互联网应用开发技术

Web Application Development

第2课
WEB前端-XML

Episode Two

XML

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Overview

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  - Introducing XML
  - Parsing an XML Documents
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  - Locating Information with Xpath
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  - XSL Transformations
- XML DBMS
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Introducing XML

- "The Extensible Markup Language (XML) has replaced Java, Design Patterns, and Object Technology as the software industry's solution to world hunger."
  - Half-jokingly stated in the preface of the book Essential XML by Don Box et al. (Addison-Wesley Professional 2000)

Introducing XML

- A property file contains a set of name/value pairs, such as
  fontname=Times Roman
  fontsize=12
  windowsize=400 200
  color=0 50 100

- Consider the fontname/fontsize entries in the example. It would be more object oriented to have a single entry:
  font=Times Roman 12
  But then parsing the font description gets ugly

- Property files have a single flat hierarchy
  title.fontname=Helvetica
  title.fontsize=36
  body.fontname=Times Roman
  body.fontsize=12

Introducing XML

- Another shortcoming of the property file format is caused by the requirement that keys be unique.

  menu.item.1=Times Roman

  menu.item.2=Helvetica

  menu.item.3=Goudy Old Style

- The XML format solves these problems
  - because it can express hierarchical structures
  - and thus is more flexible than the flat table structure of a property file.

Introducing XML


```
<configuration>
  <title>
    <font>
      <name>Helvetica</name>
      <size>36</size>
    </font>
  </title>
  <body>
    <font>
      <name>Times Roman</name>
      <size>12</size>
    </font>
  </body>
  <window>
    <width>400</width>
    <height>200</height>
  </window>
  <color>
    <red>0</red>
    <green>50</green>
    <blue>100</blue>
  </color>
  <menu>
    <item>Times Roman</item>
    <item>Helvetica</item>
    <item>Goudy Old Style</item>
  </menu>
</configuration>
```

Introducing XML

- Even though XML and HTML have common roots, there are important differences between the two.
  - Unlike HTML, XML is case sensitive.
    - For example, <H1> and <h1> are different XML tags
  - In XML, you can never omit an end tag. In HTML, you can omit end tags if it is clear from the context where a paragraph or list item ends.
    - such as </p> or tags
  - In XML, elements that have a single tag without a matching end tag must end in a /, as in .
    - That way, the parser knows not to look for a </img> tag

Introducing XML

- Even though XML and HTML have common roots, there are important differences between the two.
  - In XML, attribute values must be enclosed in quotation marks. In HTML, quotation marks are optional.
    - For example,<applet code="MyApplet.class" width=300 height=300> is legal HTML but not legal XML.
    - In XML, you have to use quotation marks: width="300"
  - In HTML, you can have attribute names without values, such as
    - <input type="radio" name="language" value="Java" checked>
  - In XML, all attributes must have values, such as
    - checked="true" or checked="checked"

The Structure of an XML Document

- An XML document should start with a header such as

  <?xml version =“1.0”?>

  or

  <?xml version =“1.0” encoding=“UTF-8”?>

  Strictly speaking, a header is optional, but it is highly recommended.

- The header can be followed by a document type definition (DTD), such as

  <!DOCTYPE web-app PUBLIC

  “-//Sun Microsystems, Inc.//DTD Web Application 2.2//EN"

  "http://java.sun.com/j2ee/dtds/web-app_2_2.dtd">

- DTDs are an important mechanism to ensure the correctness of a document, but they are not required.

The Structure of an XML Document

- Finally, the body of the XML document contains the root element, which can contain other elements.
- For example

```
<?xml version="1.0"?>
<!DOCTYPE configuration . . .>
<configuration>
   <title>
      <font>
         <name>Helvetica</name>
         <size>36</size>
      </font>
   </title>
   . . .
</configuration>
```

- An element can contain child elements, text, or both.

The Structure of an XML Document

- XML elements can contain attributes, such as

```
<size unit="pt">36</size>
```

- There is some disagreement among XML designers about when to use elements and when to use attributes.
- For example, it would seem easier to describe a font as

```
<font name="Helvetica" size="36"/>
```

than

```
<font>
  <name>Helvetica</name>
  <size>36</size>
</font>
```

The Structure of an XML Document

- However, attributes are much less flexible.

