XPath

Useful links:

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

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/xmlsdk/html/1431789e-c545-4765-8c09-3057e07d3041.asp

http://www.mulberrytech.com/quickref/XSLTquickref.pdf

XPath

- XPath is a syntax for defining parts of an XML document
- XPath uses path expressions to navigate in XML documents
- XPath contains a library of standard functions
- XPath is a major element in XSLT
- XPath is a W3C Standard

Terminology

- Element
- Attribute
- text,
- namespace,
- processing-instruction,
- comment,
- document (root) nodes

Terminology

```
<library>
  <book>

    <chapter>
    </chapter>

    <chapter>
      <section>
        <paragraph/>
        <paragraph/>
      </section>
    </chapter>

  </book>
</library>
```

- library is the parent of book; book is the parent of the two chapters
- The two chapters are the children of book, and the section is the child of the second chapter
- The two chapters of the book are siblings (they have the same parent)
- library, book, and the second chapter are the ancestors of the section
- The two chapters, the section, and the two paragraphs are the descendents of the book

expressions

The most useful path expressions:

- nodename Selects all child nodes of the named node
- / Selects from the root node
- // Selects nodes in the document from the current node that match the selection no matter where they are
- . Selects the current node
- .. Selects the parent of the current node
- @ Selects attributes

Wildcards

Path wildcards can be used to select unknown XML elements.

*	Matches any element node
@*	Matches any attribute node
node()	Matches any node of any kind

Slashes

- A path that begins with a / represents an absolute path, starting from the top of the document
  - Example: /email/message/header/from
  - Note that even an absolute path can select *more than one* element
  - A slash by itself means “the whole document”
- A path that does *not* begin with a / represents a path starting from the current element
  - Example: header/from
- A path that begins with // can start from *anywhere* in the document
  - Example: //header/from selects every element from that is a child of an element header
  - This can be expensive, since it involves searching the entire document

Brackets and last()

- A number in brackets selects a particular matching child (counting starts from 1, except in Internet Explorer)
  - Example: /library/book[1] selects the first book of the library
  - Example: //chapter/section[2] selects the second section of every chapter in the XML document
  - Example: //book/chapter[1]/section[2]
  - Only *matching* elements are counted; for example, if a book has both sections and exercises, the latter are ignored when counting sections
- The function last() in brackets selects the last matching child
  - Example: /library/book/chapter[last()]
- You can even do simple arithmetic
  - Example: /library/book/chapter[last()-1]

Stars

- A star, or asterisk, is a "wild card"—it means "all the elements at this level"
  - Example: /library/book/chapter/* selects every child of every chapter of every book in the library
  - Example: //book/* selects every child of every book (chapters, tableOfContents, index, etc.)
  - Example: /*/*/*/paragraph selects every paragraph that has exactly three ancestors
  - Example: //* selects every element in the entire document

Attributes I

- You can select attributes by themselves, or elements that have certain attributes
  - Remember: an attribute consists of a name-value pair, for example in <chapter num="5">, the attribute is named num
  - To choose the attribute itself, prefix the name with @
  - Example: @num will choose every *attribute* named num
  - Example: //@* will choose *every attribute, everywhere* in the document
- To choose *elements* that have a given attribute, put the attribute name in square brackets
  - Example: //chapter[@num] will select every chapter element (anywhere in the document) that has an attribute named num

Attributes II

- //chapter[@num] selects every chapter element with an attribute num

- //chapter[not(@num)] selects every chapter element that does *not* have a num attribute

- //chapter[@*] selects every chapter element that has *any* attribute

- //chapter[not(@*)] selects every chapter element with *no* attributes

Values of attributes

- //chapter[@num='3'] selects every chapter element with an attribute num with value 3
- //chapter[not(@num)] selects every chapter element that does *not* have a num attribute
- //chapter[@*] selects every chapter element that has *any* attribute
- //chapter[not(@*)] selects every chapter element with *no* attributes
- The normalize-space() function can be used to remove leading and trailing spaces from a value before comparison
  - Example: //chapter[normalize-space(@num)="3"]

