XML

1. Introduction to XML

XML was designed to describe data.

HTML was designed to display data.

What You Should Already Know

Before you continue you should have a basic understanding of the following:

- HTML
- JavaScript

If you want to study these subjects first, find the tutorials on our Home page.

What is XML?

- XML stands for EXtensible Markup Language
- XML is a markup language much like HTML
- XML was designed to describe data, not to display data
- XML tags are not predefined. You must define your own tags
- XML is designed to be self-descriptive
- XML is a W3C Recommendation

The Difference Between XML and HTML

XML is not a replacement for HTML.

XML and HTML were designed with different goals:

- XML was designed to describe data, with focus on what data is
- HTML was designed to display data, with focus on how data looks

HTML is about displaying information, while XML is about carrying information.

XML Does Not DO Anything

Maybe it is a little hard to understand, but XML does not DO anything.

The following example is a note to Tove, from Jani, stored as XML:

```
<note>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

The note above is quite self descriptive. It has sender and receiver information, it also has a heading and a message body.

But still, this XML document does not DO anything. It is just information wrapped in tags. Someone must write a piece of software to send, receive or display it.

With XML You Invent Your Own Tags

The tags in the example above (like <to> and <from>) are not defined in any XML standard. These tags are "invented" by the author of the XML document.

That is because the XML language has no predefined tags.

The tags used in HTML are predefined. HTML documents can only use tags defined in the HTML standard (like <p>, <h1>, etc.).

XML allows the author to define his/her own tags and his/her own document structure.

XML is Not a Replacement for HTML

XML is a complement to HTML.

It is important to understand that XML is not a replacement for HTML. In most web applications, XML is used to describe data, while HTML is used to format and display the data.

My best description of XML is this:

XML is a software- and hardware-independent tool for carrying information.

2. How Can XML be Used?

XML is used in many aspects of web development, often to simplify data storage and sharing.

XML Separates Data from HTML

If you need to display dynamic data in your HTML document, it will take a lot of work to edit the HTML each time the data changes.

With XML, data can be stored in separate XML files. This way you can concentrate on using HTML/CSS for display and layout, and be sure that changes in the underlying data will not require any changes to the HTML.

With a few lines of JavaScript code, you can read an external XML file and update the data content of your web page.

XML Simplifies Data Sharing

In the real world, computer systems and databases contain data in incompatible formats.

XML data is stored in plain text format. This provides a software- and hardware-independent way of storing data.

This makes it much easier to create data that can be shared by different applications.

XML Simplifies Data Transport

One of the most time-consuming challenges for developers is to exchange data between incompatible systems over the Internet.

Exchanging data as XML greatly reduces this complexity, since the data can be read by different incompatible applications.

XML Simplifies Platform Changes

Upgrading to new systems (hardware or software platforms), is always time consuming. Large amounts of data must be converted and incompatible data is often lost.

XML data is stored in text format. This makes it easier to expand or upgrade to new operating systems, new applications, or new browsers, without losing data.

XML Makes Your Data More Available

Different applications can access your data, not only in HTML pages, but also from XML data sources.

With XML, your data can be available to all kinds of "reading machines" (Handheld computers, voice machines, news feeds, etc.), and make it more available for blind people, or people with other disabilities.

Internet Languages Written in XML

Several Internet languages are written in XML. Here are some examples:

- XHTML
- XML Schema
- SVG
- WSDL

RSS

3. XML Tree

An Example XML Document

XML documents use a self-describing and simple syntax:

```
<?xml version="1.0" encoding="UTF-8"?>
<note>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

The first line is the XML declaration. It defines the XML version (1.0).

The next line describes the **root element** of the document (like saying: "this document is a note"):

```
<note>
```

The next 4 lines describe 4 **child elements** of the root (to, from, heading, and body):

```
<to>Tove</to>
<from>Jani</from>
<heading>Reminder</heading>
<body>Don't forget me this weekend!</body>
```

And finally the last line defines the end of the root element:

```
</note>
```

You can assume, from this example, that the XML document contains a note to Tove from Jani.

