

# XML Browsers

## How XML Is Displayed in a Browser

XML is a markup language for structured documentation. Structured documents are documents that contain both content (words, pictures, etc.) and some indication of what role that content plays. And you actually can include much more than just text contents, pictures and styles to an XML document, for example multimedia presentations, equations etc. The XML specification defines a standard way of adding markup to documents and this markup identifies structures in a document. But this markup doesn't tell what the documents look like in a browser. In order for the browser to know how to display your tag, you must tell it how to do so. There are several ways to do it:

- XML + CSS
- XML + XSL
- XML +DSSSL
- Convert XML to other format

## CSS

CSS is W3C recommendation, originally developed for HTML. The basic principle behind CSS is to define what a tag will render like. In CSS style sheet you simply tell how to display tags in your XML document. And of course you have to associate stylesheet with XML document. It is done in the following way:

```
<?xml-stylesheet type="text/css" href="foo.css"?>
```

## XSL

XSL takes a source tree, applies some processing to it to create a result tree, which is then rendered. This allows for documents to be wildly “modified“ in the rendering phase. This differs from CSS. CSS simply takes the source and applies some styles to it. XSL takes the source and creates something new.

## DSSSL

Document Style Semantics and Specification Language (DSSSL) is an International Standard style sheet language(ISO/IEC 10179:1996). It is particularly used for formatting of print documents. Some tools already exist which can process XML with DSSSL stylesheets, but none have yet been integrated into browsers.

## **Convert XML to Other Format**

Some web browsers support XML in a limited way. They want to convert the XML document first to HTML format before browsing it. You can use XSL or CSS (or even DSSSL) or some scripting language to convert the document to HTML file. And of course it possible to convert the document to other formats also, for example to rtf or TeX. /1/ /2/

## **XML And Most Common Web Browsers**

Today the most common web browser have XML support, at least in some extend. A web browser needs a built in XML parser to read XML pages.

### **Microsoft Internet Explorer**

#### **Internet Explorer 4.0**

Microsoft Internet Explorer 4.0 was the first web browser, which supported XML. IE4 uses MSXML parser. In addition, an add-on is available for processing stylesheets that can format XML data structures. This add-on, the MSXSL parser, also an ActiveX control, reads the XML data and XSL stylesheet and renders it properly in the browser window. In IE4 you can load only by using the MSXML ActiveX control in an object tag within an HTML page.

note: in IE4 you have to convert XML document to HTML for example with MS XSL add-on or you can use JavaScript and XML object model to convert XML to HTML.

