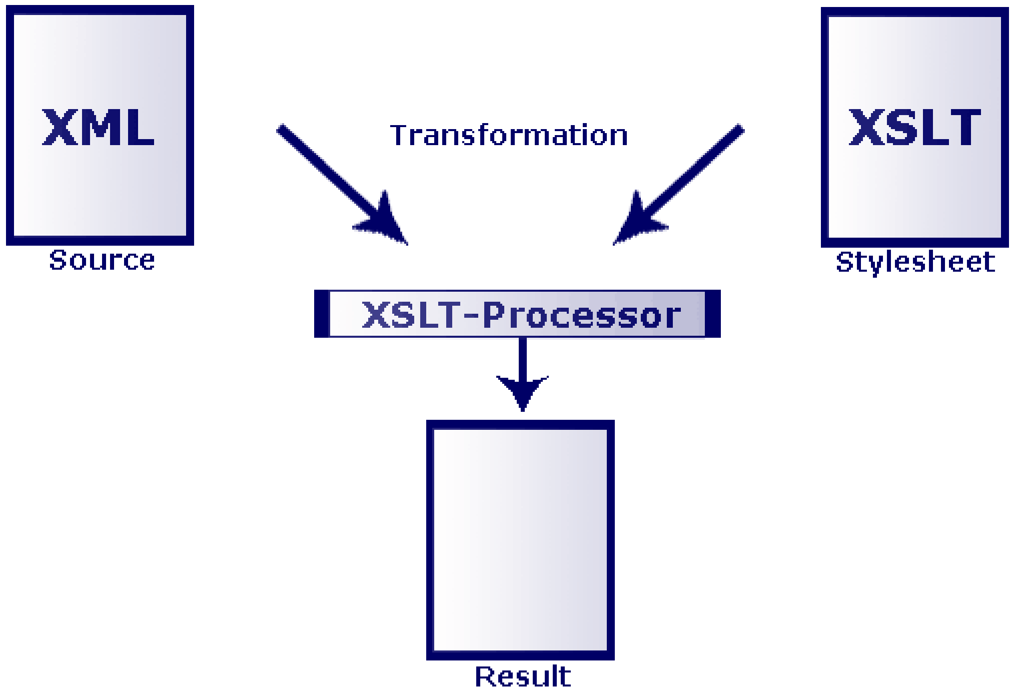
XSLT

- XSLT (Extendable Stylesheet Language Transformations) is a standardised, declarative transformation language to describe and control the transformation of XML documents into other formats, such as HTML, XHTML or text via an XSLT processor
- the XSLT processor converts a source XML document into a result document using an XSL stylesheet document (a sort of template) -> the XSL document is written in XML too

Transformation



XSLT Processors

- MS IE 6.0 or higher
  - includes one
- Oxygen XML editor and debugger for Eclipse
  - http://www.oxygenxml.com/
- Apache Cocoon (including Xalan XSLT processor)
  - http://cocoon.apache.org/
- PHP / Sablotron XSLT support
  - http://at.php.net/xslt
- Saxon XSLT / XQuery processor
  - http://saxon.sourceforge.net/

Resources

- XSLT reference
  - http://www.w3schools.com/xsl/xsl_w3celementref.asp
- specifications
  - http://www.w3.org/Style/XSL/
  - http://www.w3.org/TR/xslt20/
- literature
  - Bongers, F. (2004): XSLT 2.0 - Das umfassende Handbuch zu XSLT 2.0, XPath 2.0 und Saxon 7. Galileo Press.
  - Skulschus, M. / Wiederstein, M. (2005): XSLT und XPath für HTML, Text und XML. Mitp.

Flexibility

- the content of the XML document can be re-structured
- elements, attributes, processing directives, namespaces and comments can be accessed
- the data can be filtered or sorted
- variables and loops can be used
- CSS formatting is available when transforming to HTML / XHTML

- because of many functions XSL is a very complex language

Integrating XML and XSL

- remember the processing directive used for integrating CSS files into XML documents:
  - `<?xml-stylesheet type="text/css" href="`*`filename`*`"?>`
- for XSL files a similar processing directive is set within the XML file:
  - `<?xml-stylesheet type="text/xsl" href="`*`filename`*`"?>`
  - when declaring several XSL stylesheets only the first one is used
  - when declaring XSL and CSS stylesheets only the XSL stylesheet is used
- the components of an XML document are then represented in XSLT by a tree structure (similar to the DOM's node structure); the whole XML document has its equivalent in the XSLT root node

XPath

- for navigation within the tree and accessing the included informations XPath (XML Path Language) is used
- XPath is a path description language for XML documents and a derived subset of XQuery
  - http://www.w3.org/TR/xpath
  - http://www.w3.org/TR/xquery
- XSLT 1.0 only works with XPath 1.0; XSLT 2.0 only works with XPath 2.0
- XPath is mainly used within XSLT

XSL Stylesheet Structure (I)

- file structure

  -
    ```
    <?xml version="1.0"?>
    <!- comments -->
    <xsl:stylesheet version="1.0"
    xmlns:xsl="http://www.w3.org/1999/xsl/transform">

    <xsl:template match="/">
     … content …
    </xsl:template>

    </xsl:stylesheet>
    ```
    `<xsl:template match="/">` (corresponds to the XSLT root node)

XSL Stylesheet Structure (II)

- content structure (transforming to HTML / XHTML)

  -
    ```
    <html>
     <head>
     …
     </head>
     <body>
      <span optional_CSS_instructions>optional_content
       <xsl:value-of select="element_name"/>
      </span>
      …
     </body>
    </html>
    ```