Don't you agree that XML is pretty self-descriptive?

XML Documents Form a Tree Structure

XML documents must contain a **root element**. This element is "the parent" of all other elements.

The elements in an XML document form a document tree. The tree starts at the root and branches to the lowest level of the tree.

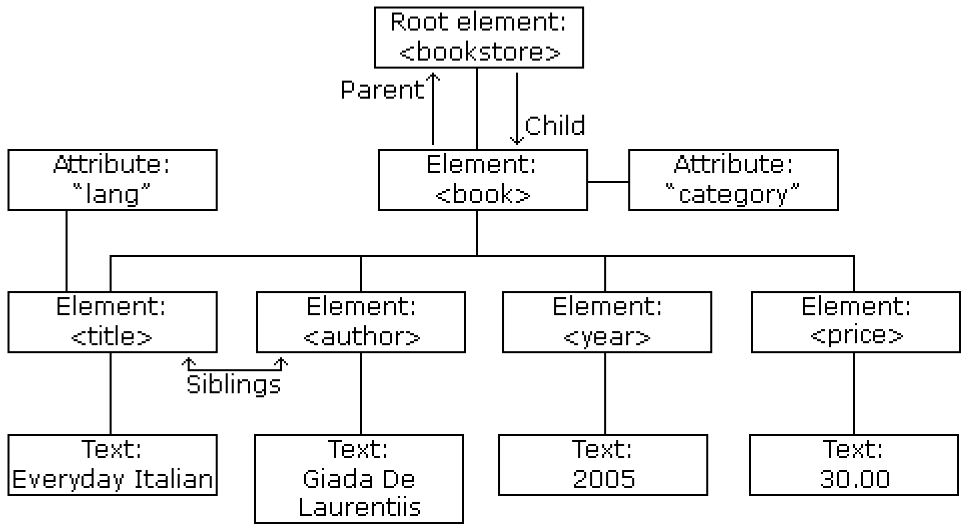
All elements can have sub elements (child elements):

```
<root>
  <child>
    <subchild>.....</subchild>
  </child>
</root>
```

The terms parent, child, and sibling are used to describe the relationships between elements. Parent elements have children. Children on the same level are called siblings (brothers or sisters).

All elements can have text content and attributes (just like in HTML).

Example:



The image above represents one book in the XML below:

```
<bookstore>
  <book category="COOKING">
    <title lang="en">Everyday Italian</title>
    <author>Giada De Laurentiis</author>
    <year>2005</year>
    <price>30.00</price>
  </book>
  <book category="CHILDREN">
    <title lang="en">Harry Potter</title>
    <author>J K. Rowling</author>
    <year>2005</year>
    <price>29.99</price>
  </book>
  <book category="WEB">
    <title lang="en">Learning XML</title>
    <author>Erik T. Ray</author>
    <year>2003</year>
    <price>39.95</price>
  </book>
</bookstore>
```

The root element in the example is <bookstore>. All <book> elements in the document are contained within <bookstore>.

The <book> element has 4 children: <title>,< author>, <year>, <price>.

4. XML Syntax Rules

The syntax rules of XML are very simple and logical. The rules are easy to learn, and easy to use.

All XML Elements Must Have a Closing Tag

In HTML, some elements do not have to have a closing tag:

```
<p>This is a paragraph.
<br>
```

In XML, it is illegal to omit the closing tag. All elements **must** have a closing tag:

```
<p>This is a paragraph.</p>
<br />
```

Note: You might have noticed from the previous example that the XML declaration did not have a closing tag. This is not an error. The declaration is not a part of the XML document itself, and it has no closing tag.

XML Tags are Case Sensitive

XML tags are case sensitive. The tag <Letter> is different from the tag <letter>.

Opening and closing tags must be written with the same case:

```
<Message>This is incorrect</message>
<message>This is correct</message>
```

Note: "Opening and closing tags" are often referred to as "Start and end tags". Use whatever you prefer. It is exactly the same thing.