- Suppose you want to add units to the size value. If you use attributes, then you must add the unit to the attribute value:

```
<font name="Helvetica" size="36 pt"/>
```

- Adding an attribute to the size element is much cleaner:

```
<font>
   <name>Helvetica</name>
   <size unit="pt">36</size>
</font>
```

The Structure of an XML Document

- Elements and text are the "bread and butter" of XML documents.

- Here are a few other markup instructions that you might encounter:
  - Character references have the form &#decimalValue; or &#xhexValue;.
    - For example, the character é can be denoted with either of the following:
    - é or Ù
  - Entity references have the form &name;. The entity references
    - <, >, &, " and '
    - have predefined meanings: the less than, greater than, ampersand, quotation mark, and apostrophe characters.
  - CDATA sections are delimited by <![CDATA[and]]>. They are a special form of character data.
    - <![CDATA[< & > are my favorite delimiters]]>

The Structure of an XML Document

- Here are a few other markup instructions that you might encounter:
  - Processing instructions are instructions for applications that process XML documents. They are delimited by <? and ?>, for example,

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

    Every XML document starts with a processing instruction

    <?xml version="1.0"?>

  - Comments are delimited by <!-- and -->, for example,

    <!-- This is a comment. -->

    Comments should not contain the string --.

Parsing an XML Document

- A parser is a program that
  - reads a file,
  - confirms that the file has the correct format,
  - breaks it up into the constituent elements,
  - and lets a programmer access those elements.

- The Java library supplies two kinds of XML parsers:
  - Tree parsers such as the Document Object Model (DOM) parser that read an XML document into a tree structure.
  - Streaming parsers such as the Simple API for XML (SAX) parser that generate events as they read an XML document.

Parsing an XML Document - DOM

- To read an XML document, you need a DocumentBuilder object, which you get from a DocumentBuilderFactory, like this:

```
DocumentBuilderFactory factory =
        DocumentBuilderFactory.newInstance();
DocumentBuilder builder = factory.newDocumentBuilder();
```

- You can now read a document from a file:

```
File f = . . .
Document doc = builder.parse(f);
```

- Alternatively, you can use a URL:

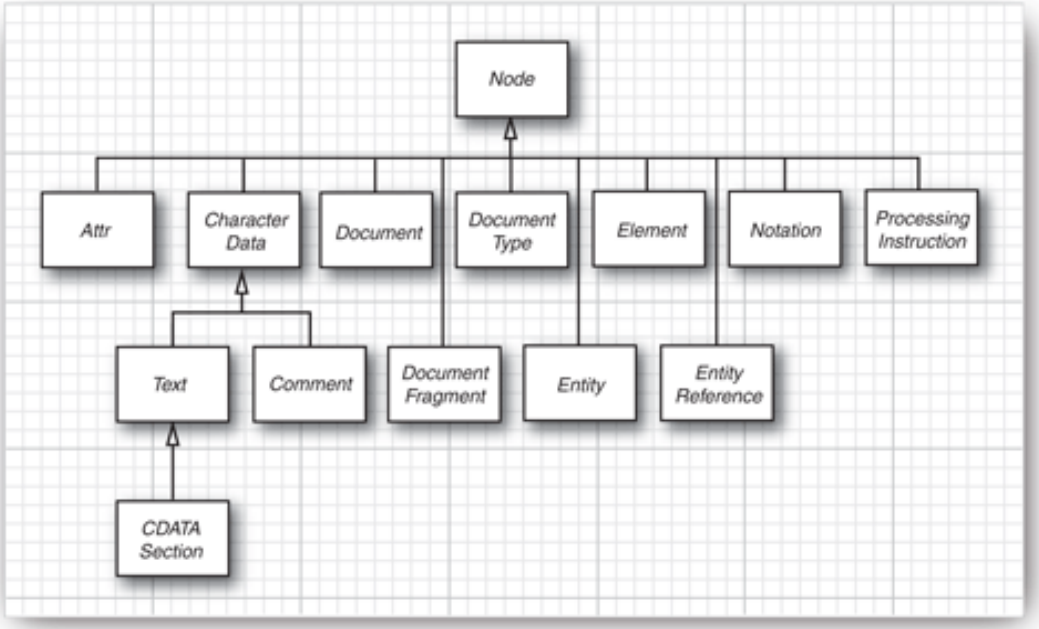
```
URL u = . . .
Document doc = builder.parse(u);
```

- You can even specify an arbitrary input stream:

```
InputStream in = . . .
Document doc = builder.parse(in);
```

Parsing an XML Document - DOM

- The Document object is an in-memory representation of the tree structure of the XML document.