Example – XML Document

- XML document
  -
```
<library>
 <book>
  <author>Mark Twain</author>
  <title>Huckleberry Finn</title>
  <pages>334</pages>
 </book>
 …
</library>
```

Example – XSL Stylesheet

- XSL document

  -
    ```
    <span style="font-style:italic">Author:
     <xsl:value-of select="library/book/author"/>
    </span><br />
    <span>Title:
     <xsl:value-of select="library/book/title"/>
    </span>
    ```
- the element path must start with the template match node (unless the XSLT processor already moved to another node (the so-called context node) while processing the stylesheet)

Loops (I)

- to show all elements of a data set

  -
    ```
    <xsl:for-each select="library/book">
     <span>Author: <xsl:value-of select="author"/>
     </span><br />
     <span>Title: <xsl:value-of select="title"/>
     </span><br />
     <span>Pages: <xsl:value-of select="pages"/>
     </span>
    </xsl:for-each>
    ```
- now the actual node (context node) is `library/book`, selected in the `xsl:for-each`–statement, therefore only the path from that node onwards has to be specified

Loops (II)

- loops can also be created by defining more than one template in a stylesheet

  -
    ```
    <xsl:template match="/">
     <body>
      <xsl:apply-templates select="library/book"/>
     </body>
    </xsl:template>
    <xsl:template match="book">
     <span>Author: <xsl:value-of select="author"/>
     </span><br />
     <span>Title: <xsl:value-of select="title"/>
     </span>
    </xsl:template>
    ```

Select- & Match-Terms (I)

Path	Meaning	Example
`name`	the element with the specified name	`book`
`/` (within a path)	separates the levels of a path	`book/title`
`/` (at the beginning of a path)	the XSLT root node	`/library`

Select- & Match-Terms (II)

Path	**Meaning**	**Example**
`//`	recursion; the following term means all subordinated elements on any level	`library//author` (means all authors in the library)
`.` (`select` only)	the actual context node	`<xsl:value-of select="."/>` (returns the context node)
`..` (`select` only)	the superordinated node to a context node	`../author` (each `author`-element on the same level as the context node)

Select- & Match-Terms (III)

Path	Meaning	Example
`*`	each element	`book/*` (each element subordinated to `book`)
`@name`	the attribute with the specified name	`book/@available` (each attribute with the specified name belonging to a `book` element)
`|`	combines more than one path in a path	`* | @*` (all element and attribute nodes)

Functions

- a function is an XSLT module that performs a task and then returns a value
  - `<xsl:value-of select="sum(library/books/pages)"/>`
- if at least one of the corresponding nodes returns a value not being a number the function returns "NaN" meaning "not a number"
- for a list of all available functions see:
  - http://www.w3.org/TR/xquery-operators/

Filtering (I)

- a filter defines a condition to narrow down the number of selected nodes

  -
    ```
    <xsl:for-each select="library/book[author='Mark Twain']">
     <span>Title: <xsl:value-of select="title"/>
     </span>
    </xsl:for-each>
    ```
- What about this one?

  -
    ```
    <xsl:apply-templates select="library/book[author='Mark Twain']"/>
    …
    <xsl:template match="book">
     <span>Title: <xsl:value-of select="title"/>
     </span>
    </xsl:template>
    ```

Filtering (II)

- And what about this one?

```
– <xsl:apply-templates select="library/book"/>

  …

  <xsl:template match="book[author='Mark Twain']">

   <span>Title: <xsl:value-of select="title"/>

   </span>

  </xsl:template>
```

Operators To Compare

Operator	Meaning
=	is
!=	is not
&lt;	smaller than
&lt;=	smaller than or same as
>	bigger than
>=	bigger than or same as

- remember: &lt; and &lt;= must be used as < is not a valid character within an attribute's value (see p.17)

Special Filterings

- if there is more than one subordinated element with the same name
  - `<xsl:for-each select="catalog/trousers[colour[2]='blue']">`
- if all subordinated elements of a specific element are to be selected
  - `<xsl:for-each select="library/book[5]/*">`
- a set of subelements may only be selected if it includes a certain subelement
  - `<xsl:for-each select="library/book[pages]">`

Sorting

- controls the order of the nodes

  -
    ```
    <xsl:for-each select="library/book">
     <xsl:sort select="author" data-type="text" order="ascending"/>
     <xsl:sort select="title" data-type="text" order="ascending"/>
     <span>Author (alphabetically): <xsl:value-of select="author"/>
     </span>
     <span>Title: <xsl:value-of select="title"/>
     </span>
    </xsl:for-each>
    ```
- values for `data-type`: `text` and `number`
- values for `order`: `ascending` and `descending`

Accessing Attributes

- displaying a specific attribute of an element
  - `<xsl:value-of select="element/@attribute_name"/>`
- displaying all attributes of an element
  - `<xsl:value-of select="element/@*"/>`
- filtering using an attribute (without its value)
  - `<xsl:for-each select="element[@attribute_name]">`
- filtering using an attribute (with its value)
  - `<xsl:for-each select="element[@attribute_name='value']">`

Conditions (I)

- if-condition

  -
    ```
    <xsl:for-each select="library/book">
     <span>
      <xsl:value-of select="title"/>
      <xsl:if test="@available='no'">Not available!</xsl:if>
     </span>
     <br />
    </xsl:for-each>
    ```

Conditions (II)

- choose-condition

  -
    ```
    <xsl:for-each select="library/book">
     <span>
      <xsl:choose>
       <xsl:when test="pages &lt;=300">*</xsl:when>
       <xsl:when test="pages &lt;=500">**</xsl:when>
       <xsl:otherwise>***</xsl:otherwise>
      </xsl:choose>
      <xsl:value-of select="title"/>
     </span>
     <br />
    </xsl:for-each>
    ```