XML Elements Must be Properly Nested

In HTML, you might see improperly nested elements:

```
<b><i>This text is bold and italic</b></i>
```

In XML, all elements **must** be properly nested within each other:

```
<b><i>This text is bold and italic</i></b>
```

In the example above, "Properly nested" simply means that since the <i> element is opened inside the <b> element, it must be closed inside the <b> element.

XML Documents Must Have a Root Element

XML documents must contain one element that is the **parent** of all other elements. This element is called the **root** element.

```
<root>
  <child>
    <subchild>.....</subchild>
  </child>
</root>
```

XML Attribute Values Must be Quoted

XML elements can have attributes in name/value pairs just like in HTML.

In XML, the attribute values must always be quoted.

INCORRECT:

```
<note date=12/11/2007>
  <to>Tove</to>
  <from>Jani</from>
</note>
```

CORRECT:

```
<note date="12/11/2007">
  <to>Tove</to>
  <from>Jani</from>
</note>
```

The error in the first document is that the date attribute in the note element is not quoted.

Entity References

Some characters have a special meaning in XML.

If you place a character like "<" inside an XML element, it will generate an error because the parser interprets it as the start of a new element.

This will generate an XML error:

```
<message>if salary < 1000 then</message>
```

To avoid this error, replace the "<" character with an **entity reference**:

```
<message>if salary &lt; 1000 then</message>
```

There are 5 pre-defined entity references in XML:

&lt;	<	less than
&gt;	>	greater than
&amp;	&	ampersand
&apos;	'	apostrophe
&quot;	"	quotation mark

Note: Only the characters "<" and "&" are strictly illegal in XML. The greater than character is legal, but it is a good habit to replace it.

Comments in XML

The syntax for writing comments in XML is similar to that of HTML.

```
<!-- This is a comment -->
```

White-space is Preserved in XML

XML does not truncate multiple white-spaces in a document (while HTML truncates multiple white-spaces to one single white-space):

```
XML:   Hello           Tove
```

HTML: Hello Tove

XML Stores New Line as LF

Windows applications store a new line as: carriage return and line feed (CR+LF).

Unix and Mac OSX uses LF.

Old Mac systems uses CR.

XML stores a new line as LF.

Well Formed XML

XML documents that conform to the syntax rules above are said to be "Well Formed" XML documents.

5. XML Elements

An XML document contains XML Elements.

What is an XML Element?

An XML element is everything from (including) the element's start tag to (including) the element's end tag.

An element can contain:

- other elements
- text
- attributes
- or a mix of all of the above...

```
<bookstore>
  <book category="CHILDREN">
    <title>Harry Potter</title>
    <author>J K. Rowling</author>
    <year>2005</year>
    <price>29.99</price>
  </book>
  <book category="WEB">
    <title>Learning XML</title>
    <author>Erik T. Ray</author>
    <year>2003</year>
    <price>39.95</price>
  </book>
</bookstore>
```

In the example above, <bookstore> and <book> have **element contents**, because they contain other elements. <book> also has an **attribute** (category="CHILDREN"). <title>, <author>, <year>, and <price> have **text content** because they contain text.

Empty XML Elements

An element with no content is said to be empty.

In XML, you can indicate an empty element like this:

```
<element></element>
```

or you can use an empty tag, like this (this sort of element syntax is called self-closing):

```
<element />
```

The two forms above produce identical results in an XML parser.

Note: Empty elements do not have any content, but they can have attributes!

XML Naming Rules

XML elements must follow these naming rules:

- Element names are case-sensitive
- Element names must start with a letter or underscore
- Element names cannot start with the letters xml (or XML, or Xml, etc)
- Element names can contain letters, digits, hyphens, underscores, and periods
- Element names cannot contain spaces

Any name can be used, no words are reserved (except xml).

Best Naming Practices

Create descriptive names, like this: <person>, <firstname>, <lastname>.

