Computer Science E-259

XML with Java

Lecture 4: XPath 1.0 (and 2.0) and XSLT 1.0 (and 2.0)

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Computer Science E-259

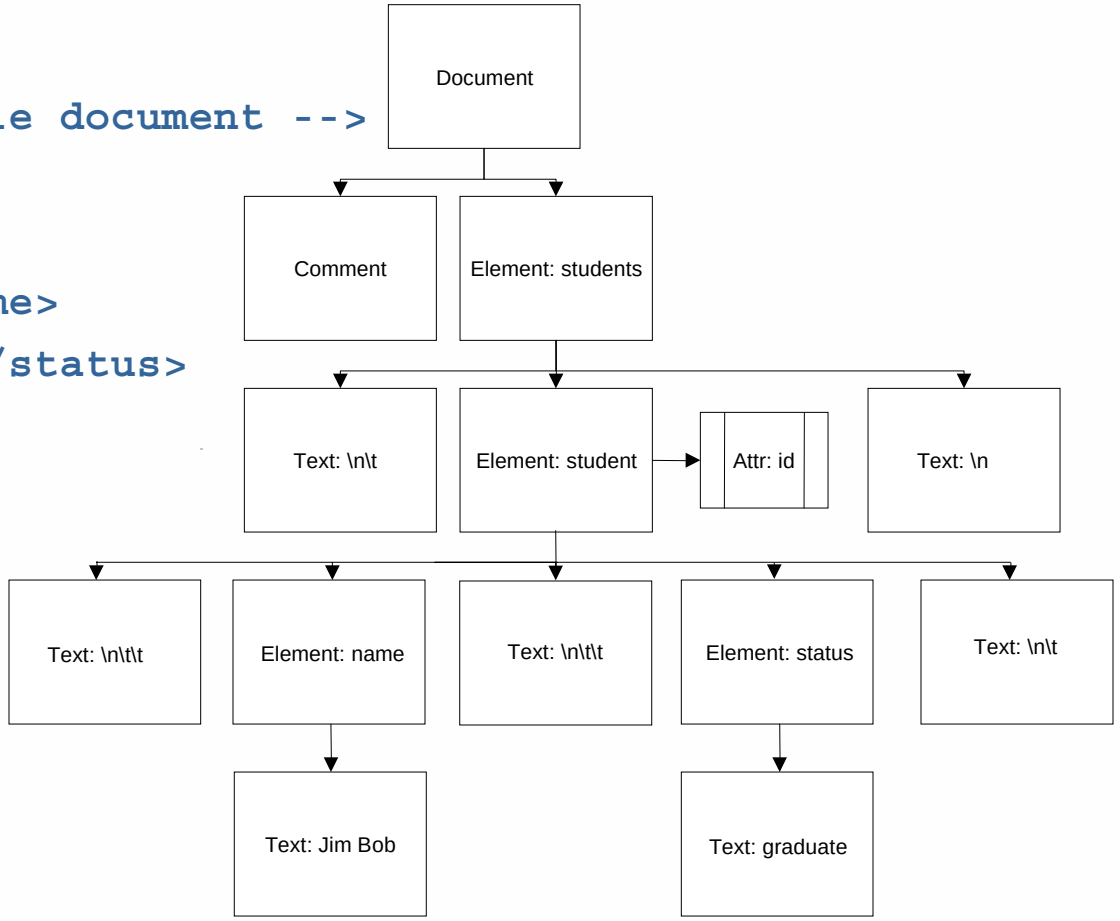
Last Time

- DOM Level 3
- JAXP 1.3 and Xerces 2.7.1
- My First XML Parser

Last Time

DOM Level 3

```
<!-- This is an example document -->
<students>
  <student id="0001">
    <name>Jim Bob</name>
    <status>graduate</status>
  </student>
</students>
```



Last Time

JAXP 1.3 and Xerces 2.7.1

```
javax.xml.parsers.DocumentBuilderFactory
javax.xml.parsers.DocumentBuilder
org.w3c.dom.*
...
```