Parsing an XML Document - DOM

- You start analyzing the contents of a document by calling the getDocumentElement method. It returns the root element.

```
Element root = doc.getDocumentElement();
```

- For example, if you are processing a document

```
<?xml version="1.0"?>
<font>
  . . .
</font>
```

then calling getDocumentElement returns the font element.

- The getTagName method returns the tag name of an element.
  - In the preceding example, root.getTagName() returns the string "font".

Parsing an XML Document - DOM

- To get the element's children, use the getChildNodes method.
  - That method returns a collection of type NodeList.
  - The item method gets the item with a given index,
  - and the getLength method gives the total count of the items.

- Therefore, you can enumerate all children like this:

```
NodeList children = root.getChildNodes();
for (int i = 0; i < children.getLength(); i++)
{
  Node child = children.item(i);
  . . .
}
```

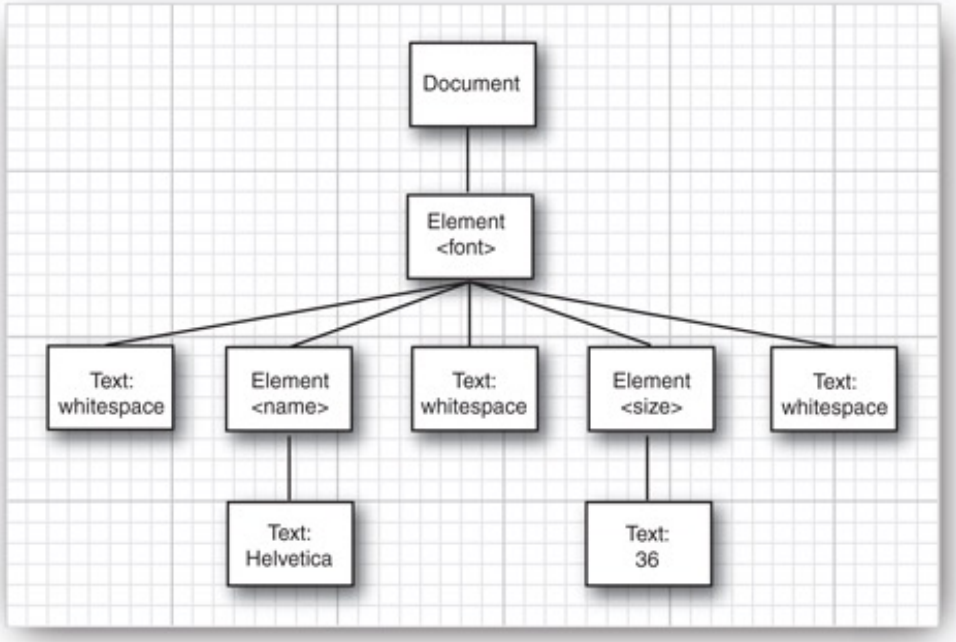
Parsing an XML Document - DOM

- Be careful when analyzing the children.
- Suppose, for example, that you are processing the document

```
<font>
  <name>Helvetica</name>
  <size>36</size>
</font>
```

- You would expect the font element to have two children, but the parser reports five:
  - The whitespace between and <name>
  - The name element
  - The whitespace between </name> and <size>
  - The size element
  - The whitespace between </size> and

Parsing an XML Document - DOM



Parsing an XML Document - DOM

- If you expect only subelements, then you can ignore the whitespace:

```
for (int i = 0; i < children.getLength(); i++)
{
  Node child = children.item(i);
  if (child instanceof Element)
  {
    Element childElement = (Element) child;
    . . .
  }
}
```

Now you look at only two elements, with tag names name and size.

