XML, even when using a numeric character reference.[15] An alternative encoding mechanism such as Base64 is needed to represent such characters.

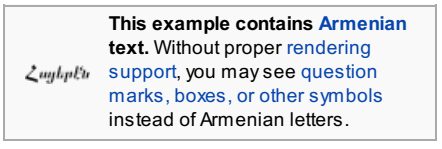
Comments [edit]

Comments may appear anywhere in a document outside other markup. Comments cannot appear before the XML declaration. Comments begin with `<!--` and end with `-->`. For compatibility with SGML, the string "--" (double-hyphen) is not allowed inside comments;[16] this means comments cannot be nested. The ampersand has no special significance within comments, so entity and character references are not recognized as such, and there is no way to represent characters outside the character set of the document encoding.

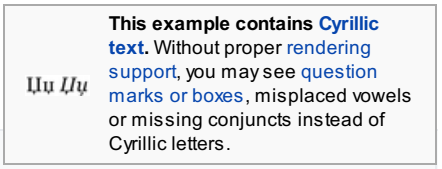
An example of a valid comment: `<!--no need to escape <code> & such in comments-->`

International use [edit]

XML 1.0 (Fifth Edition) and XML 1.1 support the direct use of almost any Unicode character in element names, attributes, comments, character data, and processing instructions (other than the ones that have special symbolic meaning in XML itself, such as the less-than sign, "<"). The following is a well-formed XML document including Chinese, Armenian and Cyrillic characters:



This example contains Armenian text. Without proper rendering support, you may see question marks, boxes, or other symbols instead of Armenian letters.



This example contains Cyrillic text. Without proper rendering support, you may see question marks or boxes, misplaced vowels or missing conjuncts instead of Cyrillic letters.

```
<?xml version="1.0" encoding="UTF-8"?>
<俄语 լեզու="ռուսերեն">данные</俄语>
```

Well-formedness and error-handling [edit]

Main article: Well-formed document

The XML specification defines an XML document as a well-formed text, meaning that it satisfies a list of syntax rules provided in the specification. Some key points in the fairly lengthy list include:

- The document contains only properly encoded legal Unicode characters.
- None of the special syntax characters such as `<` and `&` appear except when performing their markup-delineation roles.
- The start-tag, end-tag, and empty-element tag that delimit elements are correctly nested, with none missing and none overlapping.

- Tag names are case-sensitive; the start-tag and end-tag must match exactly.
- Tag names cannot contain any of the characters !"#$%&'()*+,/;<=>?@[\]^`{|}~, nor a space character, and cannot begin with "-", ".", or a numeric digit.
- A single root element contains all the other elements.

The definition of an *XML document* excludes texts that contain violations of well-formedness rules; they are simply not XML. An XML processor that encounters such a violation is required to report such errors and to cease normal processing. This policy, occasionally referred to as "draconian error handling," stands in notable contrast to the behavior of programs that process HTML, which are designed to produce a reasonable result even in the presence of severe markup errors.[17] XML's policy in this area has been criticized as a violation of Postel's law ("Be conservative in what you send; be liberal in what you accept").[18]

The XML specification defines a valid XML document as a well-formed XML document which also conforms to the rules of a Document Type Definition (DTD).[19][20]

Schemas and validation [edit]

In addition to being well-formed, an XML document may be *valid*. This means that it contains a reference to a Document Type Definition (DTD), and that its elements and attributes are declared in that DTD and follow the grammatical rules for them that the DTD specifies.

XML processors are classified as *validating* or *non-validating* depending on whether or not they check XML documents for validity. A processor that discovers a validity error must be able to report it, but may continue normal processing.

A DTD is an example of a *schema* or *grammar*. Since the initial publication of XML 1.0, there has been substantial work in the area of schema languages for XML. Such schema languages typically constrain the set of elements that may be used in a document, which attributes may be applied to them, the order in which they may appear, and the allowable parent/child relationships.

Document Type Definition [edit]

Main article: Document Type Definition

The oldest schema language for XML is the Document Type Definition (DTD), inherited from SGML.

DTDs have the following benefits:

- DTD support is ubiquitous due to its inclusion in the XML 1.0 standard.
- DTDs are terse compared to element-based schema languages and consequently present more information in a single screen.
- DTDs allow the declaration of standard public entity sets for publishing characters.
- DTDs define a *document type* rather than the types used by a namespace, thus grouping all constraints for a document in a single collection.