Create short and simple names, like this: <book_title> not like this: <the_title_of_the_book>.

Avoid "-". If you name something "first-name", some software may think you want to subtract "name" from "first".

Avoid ".". If you name something "first.name", some software may think that "name" is a property of the object "first".

Avoid ":". Colons are reserved for namespaces (more later).

Non-English letters like éòá are perfectly legal in XML, but watch out for problems if your software doesn't support them.

Naming Styles

There are no naming styles defined for XML elements. But here are some commonly used:

Style	Example	Description
Lower case	<firstname>	All letters lower case
Upper case	<FIRSTNAME>	All letters upper case
Underscore	<first_name>	Underscore separates words
Pascal case	<FirstName>	Uppercase first letter in each word
Camel case	<firstName>	Uppercase first letter in each word except the first

If you choose a naming style, it is good to be consistent!

XML documents often have a corresponding database. A good practice is to use the naming rules of your database for the elements in the XML documents.

XML Elements are Extensible

XML elements can be extended to carry more information.

Look at the following XML example:

```
<note>
  <to>Tove</to>
  <from>Jani</from>
  <body>Don't forget me this weekend!</body>
</note>
```

Let's imagine that we created an application that extracted the <to>, <from>, and <body> elements from the XML document to produce this output:

MESSAGE

To: Tove
From: Jani

Don't forget me this weekend!

Imagine that the author of the XML document added some extra information to it:

```
<note>
  <date>2008-01-10</date>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

Should the application break or crash?

No. The application should still be able to find the <to>, <from>, and <body> elements in the XML document and produce the same output.

One of the beauties of XML, is that it can be extended without breaking applications.

6. XML Attributes

XML elements can have attributes, just like HTML.

Attributes provide additional information about an element.

XML Attributes

In HTML, attributes provide additional information about elements:

```
<img src="computer.gif">
<a href="demo.asp">
```

Attributes often provide information that is not a part of the data. In the example below, the file type is irrelevant to the data, but can be important to the software that wants to manipulate the element:

```
<file type="gif">computer.gif</file>
```

XML Attributes Must be Quoted

Attribute values must always be quoted. Either single or double quotes can be used. For a person's gender, the person element can be written like this:

```
<person gender="female">
```

or like this:

```
<person gender='female'>
```

If the attribute value itself contains double quotes you can use single quotes, like in this example:

```
<gangster name='George "Shotgun" Ziegler'>
```

or you can use character entities:

```
<gangster name="George &quot;Shotgun&quot; Ziegler">
```

XML Elements vs. Attributes

Take a look at these examples:

```
<person gender="female">
  <firstname>Anna</firstname>
  <lastname>Smith</lastname>
</person>



<person>
  <gender>female</gender>
  <firstname>Anna</firstname>
  <lastname>Smith</lastname>
</person>
```

In the first example gender is an attribute. In the last, gender is an element. Both examples provide the same information.

There are no rules about when to use attributes or when to use elements. Attributes are handy in HTML. In XML my advice is to avoid them. Use elements instead.

My Favorite Way

The following three XML documents contain exactly the same information:

A date attribute is used in the first example:

```
<note date="2008-01-10">
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

A date element is used in the second example:

```
<note>
  <date>2008-01-10</date>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

An expanded date element is used in the third: (THIS IS MY FAVORITE):

```
<note>
  <date>
    <year>2008</year>
    <month>01</month>
    <day>10</day>
  </date>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

Avoid XML Attributes?

Some of the problems with using attributes are:

- attributes cannot contain multiple values (elements can)
- attributes cannot contain tree structures (elements can)
- attributes are not easily expandable (for future changes)

Attributes are difficult to read and maintain. Use elements for data. Use attributes for information that is not relevant to the data.