Parsing an XML Document - DOM

- You can use the getFirstChild method without having to traverse another NodeList.
- Then use the getData method to retrieve the string stored in the Text node.

```
for (int i = 0; i < children.getLength(); i++)
{
  Node child = children.item(i);
  if (child instanceof Element)
  {
    Element childElement = (Element) child;
    Text textNode = (Text) childElement.getFirstChild();
    String text = textNode.getData().trim();
    if (childElement.getTagName().equals("name"))
      name = text;
    else if (childElement.getTagName().equals("size"))
      size = Integer.parseInt(text);
  }
}
```

Parsing an XML Document - DOM

- You can also get the last child with the getLastChild method, and the next sibling of a node with getNextSibling.

- Therefore, another way of traversing a set of child nodes is

```
for (Node childNode = element.getFirstChild();
  childNode != null;
  childNode = childNode.getNextSibling())
{
  . . .
}
```

Parsing an XML Document - DOM

- To enumerate the attributes of a node, call the getAttributes method.
  - It returns a NamedNodeMap object that contains Node objects describing the attributes.

```
NamedNodeMap attributes = element.getAttributes();
for (int i = 0; i < attributes.getLength(); i++)
{
  Node attribute = attributes.item(i);
  String name = attribute.getNodeName();
  String value = attribute.getNodeValue();
  . . .
}
```

- Alternatively, if you know the name of an attribute, you can retrieve the corresponding value directly:

```
String unit = element.getAttribute("unit");
```

Parsing an XML Document - SAX

- The SAX parser reports events as it parses the components of the XML input, but it does not store the document in any way
  - it is up to the event handlers whether they want to build a data structure.
  - In fact, the DOM parser is built on top of the SAX parser. It builds the DOM tree as it receives the parser events.

- The ContentHandler interface defines several callback methods that the parser executes as it parses the document. Here are the most important ones:
  - startElement and endElement are called each time a start tag or end tag is encountered.
  - characters is called whenever character data are encountered.
  - startDocument and endDocument are called once each, at the start and the end of the document.

Parsing an XML Document - SAX

- For example, when parsing the fragment

```
<font>
  <name>Helvetica</name>
  <size units="pt">36</size>
</font>
```

- The parser makes the following callbacks:
  - startElement, element name: font
  - startElement, element name: name
  - characters, content: Helvetica
  - endElement, element name: name
  - startElement, element name: size, attributes: units="pt"
  - characters, content: 36
  - endElement, element name: size
  - endElement, element name: font

Parsing an XML Document - SAX

- Here is how you get a SAX parser:
  SAXParserFactory factory = SAXParserFactory.newInstance();
  SAXParser parser = factory.newSAXParser();

- You can now process a document:
  parser.parse(source, handler);
- Here,
  - source can be a file, URL string, or input stream.
  - handler belongs to a subclass of DefaultHandler.

- The DefaultHandler class defines do-nothing methods for the four interfaces:
  - ContentHandler
  - DTDHandler
  - EntityResolver
  - ErrorHandler

Parsing an XML Document - SAX


```
DefaultHandler handler = new
  DefaultHandler()
  {
    public void startElement(String namespaceURI, String lname,
                                        String qname, Attributes attrs)
      throws SAXException
    {
      if (lname.equalsIgnoreCase("a") && attrs != null)
      {
        for (int i = 0; i < attrs.getLength(); i++)
        {
          String aname = attrs.getLocalName(i);
          if (aname.equalsIgnoreCase("href"))
            System.out.println(attrs.getValue(i));
        }
      }
    }
  };
```

Parsing an XML Document - StAX

- The StAX parser is a "pull parser." Instead of installing an event handler, you simply iterate through the events, using this basic loop:

```
InputStream in = url.openStream();
XMLInputFactory factory = XMLInputFactory.newInstance();
XMLStreamReader parser = factory.createXMLStreamReader(in);
while (parser.hasNext())
{
  int event = parser.next();
  Call parser methods to obtain event details
}
```

- For example, when parsing the fragment

```
<font>
  <name>Helvetica</name>
  <size units="pt">36</size>
</font>
```