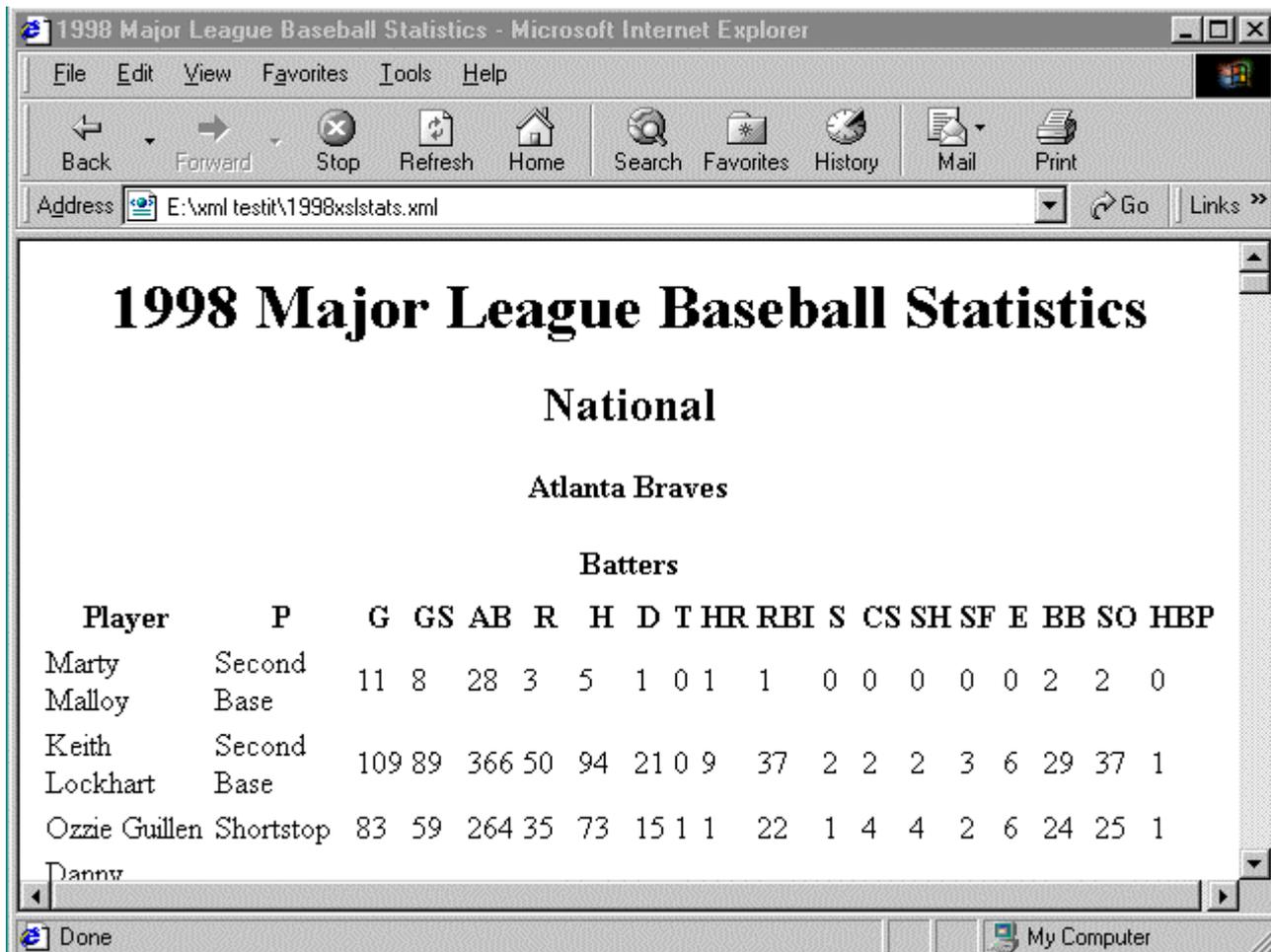
#### **Internet Explorer 5.x**

Internet Explorer 5.0 improved IE's XML support a lot. It supports World Wide Web Consortium (W3C) XML 1.0 and "Namespaces in XML" recommendations. The Microsoft XML implementation also includes support for W3C-recommended XML Document Object Model (DOM). The DOM is a object application programming interface that gives developers programmatic control of XML document content, structure, formats, and more.

In Internet Explorer 5 you can view XML documents directly using Extensible Stylesheet Language (XSL) or cascading style sheets (CSS). Internet Explorer 5 has also mechanisms that can embed XML data islands to an HTML page and bind XML data to HTML elements.

Internet Explorer 5.5 has a better CSS support than it's predecessor's and is more stable It also has limited Smil support.

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Pic.1 XML document 1998xslstats.xml opened with Internet Explorer 5.5

## Netscape + Mozilla

Netscape 4.x series browsers don't support XML. Although Netscape 4.7 has some features such as Smart Browsing that appear to be based on XML. Final version of Netscape 6 is to be released soon. Currently available version of the Netscape 6 is Preview version 3. Netscape 6 web browser is based on the Mozilla engine. Mozilla supports HTML 4.0, XML, CSS, DOM, namespaces and simple Xlink.

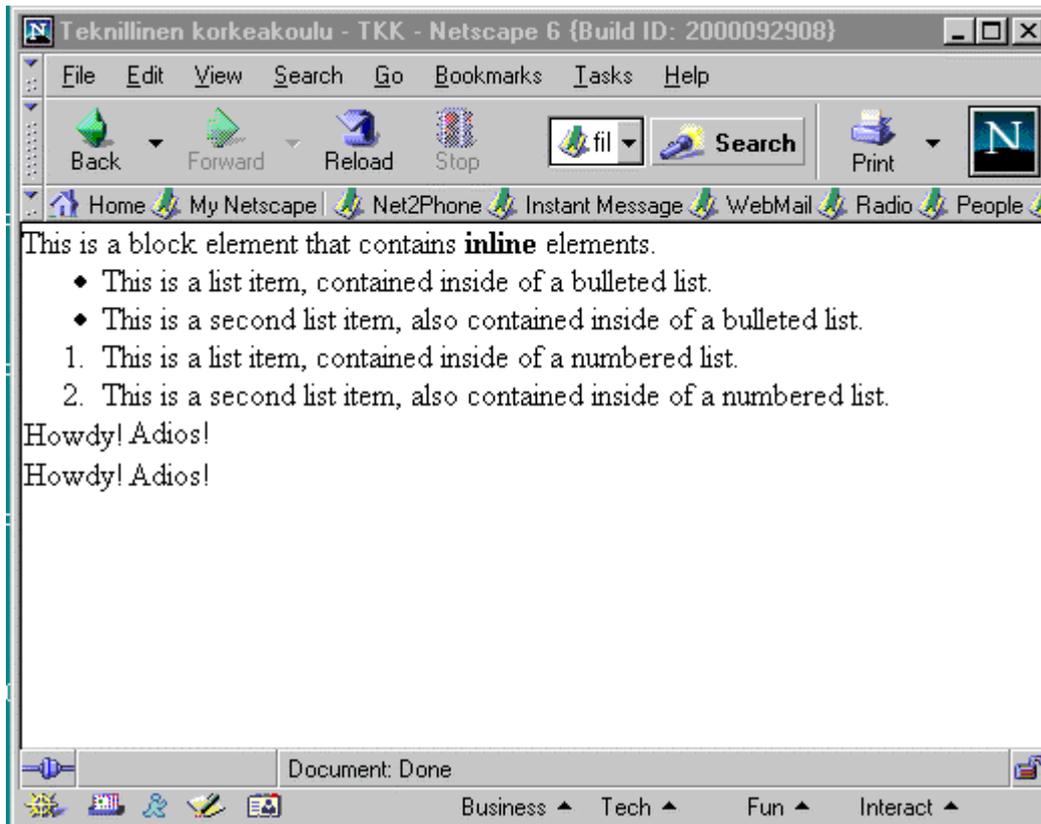
Mozilla's XML implementation is standards-orientated. The basic approach is to browse XML with CSS. Mozilla supports CSS2 Recommendation. Mozilla uses James Clark's non-validating expat parser (the same parser that is used in perl). The output from expat is then fed into a DOM-tree builder and document structures can be styled with CSS. From casual user's perspective, well-formed XML documents with style sheets look and work just like HTML documents.