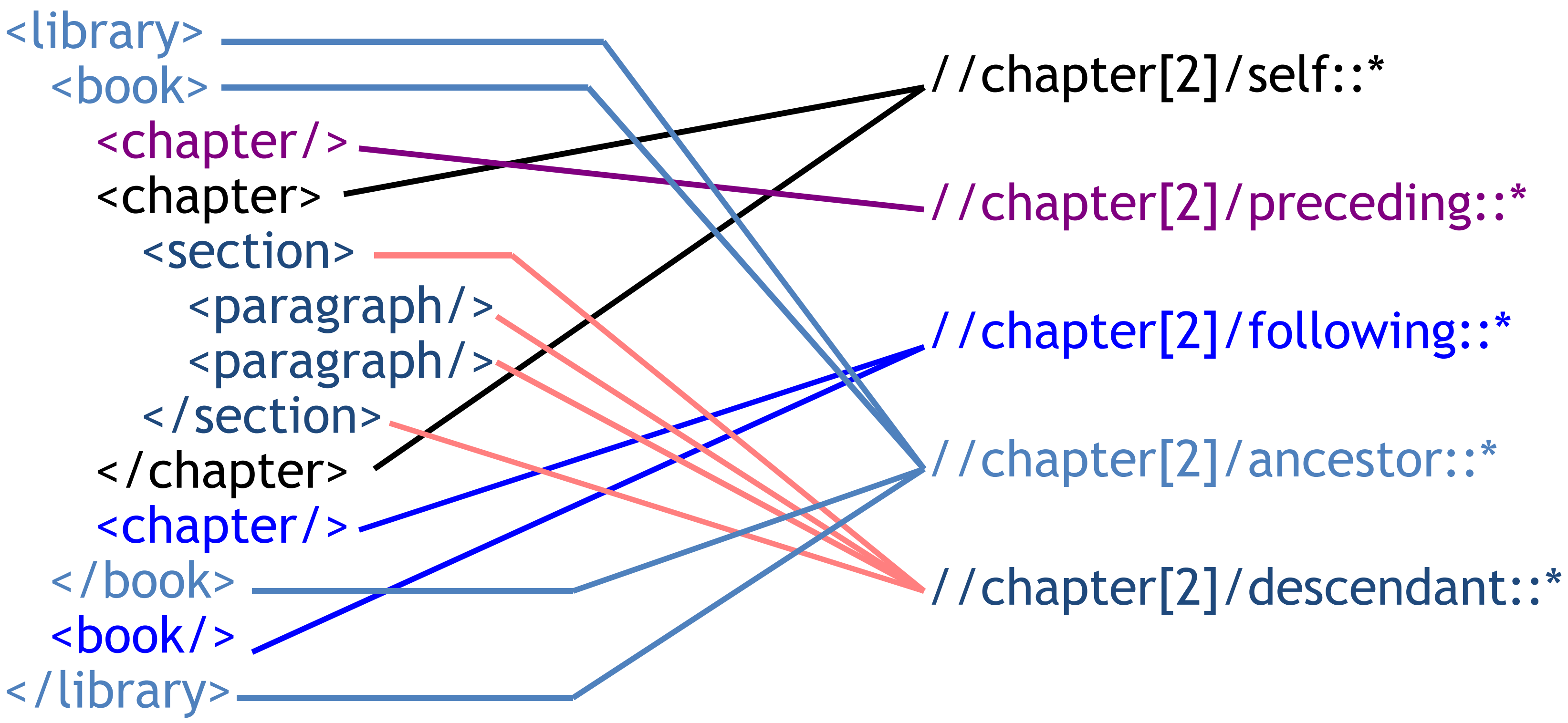
Axes

- An axis (plural axes) is a set of nodes relative to a given node; X::Y means “choose Y from the X axis”
  - self:: is the set of current nodes (not too useful)
    - self::node() is the current node
  - child:: is the default, so /child::X is the same as /X
  - parent:: is the parent of the current node
  - ancestor:: is all ancestors of the current node, up to and including the root
  - descendant:: is all descendants of the current node

