Introduction to XSLT

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From an original document by Susan Hockey

This document is part of a collection of presentations and exercises on XML. For full details of this and the rest of the collection see the cover sheet at: http://ucloer.eprints-hosting.org/id/eprint/19

Version 1.0

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Stylesheets

- **CSS** for appearance and layout
  - –Cascading Style Sheets

- **XSL-FO** for printer output
  - –Extensible Stylesheet Language: Formatting Objects

- **XSLT** for Transformation – manipulation
  - –Extensible Stylesheet Language: Transformations

XSL: Formatting Objects

- Used to describe XML documents for display (usually printed)
- Describe how page should look
- 56 Elements- enough detail to publish books

- E.g. fo:footnote, fo:page-number, fo:table, fo:external-graphic

XSLT

- Powerful transformation language
- W3C standard
- Transforms one tree structure to another
- Used for formatting as with CSS

- XSLT files are XML files and therefore follow XML rules - ie declaration / well-formed

XSL and Display on the Web

- Transforms a source XML document to an output XHTML document for web display

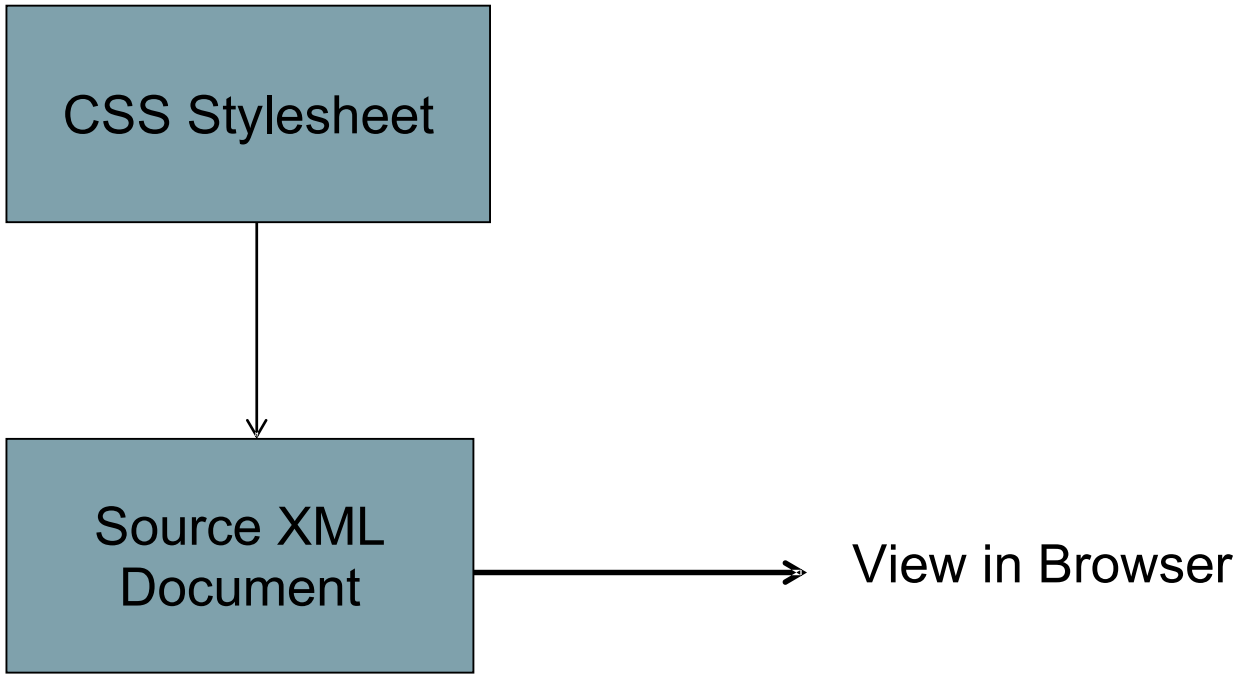
- XSL "drills down" the XML tree and picks out elements and attributes to go into the XHTML document