Last Time

My First XML Parser

`cscie259.project1.mf.*`

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This Time

- CSS Level 2
- XPath 1.0 (and 2.0)
- XSLT 1.0 (and 2.0)
- TrAX
- Project 2

CSS Level 2

By Example

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

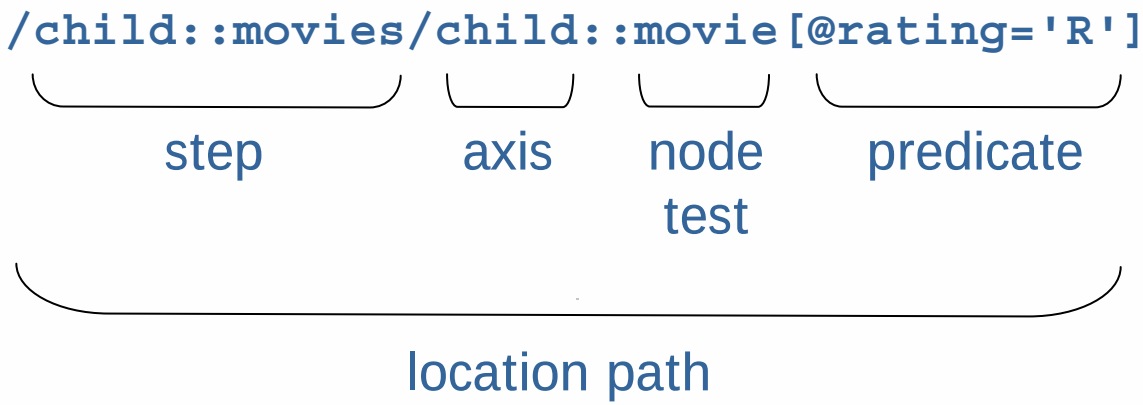
XPath 1.0 (and 2.0)

History

- XML Path Language (XPath) Version 1.0 is a Recommendation since 11/99
- XML Path Language (XPath) Version 2.0 is a Recommendation since 1/07

XPath 1.0 (and 2.0)

Location Paths



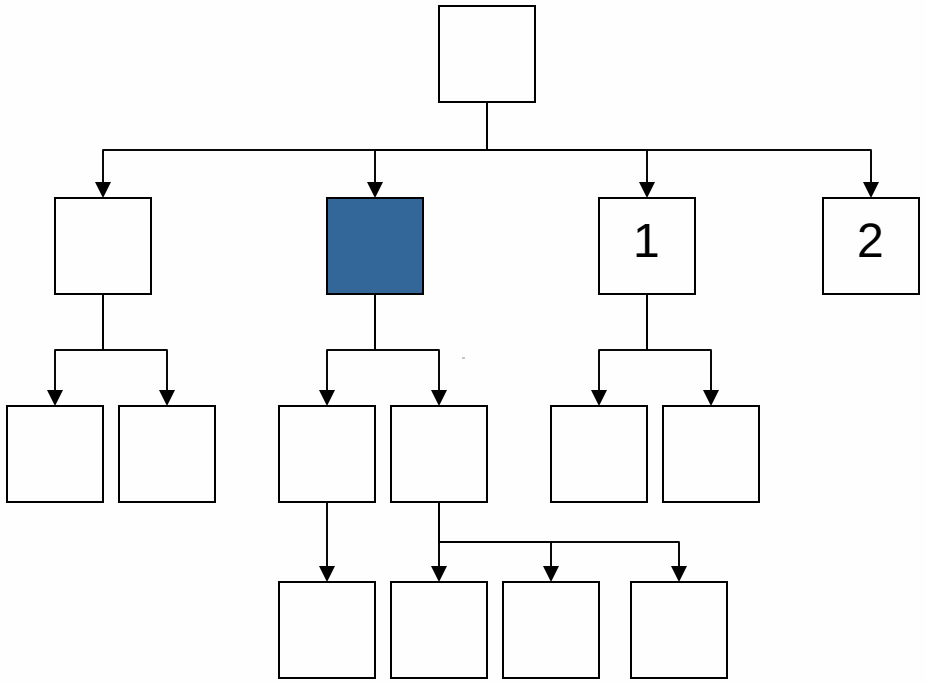
XPath 1.0 (and 2.0)