Mozilla supports namespaces. In particular the HTML namespace can be useful at times. Namespace support will also be critical for Xlink when support arrives for more recent Xlink drafts, giving Mozilla a way to find Xlink's "global attributes" for proper link processing. Mozilla's XUL tools for building user interfaces with XML also rely on namespaces in a similar fashion.

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## Expat

Mozilla uses Expat parser, which is freely available with source under the MIT licence. Expat is an XML 1.0 parser written in C and is non-validating parser. Expat 1.2 supports parsing of external DTDs and parameter entities. /10/



Pic.2 display1.xml opened with Netscape 6

## Opera

Opera has a good reputation supporting standards. Compared to other main Web browsers it's smaller and faster in older (and slower) computers. Opera 4.0 is built on the same combination of XML and Cascading Style Sheets (CSS) that the Mozilla project has used as its base. While much of the core is the same, some details, especially linking, are different.

Opera version 4.02 includes support for XML. It also supports CSS, CSS2, WAP-WML(experimental), Java , JavaScript, SSL and TSL. Among independent study Opera 4.02s CSS support ranks the best among Web browsers. /11//12/

## **Comparison And Notes: Internet Explorer, Netscape/Mozilla And Opera**

Internet Explorer has much to improve in its CSS support. But otherwise Microsoft has put lot of effort in XML support and its their own XML parser. Opera's strongest point is it's support to standards, but all these browsers follow standards considerably well. But in general Microsoft appears to be remaining far more dependent upon HTML for the presentation and linking tasks for which Mozilla and Opera use CSS and XLink. This leaves developers with a “support Microsoft or support everyone else“ problem. /7/ /9/ /11/

## **Java Based Browsers**

### **Why There Is So Many Java Based XML Browser?**

The main reason is that Java is portable. You can use Java based browser in any computer with Java support. The Java programming language is much used in any XML based applications, because XML and Java have some synergies:

- The Java platform supports the Unicode standard, making easy to process an international XML document. For platforms without native Unicode support, the application must implement its own handling of Unicode characters, which adds complexity to the overall solution.
- The Java technology binding to the W3C Document Object Model (DOM) provides developers an efficient environment for processing and querying XML documents.
- Java is object-oriented programming language which means that developers can build applications by creating hierarchies of Java objects. Also XML specification offers a hierarchical representation of data. Because they both share this underlying feature, they are compatible for representing each other's structures.
- Application written in the Java programming language that process XML can be reused in any tier in al multi-tiered client/server environment, offering an added level of reuse for XML documents. /13/