Parsing an XML Document - StAX

- The parser yields the following events:
  - START_ELEMENT, element name: font
  - CHARACTERS, content: white space
  - START_ELEMENT, element name: name
  - CHARACTERS, content: Helvetica
  - END_ELEMENT, element name: name
  - CHARACTERS, content: white space
  - START_ELEMENT, element name: size
  - CHARACTERS, content: 36
  - END_ELEMENT, element name: size
  - CHARACTERS, content: white space
  - END_ELEMENT, element name: font

- To analyze the attribute values, call the appropriate methods of the XMLStreamReader class. For example,

  `String units = parser.getAttributeValue(null, "units");`

  gets the units attribute of the current element.

Validating XML Documents

- You also need to check whether the document contains the nodes that you expect.

- To specify the document structure
  - you can supply a DTD or an XML Schema definition.
  - A DTD or schema contains rules that explain how a document should be formed, by specifying the legal child elements and attributes for each element.

Validating XML Documents

- For example, a DTD might contain a rule:

  <!ELEMENT font (name,size)>

  This rule expresses that a font element must always have two children, which are name and size elements.

- The XML Schema language expresses the same constraint as

```
<xsd:element name="font">
  <xsd:sequence>
    <xsd:element name="name" type="xsd:string"/>
    <xsd:element name="size" type="xsd:int"/>
  </xsd:sequence>
</xsd:element>
```

Document Type Definitions

- There are several methods for supplying a DTD. You can include a DTD in an XML document like this:

```
<?xml version="1.0"?>
<!DOCTYPE configuration [
  <!ELEMENT configuration . . .>
  more rules
  . . .
]>
<configuration>
 . . .
</configuration>
```

Document Type Definitions

- Supplying a DTD inside an XML document is somewhat uncommon because DTDs can grow lengthy.

- It makes more sense to store the DTD externally. The SYSTEM declaration can be used for that purpose.

- You specify a URL that contains the DTD, for example:

  ```
  <!DOCTYPE configuration SYSTEM "config.dtd">
  ```

  or

  ```
  <!DOCTYPE configuration SYSTEM "http://myserver.com/config.dtd">
  ```

Document Type Definitions

- Rules for Element Content

Rule	Meaning
E*	0 or more occurrences of E
E+	1 or more occurrences of E
E?	0 or 1 occurrences of E
$E_1 \mid E_2 \mid \ldots \mid E_n$	One of $E_1, E_2, \ldots, E_n$
$E_1, E_2, \ldots, E_n$	E_1 followed by $E_2, \ldots, E_n$
#PCDATA	Text
$(\#PCDATA \mid E_1 \mid E_2 \mid \ldots \mid E_n)^*$	0 or more occurrences of text and $E_1, E_2, \ldots, E_n$ in any order (mixed content)
ANY	Any children allowed
EMPTY	No children allowed

Document Type Definitions

- You also specify rules to describe the legal attributes of elements.

- The general syntax is
  <!ATTLIST element attribute type default>

Document Type Definitions

- Attribute Types and Defaults

Type	***Meaning***
CDATA	Any character string
$(A_1 \mid A_2 \mid \ldots \mid A_n)$	One of the string attributes A_1 A_2 . . . $\mid A_n$
NMTOKEN, NMTOKENS	One or more name tokens
ID	A unique ID
IDREF, IDREFS	One or more references to a unique ID
ENTITY, ENTITIES	One or more unparsed entities

Default	***Meaning***
#REQUIRED	Attribute is required.
#IMPLIED	Attribute is optional.
A	Attribute is optional; the parser reports it to be A if it is not specified.
#FIXED A	The attribute must either be unspecified or A; in either case, the parser reports it to be A.