Axes

- ancestor, ancestor-or-self
- attribute
- child
- descendant, descendant-or-self
- following, following-sibling
- namespace
- parent
- preceding, preceding-sibling
- self

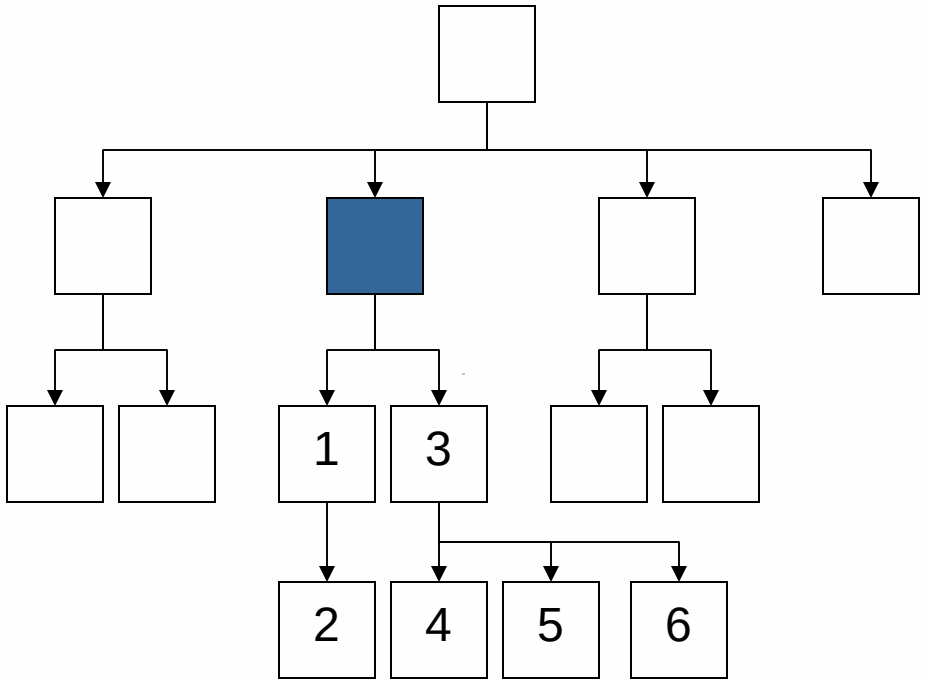
XPath 1.0 (and 2.0)

following-sibling



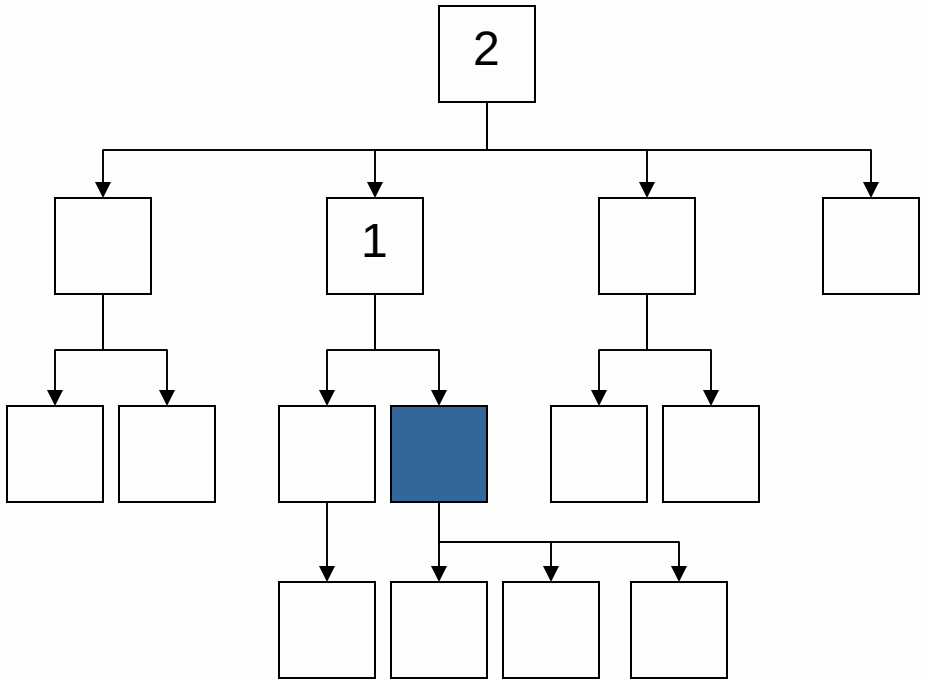
XPath 1.0 (and 2.0)