- The XHTML can also have some CSS
- Not all elements need be transformed

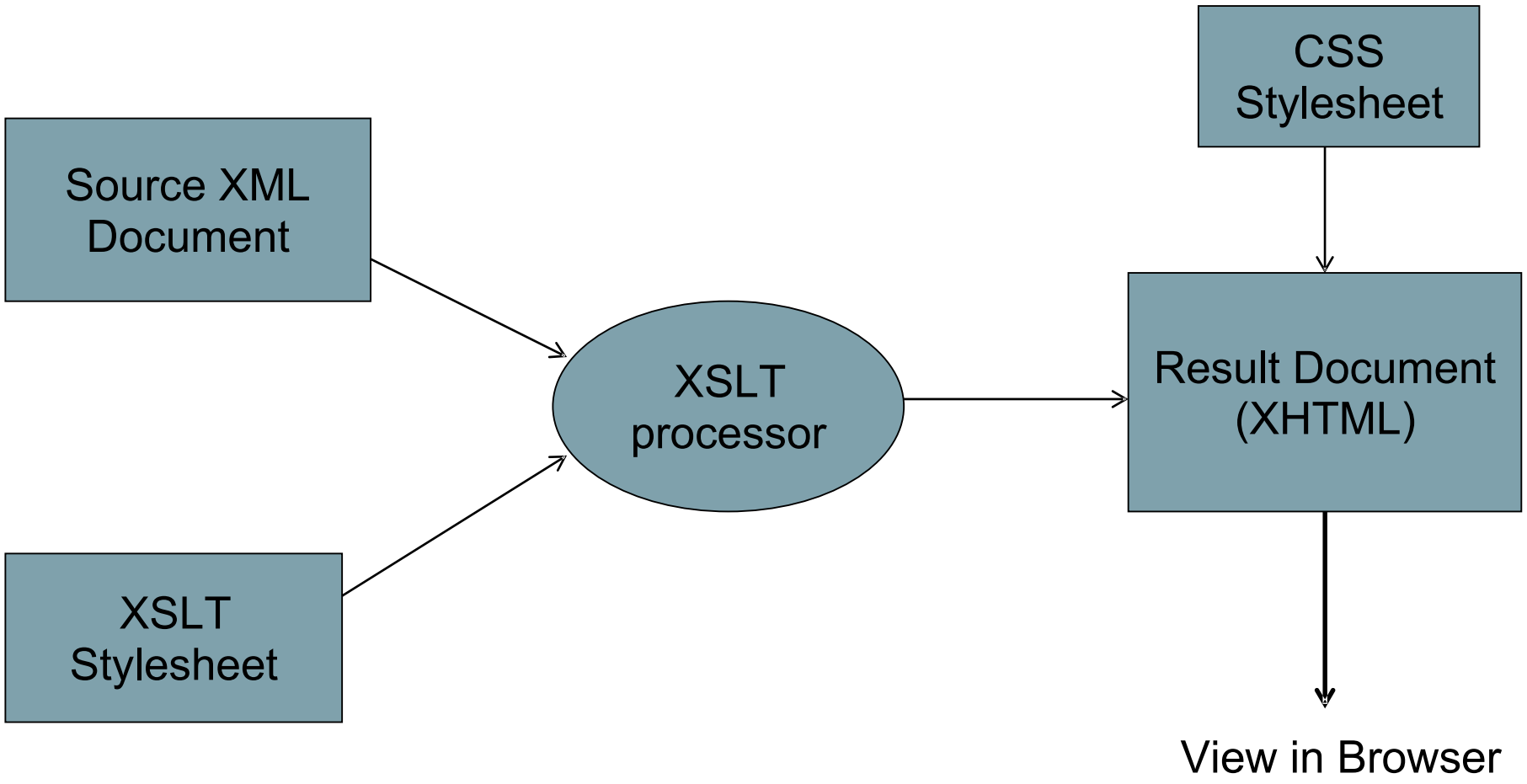
Publication Process

- Document analysis
- Create DTD (or other Schema)
- Create documents
- Well Formed and Validate against DTD/Schema
- Publish
  - Transform with XSLT Stylesheet
  - Style with CSS Stylesheet

CSS Styling



Transformation and Styling



Overview of Some XSLT Functions

- Present selected information for different readers
- Add elements for viewing, e.g. add address or logo
- Create new content from existing content, e.g. table of contents
- Re-order content
- Can also operate on attributes

XSLT Processors

- Incorporate Well-formedness check
- IE6 +, Firefox include CSS and XSLT processors
- Others are available
  - Saxon
  - Xalan
  - MSXML
- Transformation processing (Saxon) built in to Oxygen
  - Also debugging

XSL

- An XML Language
- Namespace xsl:
- Declaration

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet
  xmlns:xsl="http://www.w3.org/1999/XSL/Transfor
  m" version="1.0">