DTDs have the following limitations:

- They have no explicit support for newer features of XML, most importantly namespaces.
- They lack expressiveness. XML DTDs are simpler than SGML DTDs and there are certain structures that cannot be expressed with regular grammars. DTDs only support rudimentary datatypes.
- They lack readability. DTD designers typically make heavy use of parameter entities (which behave essentially as textual macros), which make it easier to define complex grammars, but at the expense of clarity.
- They use a syntax based on regular expression syntax, inherited from SGML, to describe the schema. Typical XML APIs such as SAX do not attempt to offer applications a structured representation of the syntax, so it is less accessible to programmers than an element-based syntax may be.

Two peculiar features that distinguish DTDs from other schema types are the syntactic support for embedding a DTD within XML documents and for defining *entities*, which are arbitrary fragments of text and/or markup that the XML processor inserts in the DTD itself and in the XML document wherever they are referenced, like character escapes.

DTD technology is still used in many applications because of its ubiquity.

XML Schema [edit]

Main article: XML Schema (W3C)

A newer schema language, described by the W3C as the successor of DTDs, is XML Schema, often referred to by the initialism for XML Schema instances, XSD (XML Schema Definition). XSDs are far more powerful than DTDs in describing XML languages. They use a rich datatyping system and allow for more detailed constraints on an XML document's logical structure. XSDs also use an XML-based format, which makes it possible to use ordinary XML tools to help process them.