Don't end up like this:

```
<note day="10" month="01" year="2008"
to="Tove" from="Jani" heading="Reminder"
body="Don't forget me this weekend!">
</note>
```

XML Attributes for Metadata

Sometimes ID references are assigned to elements. These IDs can be used to identify XML elements in much the same way as the id attribute in HTML. This example demonstrates this:

```
<messages>
  <note id="501">
    <to>Tove</to>
    <from>Jani</from>
    <heading>Reminder</heading>
    <body>Don't forget me this weekend!</body>
  </note>
  <note id="502">
    <to>Jani</to>
    <from>Tove</from>
    <heading>Re: Reminder</heading>
    <body>I will not</body>
  </note>
</messages>
```

The id attributes above are for identifying the different notes. It is not a part of the note itself.

What I'm trying to say here is that metadata (data about data) should be stored as attributes, and the data itself should be stored as elements.

7. XML Namespaces

XML Namespaces provide a method to avoid element name conflicts.

Name Conflicts

In XML, element names are defined by the developer. This often results in a conflict when trying to mix XML documents from different XML applications.

This XML carries HTML table information:

```
<table>
  <tr>
    <td>Apples</td>
    <td>Bananas</td>
  </tr>
</table>
```

This XML carries information about a table (a piece of furniture):

```
<table>
  <name>African Coffee Table</name>
  <width>80</width>
  <length>120</length>
</table>
```

If these XML fragments were added together, there would be a name conflict. Both contain a <table> element, but the elements have different content and meaning.

A user or an XML application will not know how to handle these differences.

Solving the Name Conflict Using a Prefix

Name conflicts in XML can easily be avoided using a name prefix.

This XML carries information about an HTML table, and a piece of furniture:

```
<h:table>
  <h:tr>
    <h:td>Apples</h:td>
    <h:td>Bananas</h:td>
  </h:tr>
</h:table>

<f:table>
  <f:name>African Coffee Table</f:name>
  <f:width>80</f:width>
  <f:length>120</f:length>
</f:table>
```

In the example above, there will be no conflict because the two <table> elements have different names.

XML Namespaces - The xmlns Attribute

When using prefixes in XML, a so-called **namespace** for the prefix must be defined.

The namespace is defined by the **xmlns attribute** in the start tag of an element.

The namespace declaration has the following syntax. xmlns:*prefix*="*URI*".

```
<root>

<h:table xmlns:h="http://www.w3.org/TR/html4/">
  <h:tr>
    <h:td>Apples</h:td>
    <h:td>Bananas</h:td>
  </h:tr>
</h:table>

<f:table xmlns:f="http://www.w3schools.com/furniture">
  <f:name>African Coffee Table</f:name>
  <f:width>80</f:width>
  <f:length>120</f:length>
</f:table>

</root>
```

In the example above, the xmlns attribute in the <table> tag give the h: and f: prefixes a qualified namespace.

When a namespace is defined for an element, all child elements with the same prefix are associated with the same namespace.

Namespaces can be declared in the elements where they are used or in the XML root element:

```
<root xmlns:h="http://www.w3.org/TR/html4/"
xmlns:f="http://www.w3schools.com/furniture">

<h:table>
  <h:tr>
    <h:td>Apples</h:td>
    <h:td>Bananas</h:td>
  </h:tr>
</h:table>

<f:table>
  <f:name>African Coffee Table</f:name>
  <f:width>80</f:width>
  <f:length>120</f:length>
</f:table>

</root>
```

Note: The namespace URI is not used by the parser to look up information.

The purpose is to give the namespace a unique name. However, often companies use the namespace as a pointer to a web page containing namespace information.

Uniform Resource Identifier (URI)

A **Uniform Resource Identifier** (URI) is a string of characters which identifies an Internet Resource.

The most common URI is the **Uniform Resource Locator** (URL) which identifies an Internet domain address. Another, not so common type of URI is the **Universal Resource Name** (URN).

In our examples we will only use URLs.