</xsl:stylesheet>
```

XSLT Versions

- Version 1.0 November 1999
- Version 1.1 Working draft December 2000
  - Never formally released. Changes subsumed into …
- Version 2.0 January 2007.
  - Still quite new
  - Backwards compatible with version 1.0
- Version 1.0 is the version used here

An XSL Stylesheet

- Well-formed XML document
  - Extension .xsl

- Describes and works on the document tree
- Top level element is <xsl:stylesheet>

How does it work?

- Selects part(s) of source document
- Defines 'templates' for selected parts to be transformed
- Creates new 'result document' containing transformed part(s) of source document
- Source document is XML
- Result document can be text, xml, xhtml,
- Our focus here is on xhtml for display in browser as part of a web site

Selecting from Source Document

- Uses **XPath** expression language

- Collects information from the source document by navigating through the document tree to **nodes** specified in the stylesheet
- Can also perform calculations – average, count, >, <, etc.

Templates

- Stylesheet is a set of templates

```
<xsl:stylesheet>
    <xsl:template></xsl:template>
    <xsl:template></xsl:template>
</xsl:stylesheet>
```

- Each template consists of two parts:
  - a path (how to find the bit you want)
  - content (what you want to do with it)
- Use the path to find an element – using XPath language
- The content is what is done to the element as it is transferred to the result document

XPath (XML Path Language)

- Language used with XSLT
- Describes path to the element in the source tree to which the template applies
- Syntax is similar to file paths, starting from the root

  /article/section

  <section> as a child of <article>

  /section/title

  <title> as a child of <section>
- / points to the immediate children of the element

Xpath 'view' of your Document

- Specifying the right path depends on your start point.
- XSL and Xpath see your document like a tree.
- Each component of your document is called a 'node'
  - Element nodes
  - Attribute nodes
  - Text nodes
  - Comment nodes
  - Processing-instruction nodes

XSLT nodes

- **Node** is an individual piece of the XML document
- **Root**: the document itself - independent of any content
- **Element**: each element in the XML document
- **Attribute**: each attribute in the XML document
- **Text**: text content of an element
- **Comment**: comment in the XML doc
- **Processing instruction**: instructions in XML doc

Parent / child / sibling

- Every node is related in some way to another
- Relationship as in tree structure
- Root node has children
- To child nodes the root node is a parent node
- Children can have children or siblings
- Siblings have same parent node
- Descendants are a node's child nodes
- Ancestor nodes are a node's parent / grandparent / great-grandparent etc

The Document Root

- The XSL **root** is the whole document - **NOT** the root element of the document.
- '/' addresses the entire document including comments and processing instructions
- So to address <recipe> in XSL/Xpath use '/recipe'
- To address <author> use /recipe/author
- Similar to filesystem addressing

More Paths

- //section
  - <section> anywhere within the document
- /article/*/title
  - <title> when it is a grandchild of <article>

Attributes in Paths

book/@style

Finds the style attribute of <book>

XSL Template Content

- Content of the template gives the elements to insert in the resulting tree
- Convert to XHTML for display by a web browser
- Not all elements need to be transformed
- Add 'literal result elements' in the stylesheet
  - XHTML tags to give basic formatting

XSL Template Content

•To display the element <title> within <section> as a paragraph in italic, XSL must find instances of <title> within <section> and then convert <title> ... </title> to

 …

or to the appropriate CSS

Example

```
<xsl:template match="section/title">
   <p><i>
<xsl:value-of select="."/>
    </i></p>
</xsl:template>
```

<xsl:value-of select="."> takes the value (content) of the current element

Example

<section><title>Pride and Prejudice</title></section>

Is transformed to

Pride and Prejudice

[Uses tag for simplicity]

XSL Selections

- Can include patterns
- Rather like database queries
- Using location paths to drill down the tree to the required element

Context Node

- Patterns require a context node from where search is begun
- Start with the document instance, not the outermost element which is inside the document instance

Building an XSL Stylesheet

- Define templates for each element (normally called nodes) to be processed
- Define template for the document instance
- Apply the templates wherever necessary

Repeating Information

- The template can deal with all instances of a particular element one by one using

  <xsl:for-each>

- Useful for documents with a repeating structure
- Will return each and every occurrence of the node
- <xsl:value-of select="title"> finds an exact element with the content specified in the select attribute

XML	XHTML
<poem> <title>Title of Poem</title> <author>Name of Author</author> <stanza> <line>line 1</line> <line>line 2 </line> <line>line 3</line> <line>line 4</line> </stanza> <stanza> <line>line 1</line> <line>line 2</line> <line>line 3</line> <line>line 4</line> </stanza> </poem>	<html> <head> <title>Title of Poem by name of Author</title> </head> <body> Title of Poem Author of Poem line 1 line 2 line 3 line 4 line 1 line 2 line 3 line 4 </body> </html>