xs:schema element that defines a schema:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"></xs:schema>
```

RELAX NG [edit]

RELAX NG (Regular Language for XML Next Generation) was initially specified by OASIS and is now a standard (Part 2: *Regular-grammar-based validation* of ISO/IEC 19757 - DSDL). RELAX NG schemas may be written in either an XML based syntax or a more compact non-XML syntax; the two syntaxes are isomorphic and James Clark's conversion tool—Trang—can convert between them without loss of information. RELAX NG has a simpler definition and validation framework than XML Schema, making it easier to use and implement. It also has the ability to use datatype framework plug-ins; a RELAX NG schema author, for example, can require values in an XML document to conform to definitions in XML Schema Datatypes.

Schematron [edit]

Schematron is a language for making assertions about the presence or absence of patterns in an XML document. It typically uses XPath expressions. Schematron is now a standard (Part 3: *Rule-based validation* of ISO/IEC 19757 - DSDL).

DSDL and other schema languages [edit]

DSDL (Document Schema Definition Languages) is a multi-part ISO/IEC standard (ISO/IEC 19757) that brings together a comprehensive set of small schema languages, each targeted at specific problems. DSDL includes RELAX NG full and compact syntax, Schematron assertion language, and languages for defining datatypes, character repertoire constraints, renaming and entity expansion, and namespace-based routing of document fragments to different validators. DSDL schema languages do not have the vendor support of XML Schemas yet, and are to some extent a grassroots reaction of industrial publishers to the lack of utility of XML Schemas for publishing.

Some schema languages not only describe the structure of a particular XML format but also offer limited facilities to influence processing of individual XML files that conform to this format. DTDs and XSDs both have this ability; they can for instance provide the infoset augmentation facility and attribute defaults. RELAX NG and Schematron intentionally do not provide these.

Related specifications [edit]

A cluster of specifications closely related to XML have been developed, starting soon after the initial publication of XML 1.0. It is frequently the case that the term "XML" is used to refer to XML together with one or more of these other technologies that have come to be seen as part of the XML core.

- XML namespaces enable the same document to contain XML elements and attributes taken from different vocabularies, without any naming collisions occurring. Although XML Namespaces are not part of the XML specification itself, virtually all XML software also supports XML Namespaces.
- XML Base defines the `xml:base` attribute, which may be used to set the base for resolution of relative URI references within the scope of a single XML element.
- XML Information Set or XML Infoset is an abstract data model for XML documents in terms of *information items*. The infoset is commonly used in the specifications of XML languages, for convenience in describing constraints on the XML constructs those languages allow.
- XSL (Extensible Stylesheet Language) is a family of languages used to transform and render XML documents, split into three parts:
  - XSLT (XSL Transformations), an XML language for transforming XML documents into other XML documents or other formats such as HTML, plain text, or XSL-FO. XSLT is very tightly coupled with XPath, which it uses to address components of the input XML document, mainly elements and attributes.

- XSL-FO (XSL Formatting Objects), an XML language for rendering XML documents, often used to generate PDFs.
- XPath (XML Path Language), a non-XML language for addressing the components (elements, attributes, and so on) of an XML document. XPath is widely used in other core-XML specifications and in programming libraries for accessing XML-encoded data.

- XQuery (XML Query) is an XML query language strongly rooted in XPath and XML Schema. It provides methods to access, manipulate and return XML, and is mainly conceived as a query language for XML databases.
- XML Signature defines syntax and processing rules for creating digital signatures on XML content.
- XML Encryption defines syntax and processing rules for encrypting XML content.
- xml-model (Part 11: *Schema Association* of ISO/IEC 19757 - DSDL) defines a means of associating any xml document with any of the schema types mentioned above.

Some other specifications conceived as part of the "XML Core" have failed to find wide adoption, including XInclude, XLink, and XPointer.

Programming interfaces [edit]

The design goals of XML include, "It shall be easy to write programs which process XML documents."[5] Despite this, the XML specification contains almost no information about how programmers might go about doing such processing. The XML Infoset specification provides a vocabulary to refer to the constructs within an XML document, but does not provide any guidance on how to access this information. A variety of APIs for accessing XML have been developed and used, and some have been standardized.

Existing APIs for XML processing tend to fall into these categories:

- Stream-oriented APIs accessible from a programming language, for example SAX and StAX.