Default Namespaces

Defining a default namespace for an element saves us from using prefixes in all the child elements. It has the following syntax:

xmlns="*namespaceURI*"

This XML carries HTML table information:

```
<table xmlns="http://www.w3.org/TR/html4/">
  <tr>
    <td>Apples</td>
    <td>Bananas</td>
  </tr>
</table>
```

This XML carries information about a piece of furniture:

```
<table xmlns="http://www.w3schools.com/furniture">
  <name>African Coffee Table</name>
  <width>80</width>
  <length>120</length>
</table>
```

Namespaces in Real Use

XSLT is an XML language that can be used to transform XML documents into other formats, like HTML.

In the XSLT document below, you can see that most of the tags are HTML tags.

The tags that are not HTML tags have the prefix xsl, identified by the namespace xmlns:xsl="http://www.w3.org/1999/XSL/Transform":

```
<?xml version="1.0" encoding="UTF-8"?>

<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">

<xsl:template match="/">
<html>
<body>
  <h2>My CD Collection</h2>
  <table border="1">
    <tr>
      <th style="text-align:left">Title</th>
      <th style="text-align:left">Artist</th>
    </tr>
    <xsl:for-each select="catalog/cd">
    <tr>
```

```
      <td><xsl:value-of select="title"/></td>
      <td><xsl:value-of select="artist"/></td>
    </tr>
    </xsl:for-each>
  </table>
</body>
</html>
</xsl:template>

</xsl:stylesheet>
```

If you want to learn more about XSLT, please read our XSLT Tutorial.

8. XML Encoding

XML documents can contain international characters, like Norwegian æøå, or French êèé.

To avoid errors, you should specify the encoding used, or save your XML files as UTF-8.

Character Encoding

Character encoding defines a unique binary code for each different character used in a document.

In computer terms, character encoding are also called character set, character map, code set, and code page.

The Unicode Consortium

The Unicode Consortium develops the Unicode Standard. Their goal is to replace the existing character sets with its standard Unicode Transformation Format (UTF).

The Unicode Standard has become a success and is implemented in HTML, XML, Java, JavaScript, E-mail, ASP, PHP, etc. The Unicode standard is also supported in many operating systems and all modern browsers.

The Unicode Consortium cooperates with the leading standards development organizations, like ISO, W3C, and ECMA.

The Unicode Character Sets

Unicode can be implemented by different character sets. The most commonly used encodings are UTF-8 and UTF-16.

UTF-8 uses 1 byte (8-bits) to represent basic Latin characters, and two, three, or four bytes for the rest.

UTF-16 uses 2 bytes (16 bits) for most characters, and four bytes for the rest.

UTF-8 = The Web Standard

UTF-8 is the standard character encoding on the web.

UTF-8 is the default character encoding for HTML5, CSS, JavaScript, PHP, SQL, and XML.

XML Encoding

The first line in an XML document is called the **prolog**:

```
<?xml version="1.0"?>
```

The prolog is optional. Normally it contains the XML version number.

It can also contain information about the encoding used in the document. This prolog specifies UTF-8 encoding:

```
<?xml version="1.0" encoding="UTF-8"?>
```

The XML standard states that all XML software must understand both UTF-8 and UTF-16.

UTF-8 is the default for documents without encoding information.

In addition, most XML software systems understand encodings like ISO-8859-1, Windows-1252, and ASCII.

XML Errors

Most often, XML documents are created on one computer, uploaded to a server on a second computer, and displayed by a browser on a third computer.

If the encoding is not correctly interpreted by all the three computers, the browser might display meaningless text, or you might get an error message.

For high quality XML documents, UTF-8 encoding is the best to use. UTF-8 covers international characters, and it is also the default, if no encoding is declared.

Conclusion

When you write an XML document:

- Use an XML editor that supports encoding
- Make sure you know what encoding the editor uses
- Describe the encoding in the encoding attribute
- UTF-8 is the safest encoding to use
- UTF-8 is the web standard

9. Displaying XML

Raw XML files can be viewed in all major browsers.

Don't expect XML files to be displayed as HTML pages.