```
<poem>
 <title>Untitled</title>
 <author>Emily Bronte</author>
 <stanza>
   <line>It's over now..</line>
   <line>I'll hide it </line>
   <line>But back again</line>
   <line>And think the </line>
 </stanza>
 <stanza>
  <line>The evening sun, </line>
  <line>Had pass'd from </line>
  <line>And dark the </line>
  <line>And stars were </line>
 </stanza>
</poem>
```

```
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
   <title>Untitled by Emily Bronte</title>
 </head>
<body>
   <h1>Untitled</h1>
   <p><i>Emily Bronte</i></p>
   <div>It's over now</div>
   <div>I'll hide it </div>
   <div>But back again</div>
   <div>And think the</div>
   <br/>
   <div>The evening sun</div>
   <div>Had pass'd from</div>
   <div>And dark the</div>
   <div>And stars were </div>
   <br/>
   </body>
</html>
```

From XML to XHTML

XML	XHTML
<poem> …….. …….. …….. </poem>	<html> <head> …… </head> <body> …… </body> </html>

From XML to XHTML

XML	XHTML
<title> …… </title> <author> …… </author>	<title> [combination of 2 elements + text inserted] </title> AND ....

Create mandatory elements and add header title

```
<xsl:template match="poem">
    <html>
        <head>
            <title> <xsl:value-of select="//title"/>
            by <xsl:value-of select="//author"/> </title>
        </head>
        <body>
            <xsl:apply-templates/>
        </body>
    </html>
```

Add <h1>title </h1> and author in <body>

(note XPath now has changed – relative to position)

```
<xsl:template match="title">
    <h1>
        <xsl:apply-templates/>
    </h1>
</xsl:template>

<xsl:template match="author">
    <p>
        <i>
            <xsl:apply-templates/>
        </i>
    </p>
</xsl:template>
```

Example Document Structure

```
<catalog>
   <cd>
        <title>… </title>
        <artist>… </artist>
   </cd>
   <cd>
        <title>… </title>
        <artist>… </artist>
   </cd>
</catalog>
```

(From W3 Schools)

XML

```
<catalog>
    <cd>
        <title>     </title>
        <artist>    </artist>
    </cd>
    <cd>
        <title>     </title>
        <artist>    </artist>
    </cd>
    <cd>
        <title>     </title>
        <artist>    </artist>
    </cd>
    <cd>
        <title>     </title>
        <artist>    </artist>
    </cd>
    </cd>
```

XHTML

```
<html>
  <body>
  <h2>My CD Collection</h2>
    <table>
        <tr>
            <th>Title</th>
            <th>Artist</th>
        </tr>
        <tr>
            <td>    </td>
            <td>  </td>
         </tr>
      </table>
  </body>
</html>
```

Example 71.xsl

```
<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>
```

For each <cd> outputs the content of each <title> and <artist> element in turn within table cells (<td>).

value-of starts at specified node and repeats action until another value specified.

Instance Document example71.xml

```
<catalog>
   <cd>
      <title>CD 1 title</title>
      <artist>CD 1 artist</artist>
   </cd>
   <cd>
      <title>CD 2 title </title>
      <artist>CD 2 artist </artist>
   </cd>
</catalog>
```

Example XHTML Result document

```
<tr>
  <td>CD 1 title</td>
  <td>CD 1 artist</td>
</tr>
<tr>
  <td>CD 2 title</td>
  <td>CD 2 artist</td>
</tr>
```

Example XSL for the same document

```
<xsl:for-each select="catalog/cd">
   <p>
   <xsl:value-of select="title"/>
   is by
   <xsl:value-of select="artist"/>
   </p>
</xsl:for-each>
```

(note the supplied text [**is by**] at transformation stage)

Example Output

CD 1 title is by CD artist 1

CD 2 title is by CD artist 2

Displaying XML Documents Using an XSL Stylesheet

- Create an XHTML shell as an output document
- Literal result elements
- Use templates to put content within the shell

Putting it all Together

- The XML document references the stylesheet in exactly the same way as for CSS.

```
<?xml-stylesheet type="text/xsl"
   href="stylesheetfilename.xsl"?>
```

as the second line of the file after

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

Putting it all Together

- The stylesheet file is a well-formed XML document and begins with

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet xmlns:xsl = http://www.w3.org/1999/XSL/Transform
                                                    version="1.0">
```

It ends with

```
</xsl:stylesheet>
```

Some URLs for XSLT tutorials

Zvon XSLT Tutorial

http://www.zvon.org/xxl/XSLTutorial/Books/Book1/index.html

W3schools.com XSLT Tutorial

http://www.w3schools.com/xsl/default.asp