descendant



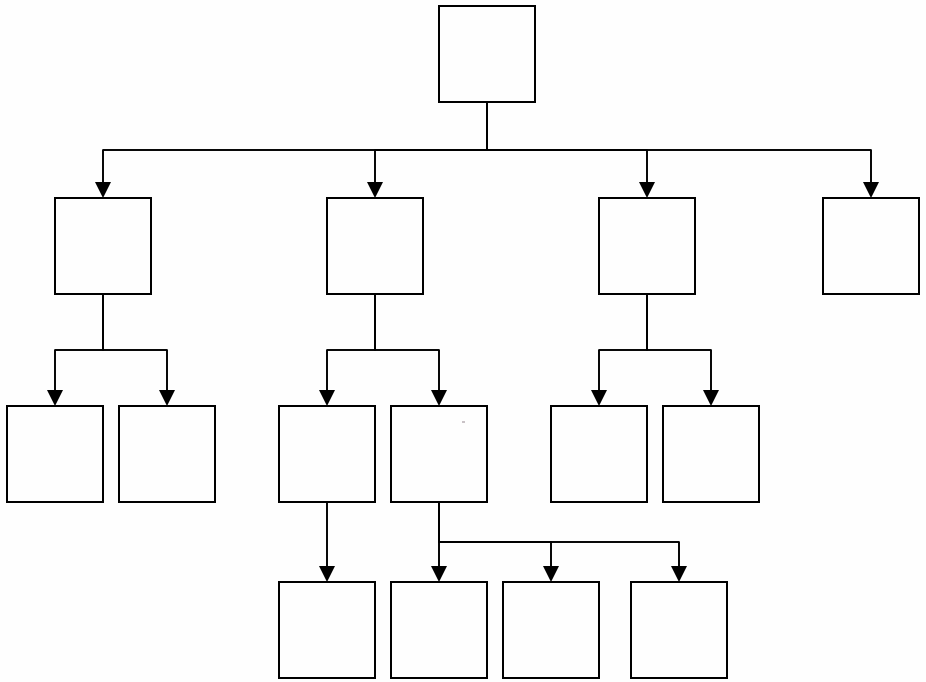
XPath 1.0 (and 2.0)

ancestor



XPath 1.0 (and 2.0)

. . .



XPath 1.0 (and 2.0)

Node Tests

- `foo`
- `foo:bar`
- `foo:*`
- `*`
- `node()`
- `comment()`
- `text()`
- `processing-instruction()`

XPath 1.0 (and 2.0)

Abbreviated Synatx

- `child::` ≡ `''`
- `attribute::` ≡ `@`
- `/descendant-or-self::node()/` ≡ `//`
- `self::node()` ≡ `.`
- `parent::node()` ≡ `..`

XPath 1.0 (and 2.0)

Data Types

- boolean
- number
- string
- node-set
- external object

XPath 1.0 (and 2.0)

boolean

- `true(), false()`
- `=, !=, <, >, <=, >=`
- `and, or`
- `not()`

XPath 1.0 (and 2.0)

number

- =, !=, <, >, <=, >=
- +, -, *, div, mod, -
- floor(), ceiling()
- ...