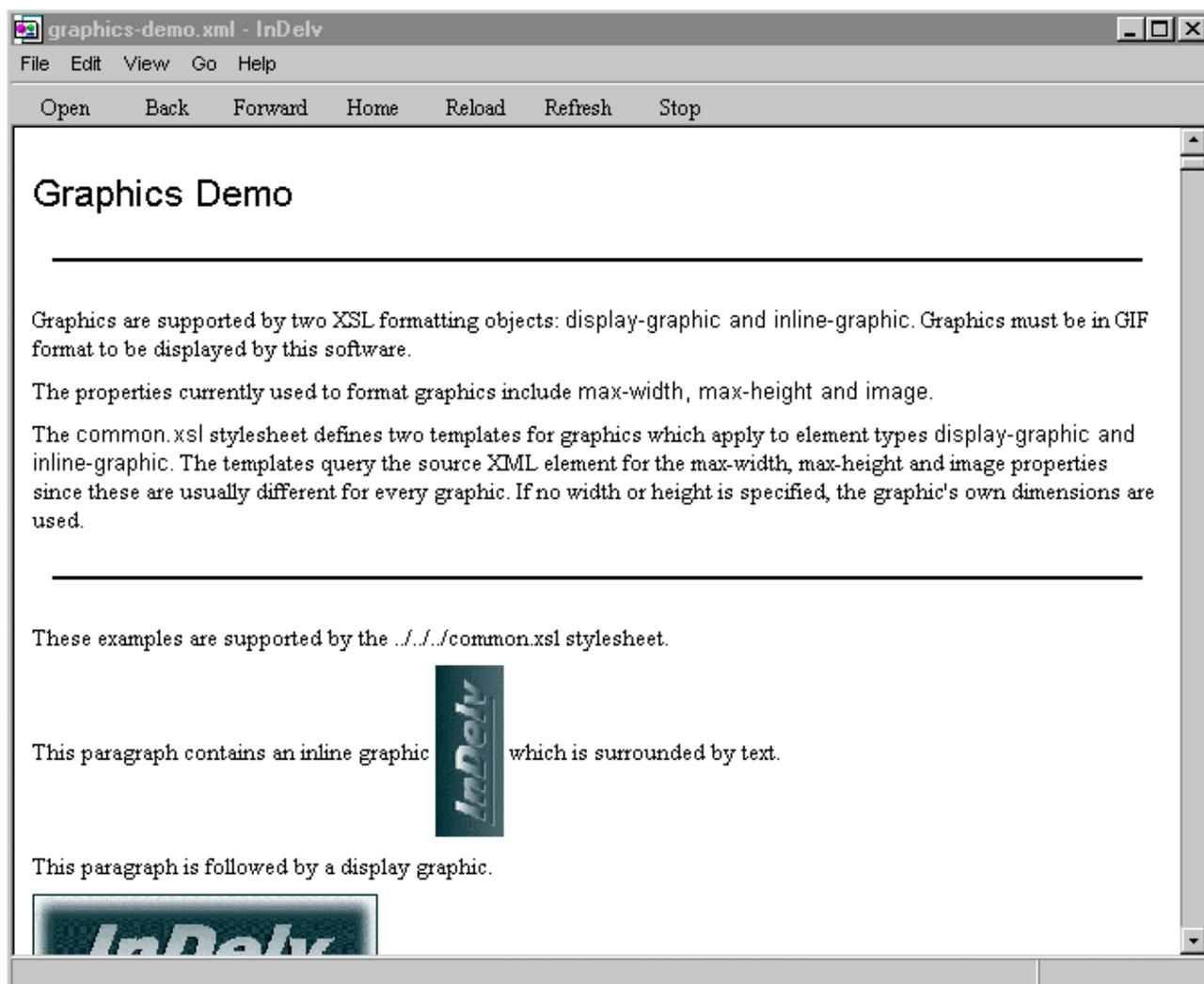
### **General note:**

These browsers work with (almost) any operating system with Java support.

## **InDelv XML browser**

InDelv XML Browser can display XML documents using XSL. It can link an XSL stylesheet to XML documents without modifying the original files. The supported standards include: XML, XML Namespaces, XSL, XSLT, XPath, XPointer and XLink.

Recently the browser has been integrated to InDelv's XML Client. The browser component is free and will continue to work indefinitely. The program was developed using Java and runs on all Java supported operating systems. /4/ /14/



*Pic.3 InDelv XML browser*

## **JUMBO**

JUMBO stands for Java Universal Molecular Browser. It is developed by The Virtual School of Molecular Sciences, University of Nottingham and it was originally created to support the Chemical Markup Language (CML). JUMBO was the earliest XML browser, initially available when XML was still a working draft. It can be used as a standalone Java application, or in conjunction with Netscape or Internet Explorer.

New version of JUMBO browser, JUMBO2 was released in the September 1998. JUMBO2 uses SAX, Swing, and supports some type of namespace and stylesheet capabilities. /15/

## **eXeMeL Browser**

eXeMeL is an XML browser is fully extensible and modular browser and is still under development. It is developed by Simon Langford and was initially designed and written as a part of

his Computer Systems Engineering degree. /16/

## **Link**

Link is simple application that allows users to view XML documents with XSL stylesheets and XLL hyperlinking. It's developed by Justin Ludwig for Study Project at the College of Wooster. It uses several third party libraries, including the Docuverse DOM implementation, James Clarks's XP parser and XSL processor, and the XML\_DEV mailing list's SAX (Simple API for XML) API.

Link renders documents with XSL stylesheets that contain HTML formatting only, and not the formatting object described in the XSL specification. /17/