    (Note: never contains attribute or namespace nodes)
  - preceding:: is everything before the current node in the entire XML document
  - following:: is everything after the current node in the entire XML document

Axes (outline view)

Starting from a given node, the self, preceding, following, ancestor, and descendant axes form a partition of all the nodes (if we ignore attribute and namespace nodes)

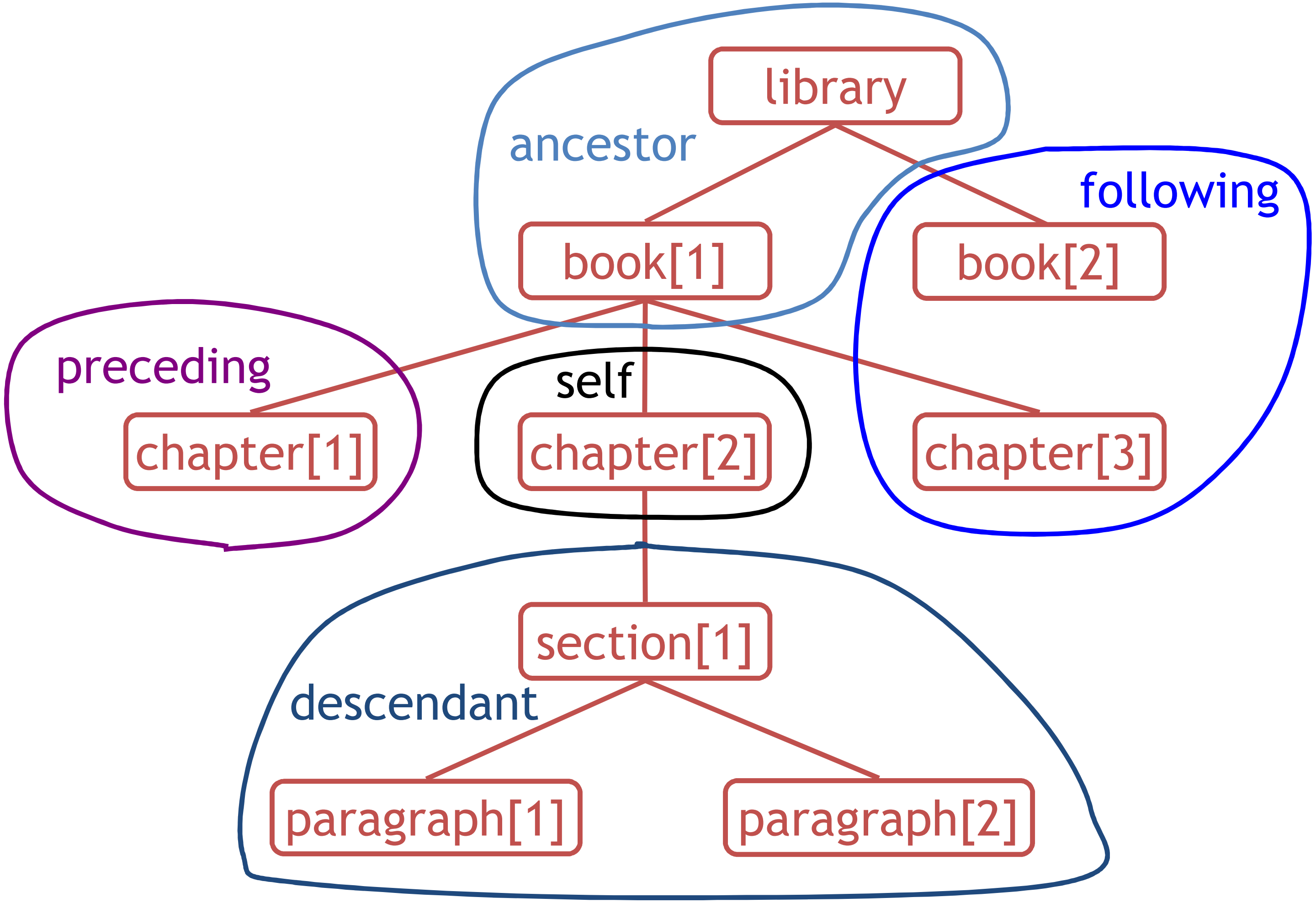


```
<library>
  <book>
    <chapter/>
    <chapter>
      <section>
        <paragraph/>
        <paragraph/>
      </section>
    </chapter>
    <chapter/>
  </book>
  <book/>
</library>
```