XPath 1.0 (and 2.0)

string

- `"foo", 'foo'`
- `concat(), contains(), starts-with(), string-length(), substring(), substring-after(), substring-before(), translate()`
- `...`

XPath 1.0 (and 2.0)

node set

- `count(), current(), last(), name(), position(), sum()`
- `|`
- `...`

XPath 1.0 (and 2.0)

Converting Types

- Explicit Conversion
  - `boolean(), string(), number()`
- Implicit Conversion
  - `false » 0, true » 1`
  - `false » 'false', true » 'true'`
  - `0 » false, other » true`
  - `'' » false, other » true`
  - `empty » false, other » true`
  - `...`

XSLT 1.0 (and 2.0)

Motivation

- XML provides a syntax for structured data formats
- No one format is likely to enable all possible uses for data
- Transforming XML can be useful in two different scenarios
  - Data conversion: transforming one format to another
    - Multiple data formats for B2B purchase orders
    - Different description formats for family trees
  - Publishing: transforming data to a human viewable form
    - Displaying XML data on the Web as HTML
    - Displaying XML data in print using PDF

XSLT 1.0 (and 2.0)

History

- XSL Transformations (XSLT) Version 1.0 is a Recommendation since 11/99 (first draft dates back to 8/98)
- XSL Transformations (XSLT) Version 2.0 is a Recommendation since 1/07

XSLT 1.0 (and 2.0)

XHTML 1.0

```
<?xml version="1.0" encoding="iso-8859-1"?>

<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
    <xsl:param name="foo"/>
    <xsl:output doctype-public="-//W3C//DTD XHTML 1.0 Transitional//EN"
    doctype-system="http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd"
    encoding="iso-8859-1" indent="yes" method="xml"/>
   <xsl:template match="/">
        <html>
            <head>
                <title>My First XSLT-Generated Webpage</title>
            </head>
            <body/>
         </html>
   </xsl:template>
</xsl:stylesheet>
```

XSLT 1.0 (and 2.0)

Nodes

- root node
- element nodes
- attribute nodes
- text nodes
- comment nodes
- PI nodes
- …

XSLT 1.0 (and 2.0)

Elements

- `xsl:stylesheet`
- `xsl:apply-templates, xsl:call-template, xsl:template, xsl:with-param`
- `xsl:for-each`
- `xsl:value-of`
- `...`

XSLT 1.0 (and 2.0)

Matching Templates

```
<xsl:template match="/">
   ...
</xsl:template>

<xsl:template match="foo">
   ...
</xsl:template>
```

XSLT 1.0 (and 2.0)

Named Templates

```
<xsl:template name="foo">
   <xsl:param name="bar" select="'baz'"/>
   ...
</xsl:template>

<xsl:call-template name="foo">
   <xsl:with-param name="bar" select="'not bar'"/>
   ...
</xsl:template>
```

XSLT 1.0 (and 2.0)

Applying Templates

```
<xsl:apply-templates select="..."/>
```

XSLT 1.0 (and 2.0)

Built-In Templates

```
<xsl:template match="*|/">
   <xsl:apply-templates/>
</xsl:template>

<xsl:template match="text()|@*">
   <xsl:value-of select="."/>
</xsl:template>

<xsl:template match="comment()|processing-instruction()"/>
```

XSLT 1.0 (and 2.0)

Values of Nodes

```
<xsl:value-of select="..."/>
```

XSLT 1.0 (and 2.0)

Recursive Descent Processing

- Start from the root node
- Find a matching template
- Instantiate the body of the template
  - Send literal result elements (*i.e.*, non-XSLT elements) to standard output
  - Interpret XSLT elements as instructions
- In other words, `<xsl:apply-templates/>` selects nodes to which the processor recursively applies the same algorithm: match templates and instantiate their bodies

XSLT 1.0 (and 2.0)

Processors

- Xalan-J 2.7.0
  - `java org.apache.xalan.xslt.Process -IN foo.xml -XSL foo.xsl`
- Microsoft Core XML Services (MSXML) 6.0
- SAXON 8.9
- Stylus Studio 2007 XML Enterprise Suite
- XMLSpy 2007 Enterprise Edition
- …

XSLT 1.0 (and 2.0)

Versus CSS Level 2

Why two stylesheet languages?

TrAX

APIs

```
javax.xml.transform.*
javax.xml.transform.stream.*
javax.xml.transform.dom.*
javax.xml.transform.sax.*
```

Project 2

Overview

- It's B2B Time!
- My Blockbuster
- XTube

Next Time

XPath 1.0 (and 2.0) and XSLT 1.0 (and 2.0), Continued

- XPath 1.0 (and 2.0), Continued
- XSLT 1.0 (and 2.0), Continued

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