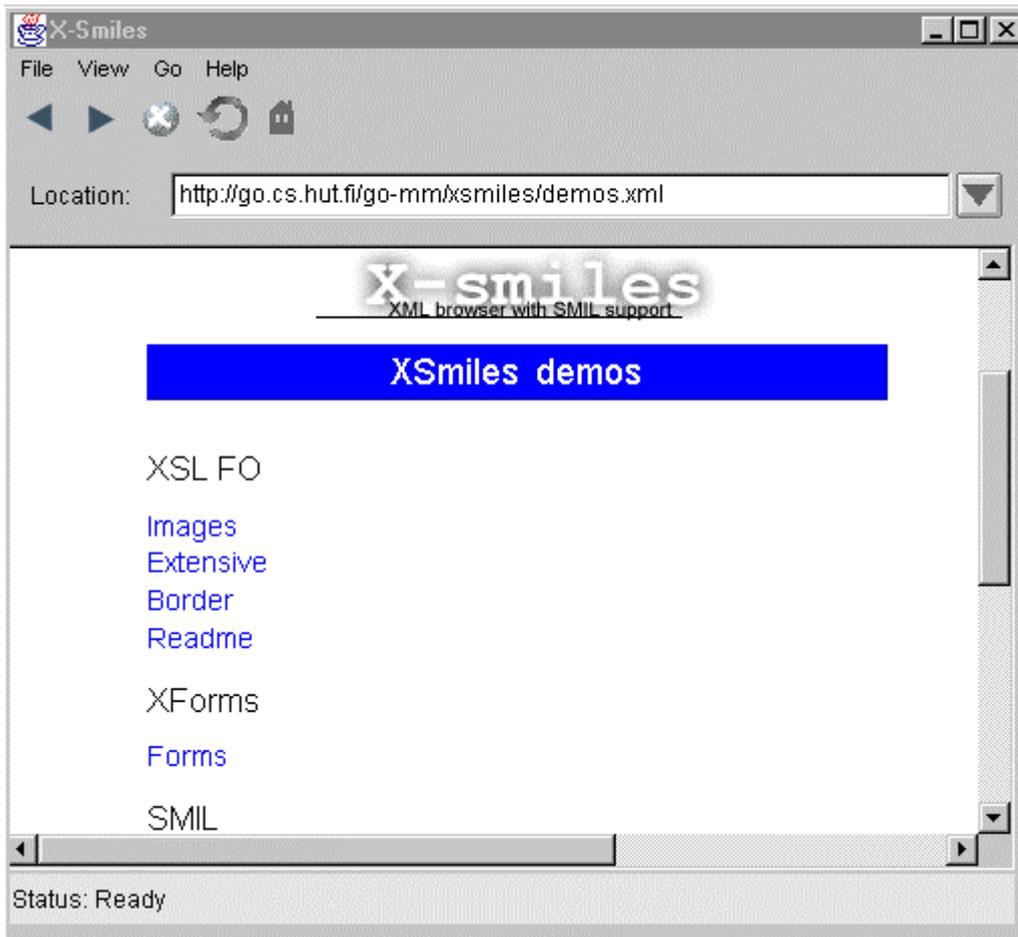
## **XML Viewer**

XML Viewer is commercial XML browser developed by Alphaworks, IBM. It displays any well-formed XML document. With XML viewer you can traverse document's hierarchy using the tree views, find out the attributes of a particular node in the hierarchy and view the source associated DTD files. You can also view the source of the selected node in the XML source view and the definition of node the DTD source view. /18/

## **X-Smiles**

X-Smiles was originally develop as a study project in Telecommunications Software and Multimedia Laboratory in Helsinki University of technology and is further developed in GO-MM (GO / Wireless Multimedia Services) project. It uses many public domain components. X-Smiles is designed as a pure XML browser, unlike many other browser I tested, which have designed originally as HTML or SGML browser. X-Smiles browsers supports several XML related specifications, but like many other XML browsers available, it is pretty much under construction.

It has a component-oriented approach, which means that different parts, for example parser or stylesheet processor can be changed easily. At the moment there are Markup Language Functional Components (MLFC) for Synchronised Multimedia Integration Language (SMIL), Scalable Vector Graphics (SVG) and XSL Formatting objects. The programmed requires Java 1.2.x (and JMF 2.x for SMIL) to be installed. Parsing is based on SAX. The DOM implementation works on top of the parser. It takes as input SAX events and constructs the DOM model of the document from that. /19/



*Pic. 4 X-Smiles browser*

## **Others**

### **DocZilla**

DocZilla is a web browser, which is developed by Citec and is based on Mozilla and Multidoc Pro. That's the main difference to Mozilla; Mozilla uses Expat as its XML parser. It supports SGML, HyTime, XML, and HTML. DocZilla is component-based software and its component mechanism is called XPCOM (Cross Platform COM) and has the advantage of working on all major operating systems.

DocZilla displays XML and SGML directly using Cascading Style Sheets (CSS) and can manipulate the entire document using the Document Object Model (DOM) and JavaScript.

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### **Multidoc Pro**

Multidoc Pro is an application developed by Citec for publishing and browsing SGML and XML

documents located on the Internet, Intranet, LAN, WAN and CD-ROM. It can be used as stand-alone SGML/XML document browser, or as a plug-in for web browsers. Multidoc Pro supports inline viewing of any media supported by WWW browsers plugins such as CGM version 4, VRML, Autocad DWG/DXF, PDF, MS Word, MS Excel etc. The SGML/HyTime browser engine within Multidoc Pro can also launch external applications to view the data. /21/

## **Amaya**

Amaya is web browsing and authoring environment developed by W3C. Amaya handles HTML documents very much like XML documents are handled. It always represents the document internally in structured way consistent with the Document Type Definition (DTD). A structured document enables other tools to further process the data safely. Amaya has support for the W3C style sheet language CSS although this is not complete yet. It's also possible to edit CSS style sheets with Amaya.

What's special in Amaya is that it has a support for MathML. MathML is an XML application resulting from work by the W3C Math working group. MathML allows authors to format mathematical equations for publishing on the World Wide Web. /22/

## **HyBrick**

HyBrick is a SGML/XML browser developed by Fujitsu Laboratories. HyBrick supports advanced linking and formatting capabilities. It includes a DSSL renderer and XLink/XPointer engine running on top of James Clark's SP and Jade. XLink is implemented as a subset of the HyTime property set. HyBrick supports printing and print preview based on DSSL stylesheets. HyBrick works with Windows 95/98/NT4.0 operating systems. /23/

## **Comparison of documented XML features**

Browser	Stylesheets	Documented XML features (beside XML)	Other features
Internet Explorer	XSL, CSS	Support for DTD standards, Binding data to HTML elements, access to the DOM, Smil (limited)	
Netscape/Mozilla	CSS	DOM, namespaces, Simple Xlink	
Opera	CSS	(ECMAScript)	
InDelv XML browser	XSL, XSLT	XML Namespaces, XSLT, XPath, Xpointer, Xlink, XSL FO	
Jumbo2	Stylesheets supported (?)	Namespaces (limited)	CML
ExeMeL	No style support	?	
Link	XSL (transformation part)	XLL hyperlinking, XPointer resolution scheme DOM	
Xsmiles	XSL, XSLT	Smil, SVG, ECMAScript	
DocZilla	CSS	DOM, DTD, Xlink, D/IDREF and HyTime clinks with nameloc, Treeloc, queryloc	SGML
Multidoc Pro	Supported(?)	DTD	SGML
Amaya	CSS	MathML, DTD	
XML Viewer	?	DTD	
HyBrick	DSSL	Xlink, Xpointer	SGML