- Tree-traversal APIs accessible from a programming language, for example DOM.
- XML data binding, which provides an automated translation between an XML document and programming-language objects.
- Declarative transformation languages such as XSLT and XQuery.
- Syntax extensions to general-purpose programming languages, for example LINQ and Scala.

Stream-oriented facilities require less memory and, for certain tasks based on a linear traversal of an XML document, are faster and simpler than other alternatives. Tree-traversal and data-binding APIs typically require the use of much more memory, but are often found more convenient for use by programmers; some include declarative retrieval of document components via the use of XPath expressions.

XSLT is designed for declarative description of XML document transformations, and has been widely implemented both in server-side packages and Web browsers. XQuery overlaps XSLT in its functionality, but is designed more for searching of large XML databases.

Simple API for XML [edit]

Main article: Simple API for XML

Simple API for XML (SAX) is a lexical, event-driven API in which a document is read serially and its contents are reported as callbacks to various methods on a handler object of the user's design. SAX is fast and efficient to implement, but difficult to use for extracting information at random from the XML, since it tends to burden the application author with keeping track of what part of the document is being processed. It is better suited to situations in which certain types of information are always handled the same way, no matter where they occur in the document.

Pull parsing [edit]

Pull parsing[21] treats the document as a series of items read in sequence using the iterator design pattern. This allows for writing of recursive descent parsers in which the structure of the code performing the parsing mirrors the structure of the XML being parsed, and intermediate parsed results can be used and accessed as local variables within the methods performing the parsing, or passed down (as method parameters) into lower-level methods, or returned (as method return values) to higher-level methods. Examples of pull parsers include Data::Edit::Xml https://metacpan.org/pod/Data::Edit::Xml in Perl, StAX in the Java programming language, XMLPullParser in Smalltalk, XMLReader in PHP, ElementTree.iterparse in Python, System.Xml.XmlReader in the .NET Framework, and the DOM traversal API (NodeIterator and TreeWalker).

A pull parser creates an iterator that sequentially visits the various elements, attributes, and data in an XML document. Code that uses this iterator can test the current item (to tell, for example, whether it is a start-tag or end-tag, or text), and inspect its attributes (local name, namespace, values of XML attributes, value of text, etc.), and can also move the iterator to the next item. The code can thus extract information from the document as it traverses it. The recursive-descent approach tends to lend itself to keeping data as typed local variables in the code doing the parsing, while SAX, for instance, typically requires a parser to manually maintain intermediate data within a stack of elements that are parent elements of the element being parsed. Pull-parsing code can be more straightforward to understand and maintain than SAX parsing code.

Document Object Model [edit]

Main article: Document Object Model

Document Object Model (DOM) is an API that allows for navigation of the entire document as if it were a tree of node objects representing the document's contents. A DOM document can be created by a parser, or can be generated manually by users (with limitations). Data types in DOM nodes are abstract; implementations provide their own programming language-specific bindings. DOM implementations tend to be memory intensive, as they generally require the entire document to be loaded into memory and constructed as a tree of objects before access is allowed.

Data binding [edit]

XML data binding is the binding of XML documents to a hierarchy of custom and strongly typed objects, in contrast to the generic objects created by a DOM parser. This approach simplifies code development, and in many cases allows problems to be identified at compile time rather than run-time. It is suitable for applications where the document structure is known and fixed at the time the application is written. Example data binding systems include the Java Architecture for XML Binding (JAXB), XML Serialization in .NET Framework.[22] and XML serialization in gSOAP.

XML as data type [edit]

XML has appeared as a first-class data type in other languages. The ECMAScript for XML (E4X) extension to the ECMAScript/JavaScript language explicitly defines two specific objects (XML and XMLList) for JavaScript, which support XML document nodes and XML node lists as distinct objects and use a dot-notation specifying parent-child relationships.[23] E4X is supported by the Mozilla 2.5+ browsers (though now deprecated) and Adobe Actionscript, but has not been adopted more universally. Similar notations are used in Microsoft's LINQ implementation for Microsoft .NET 3.5 and above, and in Scala (which uses the Java VM). The open-source xmlsh application, which provides a Linux-like shell with special features for XML manipulation, similarly treats XML as a data type, using the <[ ]> notation.[24] The Resource Description Framework defines a data type `rdf:XMLLiteral` to hold wrapped, canonical XML.[25] Facebook has produced extensions to the PHP and JavaScript languages that add XML to the core syntax in a similar fashion to E4X, namely XHP and JSX respectively.