Document Type Definitions


```
<!ELEMENT font (name,size)>
<!ELEMENT name (#PCDATA)>
<!ELEMENT size (#PCDATA)>

<!ELEMENT chapter (intro,(heading,(para|image|table|note)+)+)>

<!ELEMENT para (#PCDATA|em|strong|code)*>

<!ATTLIST font style (plain|bold|italic|bold-italic) "plain">
<!ATTLIST size unit CDATA #IMPLIED>
```

XML Schema

- To reference a Schema file in a document, add attributes to the root element, for example:

```
<?xml version="1.0"?>
<configuration xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:noNamespaceSchemaLocation="config.xsd">
. . .
</configuration>
```

- For example, here is an enumerated type:

```
<xsd:simpleType name="StyleType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="PLAIN" />
    <xsd:enumeration value="BOLD" />
    <xsd:enumeration value="ITALIC" />
    <xsd:enumeration value="BOLD_ITALIC" />
  </xsd:restriction>
</xsd:simpleType>
```

XML Schema

- You can compose types into complex types, for example:

```
<xsd:complexType name="FontType">
  <xsd:sequence>
    <xsd:element name="name" type="xsd:string"/>
    <xsd:element name="size" type="xsd:int"/>
    <xsd:element name="style" type="StyleType">
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:enumeration value="PLAIN" />
          <xsd:enumeration value="BOLD" />
          <xsd:enumeration value="ITALIC" />
          <xsd:enumeration value="BOLD_ITALIC" />
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:element>
  </xsd:sequence>
</xsd:complexType>
```

Locating Information with XPath

- The XPath language makes it simple to access tree nodes.
- For example, suppose you have this XML document:

```
<configuration>
  . . .
  <database>
    <username>dbuser</username>
    <password>secret</password>
    . . .
  </database>
</configuration>
```

- You can get the database user name by evaluating the XPath expression

```
/configuration/database/username
```

Locating Information with XPath

- That's a lot simpler than the plain DOM approach:
  - Get the document node.
  - Enumerate its children.
  - Locate the database element.
  - Get its first child, the username element.
  - Get its first child, a Text node.
  - Get its data.

  - /gridbag/row
  - /gridbag/row[1]
  - /gridbag/row[1]/cell[1]/@anchor
  - /gridbag/row/cell/@anchor
  - count(/gridbag/row)

Locating Information with XPath

- Java SE 5.0 added an API to evaluate XPath expressions. You first create an XPath object from an XPathFactory:

```
XPathFactory xpfactory = XPathFactory.newInstance();
path = xpfactory.newXPath();
```

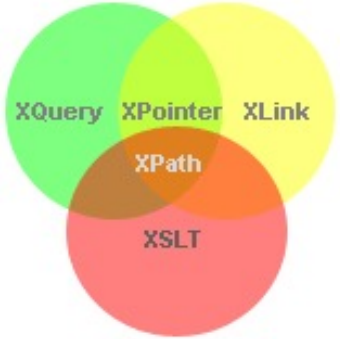
- You then call the evaluate method to evaluate XPath expressions:

```
String username = path.evaluate("/configuration/database/username", doc);
NodeList nodes = (NodeList) path.evaluate("/gridbag/row", doc,
XPathConstants.NODESET);
Node node = (Node) path.evaluate("/gridbag/row[1]", doc, XPathConstants.NODE);
int count = ((Number) path.evaluate("count(/gridbag/row)", doc, XPathConstants.NUM-
BER)).intValue();

result = path.evaluate(expression, node);
```

XQuery

- XQuery is to XML what SQL is to database tables.
  - XQuery is designed to query XML data - not just XML files, but anything that can appear as XML, including databases.
  - XQuery is ***the*** language for querying XML data
  - XQuery for XML is like SQL for databases
  - XQuery is built on XPath expressions
  - XQuery is supported by all major databases
  - XQuery is a W3C Recommendation



XQuery

- XQuery can be used to:
  - Extract information to use in a Web Service
  - Generate summary reports
  - Transform XML data to XHTML
  - Search Web documents for relevant information

- XQuery and XPath
  - XQuery 1.0 and XPath 2.0 share the same data model and support the same functions and operators.
  - If you have already studied XPath you will have no problems with understanding XQuery.