## XML plugins

There two main categories in XML plugins. One category is those plugins that enable to browse XML documents in those web browser which it isn't normally possible (for example Netscape 4.x). The other category is plugins that enable to browse some other document type that browser doesn't normally support (for example TeX and MathML). There are several XML browser plugins, but

here I present only two as an example.

## **Xesalt**

Inlogix software's main product XSL transformation (XSLT) processor xesalt enables a web server to transform XML content on the fly. There is also available xesalt browser plugin for Netscape. It enables Netscape Communicator 4.X to present XML data with the help of XSLT stylesheets. An XML data source is transformed into HTML by applying a set of transformation rules defined in an XSLT stylesheet.

Xesalt supports following W3C recommendations: XML 1.0, XSLT 1.0, XPath1.0, Namespaces in XML 1.0 and associating Style Sheets with XML documents. /24/

## **WebEQ Math Browser**

The Math Viewer is a Java applet that displays dynamic, interactive MathML equations in your browser. The Math Viewer is free component of WebEQ tools, which is commercial product. WebEQ is developed by Design Science, Inc. /25/

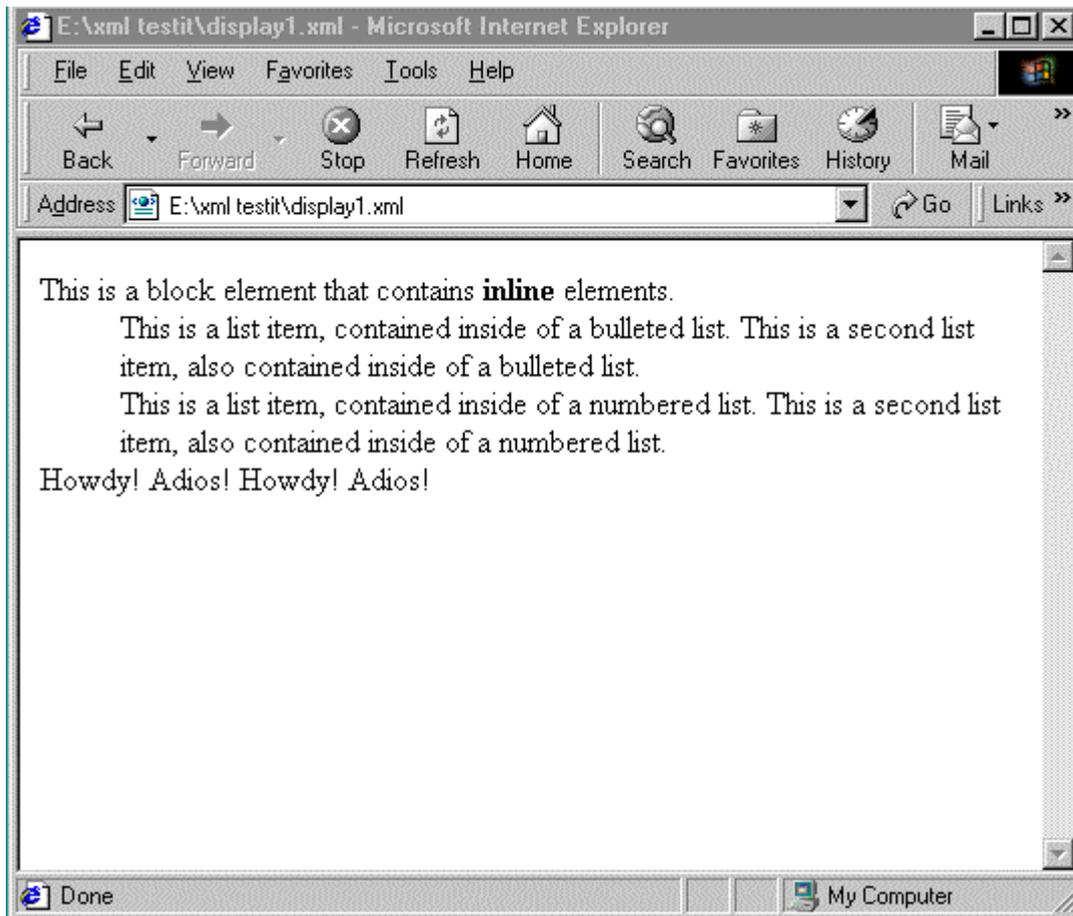
## **Tests**

I found from the Internet some XML document with CSS and/or XSL stylesheets and tested browsers with those documents. First test file is display1.xml, which is associated with display1.css. It tests the display property's block, inline, hidden, list, and table values using a very simple style sheet. The second test document books1.xml and books1.css is more complex xml+css test with different elements. The third document books5.xml and books5.css in the same document as previous one but with pictures and CSS code is IE5 optimised. 1998xslstats.xml is big XML document that uses XSL stylesheets. It's for testing XSL and how big browsers can handle big XML documents. In this tests I used Windows NT as a operating system.