History [edit]

XML is an application profile of SGML (ISO 8879).[26]

The versatility of SGML for dynamic information display was understood by early digital media publishers in the late 1980s prior to the rise of the Internet.[27][28] By the mid-1990s some practitioners of SGML had gained experience with the then-new World Wide Web, and believed that SGML offered solutions to some of the problems the Web was likely to face as it grew. Dan Connolly added SGML to the list of W3C's activities when he joined the staff in 1995; work began in mid-1996 when Sun Microsystems engineer Jon Bosak developed a charter and recruited collaborators. Bosak was well connected in the small community of people who had experience both in SGML and the Web.[29]

XML was compiled by a working group of eleven members,[30] supported by a (roughly) 150-member Interest Group. Technical debate took place on the Interest Group mailing list and issues were resolved by consensus or, when that failed, majority vote of the Working Group. A record of design decisions and their rationales was compiled by Michael Sperberg-McQueen on December 4, 1997.[31] James Clark served as Technical Lead of the Working Group, notably contributing the empty-element `<empty />` syntax and the name "XML". Other names that had been put forward for consideration included "MAGMA" (Minimal Architecture for Generalized Markup Applications), "SLIM" (Structured Language for Internet Markup) and "MGML" (Minimal Generalized Markup Language). The co-editors of the specification were originally Tim

Bray and Michael Sperberg-McQueen. Halfway through the project Bray accepted a consulting engagement with Netscape, provoking vociferous protests from Microsoft. Bray was temporarily asked to resign the editorship. This led to intense dispute in the Working Group, eventually solved by the appointment of Microsoft's Jean Paoli as a third co-editor.

The XML Working Group never met face-to-face; the design was accomplished using a combination of email and weekly teleconferences. The major design decisions were reached in a short burst of intense work between August and November 1996,[32] when the first Working Draft of an XML specification was published.[33] Further design work continued through 1997, and XML 1.0 became a W3C Recommendation on February 10, 1998.

Sources [edit]

XML is a profile of an ISO standard SGML, and most of XML comes from SGML unchanged. From SGML comes the separation of logical and physical structures (elements and entities), the availability of grammar-based validation (DTDs), the separation of data and metadata (elements and attributes), mixed content, the separation of processing from representation (processing instructions), and the default angle-bracket syntax. Removed were the SGML declaration (XML has a fixed delimiter set and adopts Unicode as the document character set).

Other sources of technology for XML were the TEI (Text Encoding Initiative), which defined a profile of SGML for use as a "transfer syntax"; and HTML, in which elements were synchronous with their resource, document character sets were separate from resource encoding, the `xml:lang` attribute was invented, and (like HTTP) metadata accompanied the resource rather than being needed at the declaration of a link. The ERCS(Extended Reference Concrete Syntax) project of the SPREAD (Standardization Project Regarding East Asian Documents) project of the ISO-related China/Japan/Korea Document Processing expert group was the basis of XML 1.0's naming rules; SPREAD also introduced hexadecimal numeric character references and the concept of references to make available all Unicode characters. To support ERCS, XML and HTML better, the SGML standard IS 8879 was revised in 1996 and 1998 with WebSGML Adaptations. The XML header followed that of ISO HyTime.

Ideas that developed during discussion that are novel in XML included the algorithm for encoding detection and the encoding header, the processing instruction target, the xml:space attribute, and the new close delimiter for empty-element tags. The notion of well-formedness as opposed to validity (which enables parsing without a schema) was first formalized in XML, although it had been implemented successfully in the Electronic Book Technology "Dynatext" software;[34] the software from the University of Waterloo New Oxford English Dictionary Project; the RISP LISP SGML text processor at Uniscope, Tokyo; the US Army Missile Command IADS hypertext system; Mentor Graphics Context; Interleaf and Xerox Publishing System.

Versions [edit]

There are two current versions of XML. The first (*XML 1.0*) was initially defined in 1998. It has undergone minor revisions since then, without being given a new version number, and is currently in its fifth edition, as published on November 26, 2008. It is widely implemented and still recommended for general use.