- Book.xml

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

<bookstore>

<book category="COOKING">
  <title lang="en">Everyday Italian</title>
  <author>Giada De Laurentiis</author>
  <year>2005</year>
  <price>30.00</price>
</book>

<book category="CHILDREN">
  <title lang="en">Harry Potter</title>
  <author>J K. Rowling</author>
  <year>2005</year>
  <price>29.99</price>
</book>

<book category="WEB">
  <title lang="en">XQuery Kick Start</title>
  <author>James McGovern</author>
  <author>Per Bothner</author>
  <author>Kurt Cagle</author>
  <author>James Linn</author>
  <author>Vaidyanathan Nagarajan</author>
  <year>2003</year>
  <price>49.99</price>
</book>

<book category="WEB">
  <title lang="en">Learning XML</title>
  <author>Erik T. Ray</author>
  <year>2003</year>
  <price>39.95</price>
</book>

</bookstore>
```

- Functions
  - XQuery uses functions to extract data from XML documents.
  - The doc() function is used to open the "books.xml" file:

```
doc("books.xml")
```

- Path Expressions
  - XQuery uses path expressions to navigate through elements in an XML document.

```
doc("books.xml")/bookstore/book/title
```

  - The XQuery above will extract the following:

```
<title lang="en">Everyday Italian</title>
<title lang="en">Harry Potter</title>
<title lang="en">XQuery Kick Start</title>
<title lang="en">Learning XML</title>
```

- Predicates
  - XQuery uses predicates to limit the extracted data from XML documents.

```
doc("books.xml")/bookstore/book[price<30]
```

  - The XQuery above will extract the following:

```
<book category="CHILDREN">
 <title lang="en">Harry Potter</title>
 <author>J K. Rowling</author>
 <year>2005</year>
 <price>29.99</price>
</book>
```

Using Namespace

- A namespace is identified by a Uniform Resource Identifier (URI), such as
  http://www.w3.org/2001/XMLSchema
  uuid:1c759aed-b748-475c-ab68-10679700c4f2
  urn:com:books-r-us

- Why use HTTP URLs for namespace identifiers? It is easy to ensure that they are unique.

Using Namespace

- To specify the long names of namespace:

```
<element xmlns="namespaceURI">
   children
</element>
```

- A child can provide its own namespace, for example:

```
<element xmlns="namespaceURI1">
  <child xmlns="namespaceURI2">
    grandchildren
  </child>
  more children
</element>
```

Generating XML Documents

- A better approach is
  - to build up a DOM tree with the contents of the document
  - and then write out the tree contents.

```
Document doc = builder.newDocument();
```

- Use the createElement method of the Document class to construct the elements of your document.

```
Element rootElement = doc.createElement(rootName);
Element childElement = doc.createElement(childName);
```

- Use the createTextNode method to construct text nodes:

```
Text textNode = doc.createTextNode(textContents);
```

Generating XML Documents

- Add the root element to the document, and add the child nodes to their parents:

```
doc.appendChild(rootElement);
rootElement.appendChild(childElement);
childElement.appendChild(textNode);
```

- As you build up the DOM tree, you may also need to set element attributes. Simply call the setAttribute method of the Element class:

```
rootElement.setAttribute(name, value);
```

Generating XML Documents

- Somewhat curiously, the DOM API currently has no support for writing a DOM tree to an output stream.

- To overcome this limitation, we use the Extensible Stylesheet Language Transformations (XSLT) API.

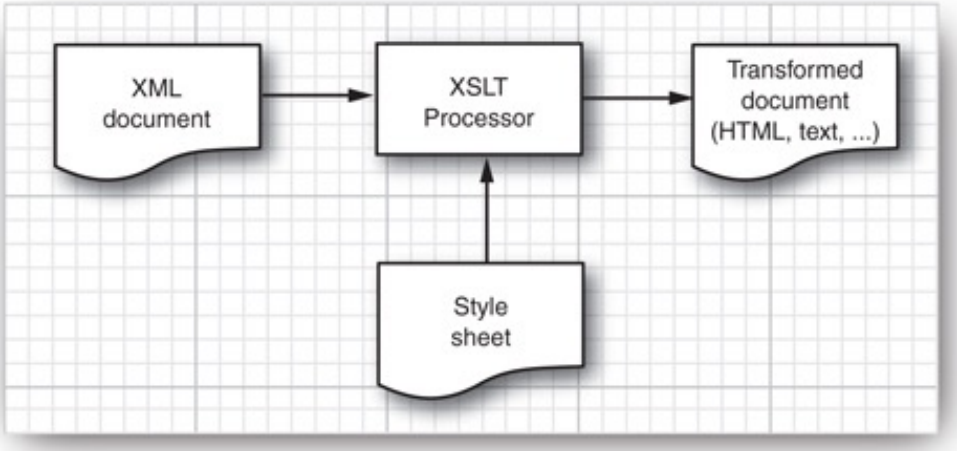
```
Transformer t = TransformerFactory.newInstance().newTransformer();