//chapter[2]/self::*
//chapter[2]/preceding::*
//chapter[2]/following::*
//chapter[2]/ancestor::*
//chapter[2]/descendant::*

Axes (tree view)

- Starting from a given node, the self, ancestor, descendant , preceding, and following axes form a *partition* of all the nodes (if we ignore attribute and namespace nodes)



Axis examples

- //book/descendant::* is all descendants of every book
- //book/descendant::section is all section descendants of every book
- //parent::* is every element that is a parent, i.e., is not a leaf
- //section/parent::* is every parent of a section element
- //parent::chapter is every chapter that is a parent, i.e., has children
- /library/book[3]/following::* is everything after the third book in the library

More axes

- ancestor-or-self:: ancestors plus the current node
- descendant-or-self:: descendants plus the current node
- attribute:: is all attributes of the current node
- namespace:: is all namespace nodes of the current node
- preceding:: is everything before the current node in the entire XML document
- following-sibling:: is all siblings after the current node

- Note: preceding-sibling:: and following-sibling:: do not apply to attribute nodes or namespace nodes

Abbreviations for axes

(none)	is the same as	child::
@	is the same as	attribute::
.	is the same as	self::node()
.//X	is the same as	self::node()/descendant-or-self::node()/child::X
..	is the same as	parent::node()
../X	is the same as	parent::node()/child::X
//	is the same as	/descendant-or-self::node()/
//X	is the same as	/descendant-or-self::node()/child::X

Arithmetic expressions

+	add
-	subtract
*	multiply
div	(not /) divide
mod	modulo (remainder)

Equality tests

- = means "equal to" (Notice it's *not* ==)
- != means "not equal to"
- But it's not that simple!
  - *value = node-set* will be true if the *node-set contains any node* with a value that matches *value*
  - *value != node-set* will be true if the *node-set contains any node* with a value that does *not* match *value*
- Hence,
  - *value = node-set* and *value != node-set* may both be true at the same time!

Other boolean operators

- and (infix operator)
- or (infix operator)
  - Example: count = 0 or count = 1
- not() (function)

- The following are used for *numerical* comparisons only:
- < “less than” Some places may require &lt;
- <= “less than
  or equal to” Some places may require &lt;=
- > “greater than” Some places may require &gt;
- >= “greater than Some places may require
  &gt;=
  or equal to”

Some XPath functions

- XPath contains a number of functions on node sets, numbers, and strings; here are a few of them:
  - count(*elem*) counts the number of selected elements
    - Example: //chapter[count(section)=1] selects chapters with exactly two section children
  - name() returns the name of the element
    - Example: //*[name()='section'] is the same as //section
  - starts-with(*arg1*, *arg2*) tests if *arg1* starts with *arg2*
    - Example: //*[starts-with(name(), 'sec']
  - contains(*arg1*, *arg2*) tests if *arg1* contains *arg2*
    - Example: //*[contains(name(), 'ect']

Thank You