## **Test results**

I have documented here the most interesting test results or test results that were surprising .

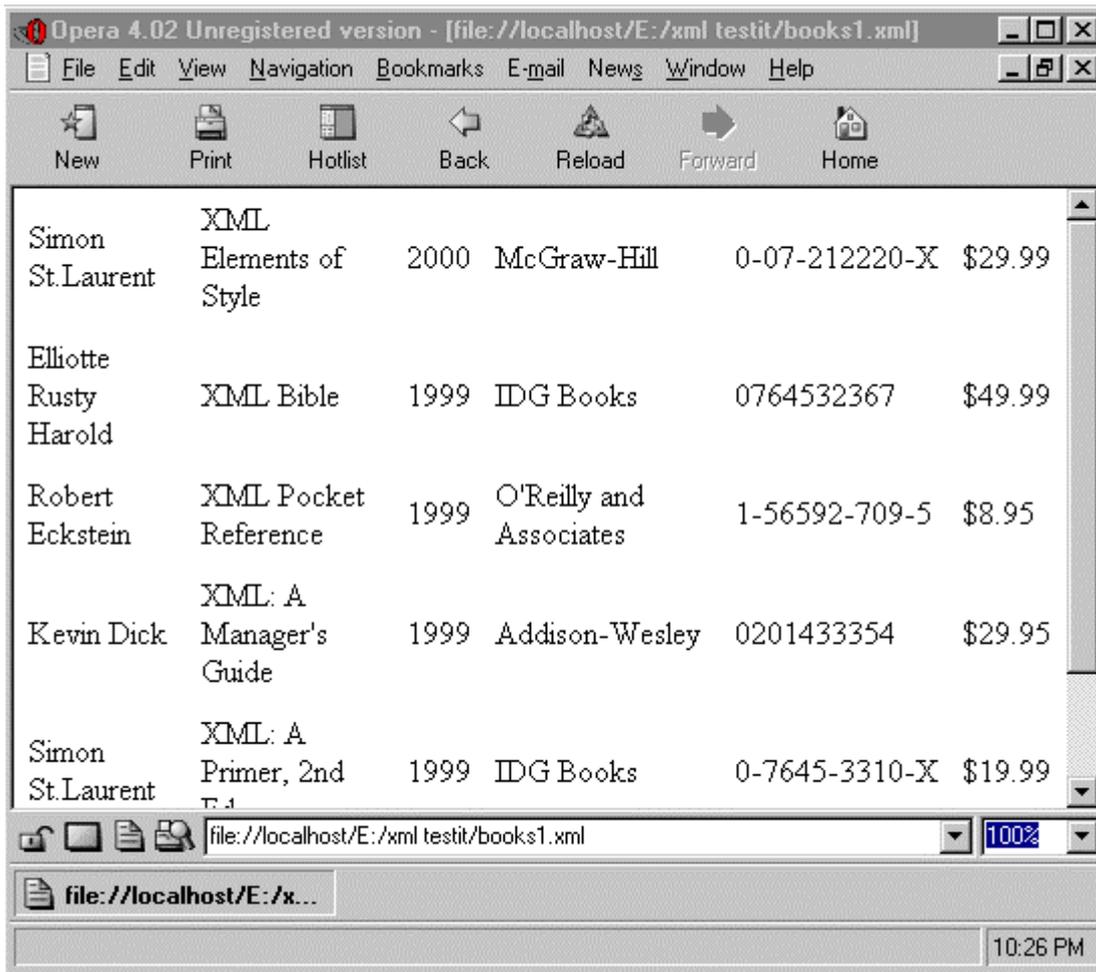
Internet Explorer couldn't handle CSS properly. Display1.xml and books1.xml were displayed wrongly (and looked awful), books5.xml worked. XSL worked much better, 1998xslstats.xml worked perfectly. For example display1.xml looked following, which shows that Internet Explorer's CSS didn't support lists (compare to picture 2, the same document opened with Netscape 6):