Viewing XML Files

```
<?xml version="1.0" encoding="UTF-8"?>
 - <note>
     <to>Tove</to>
     <from>Jani</from>
     <heading>Reminder</heading>
     <body>Don't forget me this weekend!</body>
   </note>
```

Look at the XML file above in your browser: note.xml

Notice that an XML document will be displayed with color-coded root and child elements. A plus (+) or minus sign (-) to the left of the elements can be clicked to expand or collapse the element structure. To view the raw XML source (without the + and - signs), select "View Page Source" or "View Source" from the browser menu.

Note: In Safari, only the element text will be displayed. To view the raw XML, you must right click the page and select "View Source".

Viewing an Invalid XML File

If an erroneous XML file is opened, some browsers report the error, and some only display it incorrectly.

Try to open the following XML file in Chrome, IE, Firefox, Opera, and Safari: note_error.xml.

Other XML Examples

Viewing some XML documents will help you get the XML feeling:

An XML CD catalog
This is a CD collection, stored as XML.

An XML plant catalog
This is a plant catalog from a plant shop, stored as XML.

An XML breakfast menu
This is a breakfast food menu from a restaurant, stored as XML.

Why Does XML Display Like This?

XML documents do not carry information about how to display the data.

Since XML tags are "invented" by the author of the XML document, browsers do not know if a tag like <table> describes an HTML table or a dining table.

Without any information about how to display the data, most browsers will just display the XML document as it is.

Displaying XML Files with CSS?

Below is an example of how to use CSS to format an XML document.

We can use an XML file like cd_catalog.xml and a style sheet like cd_catalog.css

RESULT: The CD catalog formatted with the CSS file

Below is a fraction of the XML file. The second line links the XML file to the CSS file:

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/css" href="cd_catalog.css"?>
<CATALOG>
  <CD>
    <TITLE>Empire Burlesque</TITLE>
    <ARTIST>Bob Dylan</ARTIST>
    <COUNTRY>USA</COUNTRY>
    <COMPANY>Columbia</COMPANY>
    <PRICE>10.90</PRICE>
    <YEAR>1985</YEAR>
  </CD>
  <CD>
    <TITLE>Hide your heart</TITLE>
    <ARTIST>Bonnie Tyler</ARTIST>
    <COUNTRY>UK</COUNTRY>
    <COMPANY>CBS Records</COMPANY>
    <PRICE>9.90</PRICE>
    <YEAR>1988</YEAR>
  </CD>
.
.
.
</CATALOG>
```

Formatting XML with CSS is not recommended. Use JavaScript or XSLT instead.

10. XML Document Types

An XML document with correct syntax is called "Well Formed".

A "Valid" XML document must also conform to a document type definition.

Well Formed XML Documents

An XML document with correct syntax is "Well Formed".

The syntax rules were described in the previous chapters:

- XML documents must have a root element

- XML elements must have a closing tag
- XML tags are case sensitive
- XML elements must be properly nested
- XML attribute values must be quoted