The second (*XML 1.1*) was initially published on February 4, 2004, the same day as XML 1.0 Third Edition,[35] and is currently in its second edition, as published on August 16, 2006. It contains features (some contentious) that are intended to make XML easier to use in certain cases.[36] The main changes are to enable the use of line-ending characters used on EBCDIC platforms, and the use of scripts and characters absent from Unicode 3.2. XML 1.1 is not very widely implemented and is recommended for use only by those who need its particular features.[37]

Prior to its fifth edition release, XML 1.0 differed from XML 1.1 in having stricter requirements for characters available for use in element and attribute names and unique identifiers: in the first four editions of XML 1.0 the characters were exclusively enumerated using a specific version of the Unicode standard (Unicode 2.0 to Unicode 3.2.) The fifth edition substitutes the mechanism of XML 1.1, which is more future-proof but reduces redundancy. The approach taken in the fifth edition of XML 1.0 and in all editions of XML 1.1 is that only certain characters are forbidden in names, and everything else is allowed to accommodate suitable name characters in future Unicode versions. In the fifth edition, XML names may contain characters in the Balinese, Cham, or Phoenician scripts among many others added to Unicode since Unicode 3.2.[36]

Almost any Unicode code point can be used in the character data and attribute values of an XML 1.0 or 1.1 document, even if the character corresponding to the code point is not defined in the current version of Unicode. In character data and attribute values, XML 1.1 allows the use of more control characters than

XML 1.0, but, for "robustness", most of the control characters introduced in XML 1.1 must be expressed as numeric character references (and #x7F through #x9F, which had been allowed in XML 1.0, are in XML 1.1 even required to be expressed as numeric character references[38]). Among the supported control characters in XML 1.1 are two line break codes that must be treated as whitespace. Whitespace characters are the only control codes that can be written directly.

There has been discussion of an XML 2.0, although no organization has announced plans for work on such a project. XML-SW (SW for skunkworks), written by one of the original developers of XML,[39] contains some proposals for what an XML 2.0 might look like: elimination of DTDs from syntax, integration of namespaces, XML Base and XML Information Set into the base standard.

The World Wide Web Consortium also has an XML Binary Characterization Working Group doing preliminary research into use cases and properties for a binary encoding of XML Information Set. The working group is not chartered to produce any official standards. Since XML is by definition text-based, ITU-T and ISO are using the name Fast Infoset for their own binary infoset to avoid confusion (see ITU-T Rec. X.891 and ISO/IEC 24824-1).

Criticism [edit]

XML and its extensions have regularly been criticized for verbosity and complexity.[40] Mapping the basic tree model of XML to type systems of programming languages or databases can be difficult, especially when XML is used for exchanging highly structured data between applications, which was not its primary design goal. However, XML data binding systems allow applications to access XML data directly from objects representing a data structure of the data in the programming language used, which ensures type safety, rather than using the DOM or SAX to retrieve data from a direct representation of the XML itself. This is accomplished by automatically creating a mapping between elements of the XML schema XSD of the document and members of a class to be represented in memory. Other criticisms attempt to refute the claim that XML is a self-describing language[41] (though the XML specification itself makes no such claim). JSON, YAML, and S-Expressions are frequently proposed as simpler alternatives (see Comparison of data serialization formats);[42] that focus on representing highly structured data rather than documents, which may contain both highly structured and relatively unstructured content. However, W3C standardized XML schema specifications offer a broader range of structured XSD data types compared to simpler serialization formats and offer modularity and reuse through XML namespace.

See also [edit]

- List of XML markup languages
- List of XML schemas
- Comparison of layout engines (XML)
- Comparison of data serialization formats
- Binary XML
- EBML
- WBXML
- XHTML
- XML Protocol

Notes [edit]

i. ^ Murata, Kohn & Lilley (2009), in their draft RFC to update RFC 3023 (2001) that introduced `text/xml`, and advocated its formal deprecation.[9] However RFC:7203 (2014) did not do this.

ii. ^ i.e., embedded quote characters would be a problem

iii. ^ A common example of this is CSS class or identifier names.

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External links [edit]

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- XML 1.0 Specification
- Retrospective on Extended Reference Concrete Syntax by Rick Jelliffe
- *XML, Java and the Future of the Web* (1997) by Jon Bosak
- http://validator.w3.org/ The Official [W3C] Markup Validation Service
- The XML FAQ originally for the W3C's XML SIG by Peter Flynn

v · t · e	World Wide Web Consortium (W3C)	