*Pic.5 display1.xml opened with Internet Explorer*

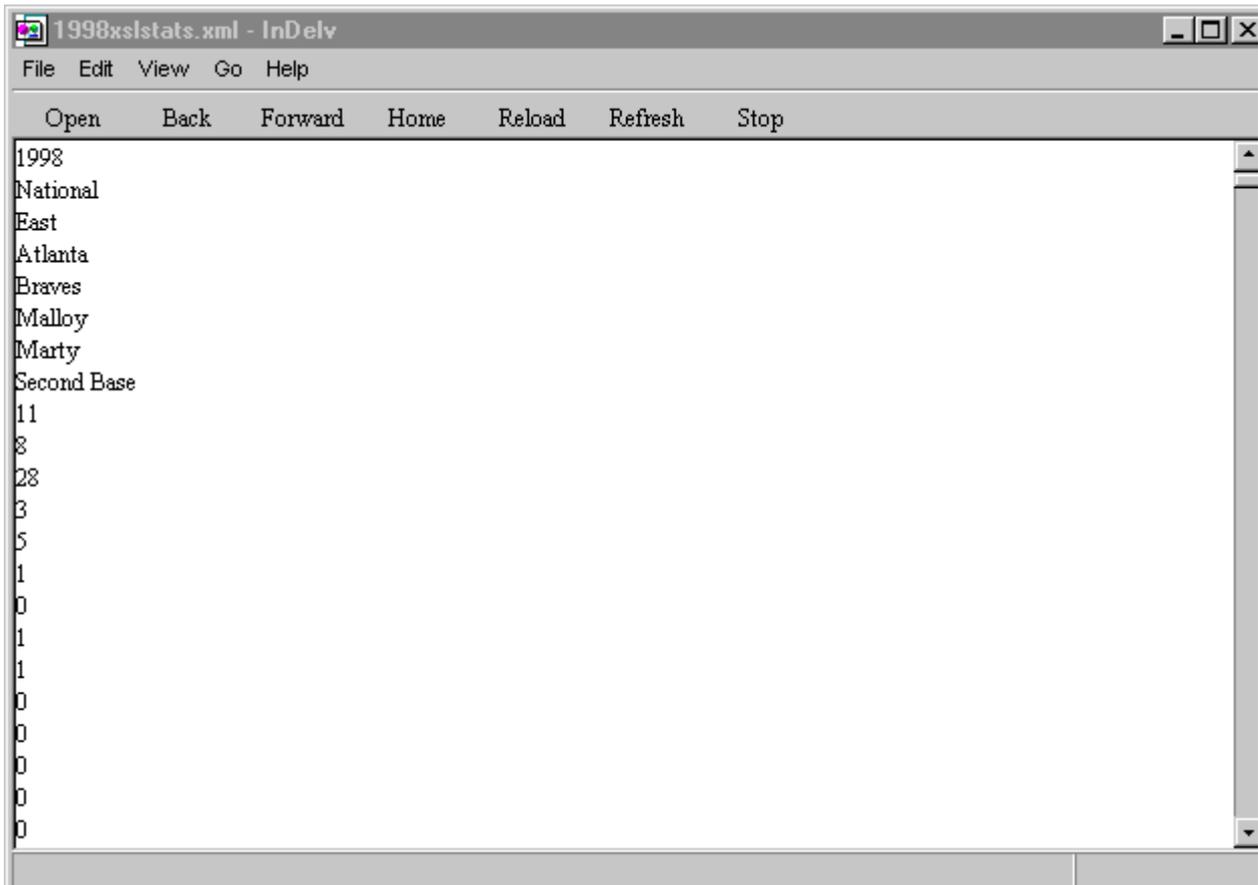
When I started to open 1998xslstats.xml with Netscape 6 prev.3, the document didn't open at all and the Netscape browser stopped responding. Tests showed that Netscape works properly with CSS.

Opera didn't show 1998xslstats.xml properly, but anyway it didn't actually promise any XSL support. But it did open the 1998xslstats.xml, which Netscape didn't. All the with CSS stylesheets worked properly. As an example you can see books1.xml opened with Opera below:



*Pic.6 books1.xml opened with Opera.*

InDelv's XML Client showed the demos which were made with it nicely, but it didn't show rightly the structure of the 1998xslstats.xml document. InDelv's XML browser doesn't support CSS. Well, actually it showed some XML documents which were associated to CSS stylesheets (but without proper structure) and some it didn't open at all.



*Pic.7 1998xslstats.xml opened with InDelv XML browser*

Multidoc Pro didn't show CSS or XML associated document's properly. Actually the product seems is more SGML browser and publishing tool than XML browser although it promised XML support.

DocZilla looks a lot like Netscape 6 (and Mozilla). It also same strengts as Mozilla, it in its bests with XML documents associated with CSS stylesheets. It showed also 1998xslstats.xml, but without proper structure.

X-smiles worked fine with it's own demos, but failed to open 1998xslstats.xml document. Or actually it opened but without style (just XML source code).

## **End Notes**

It was quite surprising to notice that stylesheet support is quite limited in many XML browsers. With several browser came some demos and they worked all fine, but the test documents did't work at all. This means that you have to know what browser(s) you will use when you design the stylesheets for your XML documents.

## References

- /1/ <http://wwwp.cs.unc.edu/Courses/wwwp-s99/members/vanduine/dispXML/dispXML.html>
- /2/ [http://www.w3.org/TR/xml-styleet/](http://www.w3.org/TR/xml-styleheet/)
- /3/ <http://www.zdnet.com/devhead/stories/articles/0,4413,348846,00.html>
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- /6/ [http://www.xml101.com/xml/xml\\_browsers.asp](http://www.xml101.com/xml/xml_browsers.asp)
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- /9/ <http://www.xml.com/pub/2000/03/29/tutorial/index.html>
- /10/ <http://www.jclark.com/xml/expat.html>
- /11/ <http://www.opera.com/presskit.txt>
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- /13/ <http://java.sun.com/xml/ncfocus.html#synergy>
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/22/ <http://www.w3.org/Amaya/Amaya.html>

/23/ <http://www.fujitsu.co.jp/hypertext/free/HyBrick/>

/24/ <http://www.inlogic.de/npmanual.html>

/25/ <http://www.webeq.com/>

Example documents taken from:

[www.xml.com](http://www.xml.com)

and

<http://www.ibiblio.org/xml/examples/>