```
<?xml version="1.0" encoding="UTF-8"?>
<note>
<to>Tove</to>
<from>Jani</from>
<heading>Reminder</heading>
<body>Don't forget me this weekend!</body>
</note>
```

An XML Validator

To help you check the syntax of your XML files, we have created an XML validator to syntax-check your XML.

Valid XML Documents

A "valid" XML document is not the same as a "well formed" XML document.

A "valid" XML document must be well formed. In addition it must conform to a document type definition.

Rules that defines the legal elements and attributes for XML documents are called Document Type Definitions (DTD) or XML Schemas.

There are two different document type definitions that can be used with XML:

- DTD - The original Document Type Definition
- XML Schema - An XML-based alternative to DTD

When to Use a DTD/Schema?

With a DTD, independent groups of people can agree to use a standard DTD for interchanging data.

Your application can use a standard DTD to verify that the data you receive from the outside world is valid.

You can also use a DTD to verify your own data.

When to NOT to Use a DTD/Schema?

XML does not require a DTD/Schema.

When you are experimenting with XML, or when you are working with small XML files, creating DTDs may be a waste of time.

If you develop applications, wait until the specification is stable before you add a document definition. Otherwise, your software might stop working because of validation errors.

11. XML Validator

Use our XML validator to syntax-check your XML.

XML Errors Will Stop You

Errors in XML documents will stop your XML applications.

The W3C XML specification states that a program should stop processing an XML document if it finds an error. The reason is that XML software should be small, fast, and compatible.

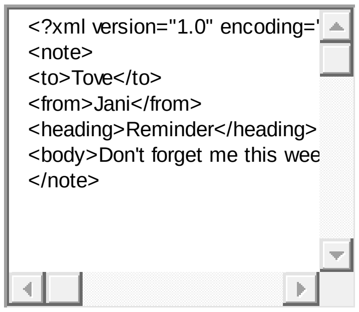
HTML browsers will display HTML documents with errors (like missing end tags).

With XML, errors are not allowed.

Syntax-Check Your XML

To help you syntax-check your XML, we have created an XML validator.

Paste your XML into the text area below, and syntax-check it by clicking the "Validate" button.



```
<?xml version="1.0" encoding='
<note>
<to>Tove</to>
<from>Jani</from>
<heading>Reminder</heading>
<body>Don't forget me this wee
</note>
```

Syntax-Check an XML File

You can syntax-check an XML file by typing the URL of the file into the input field below, and then click the "Validate" button:

Filename:

http://www.v

If you get "Access Denied" or "Network Error", it is because your browser does not allow file access across domains.

The file "note_error.xml" demonstrates your browsers error handling. If you want to see an error-free message, substitute the "note_error.xml" with "cd_catalog.xml".

A General XML Validator

To help you check your xml files, you can syntax-check any XML file here.

Parse Errors

You can read more about the parse errors in our XML DOM tutorial.

12. XML Schema

An XML Schema describes the structure of an XML document, just like a DTD.

An XML document with correct syntax is called "Well Formed".

An XML document validated against an XML Schema is both "Well Formed" and "Valid".

XML Schema

XML Schema is an XML-based alternative to DTD:

```
<xs:element name="note">

<xs:complexType>
  <xs:sequence>
    <xs:element name="to" type="xs:string"/>
    <xs:element name="from" type="xs:string"/>
    <xs:element name="heading" type="xs:string"/>
    <xs:element name="body" type="xs:string"/>
  </xs:sequence>
</xs:complexType>

</xs:element>
```

The Schema above is interpreted like this:

- <xs:element name="note"> defines the element called "note"
- <xs:complexType> the "note" element is a complex type
- <xs:sequence> the complex type is a sequence of elements
- <xs:element name="to" type="xs:string"> the element "to" is of type string (text)
- <xs:element name="from" type="xs:string"> the element "from" is of type string
- <xs:element name="heading" type="xs:string"> the element "heading" is of type string
- <xs:element name="body" type="xs:string"> the element "body" is of type string

Everything is wrapped in "Well Formed" XML.

XML Schemas are More Powerful than DTD

- XML Schemas are written in XML
- XML Schemas are extensible to additions
- XML Schemas support data types
- XML Schemas support namespaces

Why Use an XML Schema?

With XML Schema, your XML files can carry a description of its own format.

With XML Schema, independent groups of people can agree on a standard for interchanging data.

With XML Schema, you can verify data.

XML Schemas Support Data Types

One of the greatest strength of XML Schemas is the support for data types:

- It is easier to describe document content
- It is easier to define restrictions on data
- It is easier to validate the correctness of data
- It is easier to convert data between different data types

XML Schemas use XML Syntax

Another great strength about XML Schemas is that they are written in XML:

- You don't have to learn a new language
- You can use your XML editor to edit your Schema files
- You can use your XML parser to parse your Schema files
- You can manipulate your Schemas with the XML DOM
- You can transform your Schemas with XSLT

If you want to study XML Schema, please read our XML Schema Tutorial.