	Recommendations	ActivityPub · ARIA · Canonical XML · CDF · CSS · DOM · Geolocation API · HTML (HTML5) · ITS · JSON-LD · Linked Data Notifications · MathML · Micropub · OWL · P3P · PLS · RDF · RDF Schema · SISR · SKOS · SMIL · SOAP · SRGS · SRI · SSML · SVG · SCXML · SPARQL · Timed text · VoiceXML · Web storage · WSDL · Webmention · WebSub · XForms · XHTML · XHTML+RDFa · XInclude · XLink · **XML** · XML Base · XML Encryption · XML Events · XML Information Set · XML namespace · XML Schema ·

Products and standards		XML Signature · XOP · XPath · XPath 2.0 · XPointer · XProc · XQuery · XSL · XSL-FO · XSLT (elements)
	Notes	IndieAuth · JF2 · Post Type Discovery · XAdES · XHTML+SMIL · XUP
	Working drafts	CCXML · CURIE · EME · InkML · MSE · RIF · SMIL Timesheets · sXBL · WICD · XFDL · XFrames · XBL · XMLHttpRequest
	Guidelines	Web Content Accessibility Guidelines
	Initiative	Multimodal Interaction Activity (MMI) · Markup Validation Service · Web Accessibility Initiative · WebPlatform
	Deprecated	C-HTML · HDML · JSSS · PGML · VML · XHTML+MathML+SVG
Organizations	Advisory Committee (AC) · World Wide Web Foundation	
	Elected groups	Advisory Board (AB) · Technical Architecture Group (TAG) · Web Incubator Community Group (WICG)
	Working groups	CSS · Geolocation · Social Web · SVG · Web Hypertext Application Technology (WHATWG) · Web Platform
	Closed groups	Device Description (DDWG) · HTML · WebOnt (Semantic Web Activity)
Software	CERN httpd · Libwww	
	Browsers	Line Mode (1990–) · Arena (1993–98) · Agora (1994–97) · Argo (1994–97) · Amaya (browser/editor, 1996–2012)
Conferences	International World Wide Web Conference (IW3C) (Steering Committee (IW3C2) · First conference ("WWW1", 1994))	

v · t · e

Web browsers

Comparison (lightweight) · History · List (Unix & Unix-like) · Timeline · Usage share

Features	Ad filtering · Augmented browsing · Bookmarks (Bookmarklet · Live bookmark · Smart Bookmarks) · Browser extension · Browser security · Browser synchronizer (comparison) · Cookies · Download manager · Favicon · Incremental search · Plug-in · Privacy mode · Tabs · Universal Edit Button
Web standards	Acid tests · Cascading Style Sheets · HTML · HTML5 · JavaScript · MathML · SVG · WebGL · XHTML
Protocols	HTTP · HTTPS · OCSP · SPDY · SSL/TLS · WebSocket · WPAD
Related topics	BrowserChoice.eu · CRL · iLoo · Internet suite · Man-in-the-browser · Mobile Web · Offline reader · PAC · Pwn2Own · Rich Internet application · Site-specific browser · Widget · World Wide Web · **XML**

Desktop

Blink-based	Brave · Chrome · Chromium · Dragon · Falkon · Opera · Sleipnir · Slimjet · SRWare Iron · UC Browser · Vivaldi · Yandex Browser · Sputnik · SafeZone · Whale
Gecko-based	*AT&T Pogo* · Avant · *Camino* · Firefox (Conkeror · GNU IceCat · IceDragon · *Swiftfox* · *Swiftweasel* · TenFourFox · Timberwolf · Tor Browser · Waterfox · *xB Browser*) · *Galeon* · *Ghostzilla* · K-Meleon · *Kazehakase* · Kirix Strata · *Lotus Symphony* · Lunascape · *Mozilla* (*Beonex Communicator* · Classilla · *Netscape* · SeaMonkey)
Trident-based	*AOL Explorer* · Avant · *Deepnet Explorer* · GreenBrowser · *Internet Explorer* · Lunascape · Maxthon · *MediaBrowser* · MenuBox · *NeoPlanet* · *NetCaptor* · SlimBrowser · *SpaceTime* · *UltraBrowser* · WebbIE · ZAC Browser
WebKit-based	*Arora* · Avant · Dooble · Epic · *Flock* · Fluid · iCab · Konqueror · Lunascape · Maxthon · Midori · OmniWeb · *Origyn Web Browser* · Otter Browser · QtWeb · rekonq · Safari · *Shiira* · SlimBoat · surf · Torch · Uzbl · vimb · Epiphany · WebPositive · xombrero
Text-based	ELinks · *Emacs/W3* · *Line Mode Browser* · Links · Lynx · w3m
Other	abaco · *Amaya* · *Arachne* · *Arena* · Basilisk · Charon · Dillo · eww · *Gazelle* · *HotJava* · *IBM Home Page Reader* · *IBrowse* · KidZui · Microsoft Edge · *Mosaic* · *Mothra* · *NetPositive* · NetSurf · Pale Moon · Qihoo 360 Secure Browser

Mobile

Blink-based	Android Browser · Chromium (Brave · Chrome for Android · Opera Mobile · Silk) · Firefox Focus for Android
Gecko-based	Firefox for Android · *MicroB* · *Minimo* · Waterfox
WebKit-based	*BOLT* · Dolphin Browser · Chrome for iOS · Firefox for iOS · Firefox Focus for iOS · Maxthon · Mercury Browser · *Nokia Browser for Symbian* · *Opera Coast* · *Rockmelt* · Safari · *Steel*
Other	*Blazer* · CM Browser · *Deepfish* · *Internet Explorer Mobile* · *Iris Browser* · *Konqueror Embedded* · Microsoft Edge · NetFront · Opera Mini · *Skweezer* · *Skyfire* · *Teashark* · *ThunderHawk* · UC Browser · *Vision* · *WinWAP*

Television and video game console

Gecko-based	Kylo
Presto-based	Internet Channel

WebKit-based	*Google TV* · Nintendo 3DS Internet Browser · *Nintendo DS & DSi Browser* · NetFront · Steam Overlay · Wii U Internet Browser
Other	*MSN TV*

Software no longer in development shown in *italics*

Category · Commons · Internet portal · Software portal

v · t · e	**Data exchange formats**
Human readable formats	Atom · **XML** · YAML · JSON · RDF · Rebol · RSS · OWL
Binary formats	AMF · ASN.1 (SMI) · Avro · BSON · CBOR · FlatBuffers · MessagePack · Protocol Buffers · Thrift · Smile · XDR
Authority control	BNE: XX546216 · BNF: cb131774360 (data) · GND: 4501553-3 · LCCN: sh97007825

Categories: Application layer protocols | Bibliography file formats | Computer file formats | Data modeling languages | Data serialization formats | Markup languages | Open formats | Presentation layer protocols | Technical communication | World Wide Web Consortium standards | XML