t.setOutputProperty(OutputKeys.DOCTYPE_SYSTEM, systemIdentifier);
t.setOutputProperty(OutputKeys.DOCTYPE_PUBLIC, publicIdentifier);
t.setOutputProperty(OutputKeys.INDENT, "yes");
t.setOutputProperty(OutputKeys.METHOD, "xml");
t.setOutputProperty("{http://xml.apache.org/xslt}indent-amount", "2");

t.transform(new DOMSource(doc),
            new StreamResult(new FileOutputStream(file)));
```

XML Transformations

- The XSL Transformations (XSLT) mechanism allows you to
  - specify rules for transforming XML documents into other formats,
  - such as plain text, XHTML, or any other XML format.



XML Transformations

- Here is a typical example.

```
<staff>
  <employee>
    <name>Carl Cracker</name>
    <salary>75000</salary>
    <hiredate year="1987" month="12" day="15"/>
  </employee>
  <employee>
    <name>Harry Hacker</name>
    <salary>50000</salary>
    <hiredate year="1989" month="10" day="1"/>
  </employee>
  <employee>
    <name>Tony Tester</name>
    <salary>40000</salary>
    <hiredate year="1990" month="3" day="15"/>
  </employee>
</staff>
```

XML Transformations

- The desired output is an HTML table:

```
<table border="1">
<tr>
<td>Carl Cracker</td><td>$75000.0</td><td>1987-12-15</td>
</tr>
<tr>
<td>Harry Hacker</td><td>$50000.0</td><td>1989-10-1</td>
</tr>
<tr>
<td>Tony Tester</td><td>$40000.0</td><td>1990-3-15</td>
</tr>
</table>
```

XML Transformations

- A style sheet with transformation templates has this form:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<xsl:stylesheet
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  version="1.0">
  <xsl:output method="html"/>
  template1
  template2
  . . .
</xsl:stylesheet>
```

- Here is a typical template for employee nodes:

```
<xsl:template match="/staff/employee">
  <tr><xsl:apply-templates/></tr>
</xsl:template>
```

- Here is a template for name nodes:

```
<xsl:template match="/staff/employee/name">
  <td><xsl:apply-templates/></td>
</xsl:template>
```

- Here is an example for hiredate nodes. :

```
<xsl:template match="/staff/employee/hiredate">
  <td><xsl:value-of select="@year"/>-<xsl:value-of
  select="@month"/>-<xsl:value-of select="@day"/></td>
</xsl:template>
```

XML Transformations

- It is extremely simple to generate XSL transformations in the Java platform.

```
File styleSheet = new File(filename);
StreamSource styleSource = new StreamSource(styleSheet);
Transformer t = TransformerFactory.newInstance().
                        newTransformer(styleSource);
t.transform(source, result);
```

- Start and Shutdown Sedna
  - To start Sedna server go to INSTALL_DIR/bin and run:
  - se_gov
  - To shutdown Sedna server run:
  - se_stop

- Create and Run a Database
  - To create a database named testdb:
  - se_cdb testdb
  - To run the testdb database:
  - se_sm testdb
  - To shutdown the testdb database:
  - se_smsd testdb

- Access with Java API

```
import javax.xml.xquery.*;
import javax.xml.namespace.QName;
import net.xqj.sedna.SednaXQDataSource;
public class QuickStart {
  public static void main(String[] args) throws XQException  {
    XQDataSource xqs = new SednaXQDataSource();
    xqs.setProperty("serverName", "localhost");
    xqs.setProperty("databaseName", "test");
    XQConnection conn = xqs.getConnection("SYSTEM", "MANAGER");
    XQPreparedExpression xqpe =
        conn.prepareExpression("declare variable $x as xs:string external; $x");
    xqpe.bindString(new QName("x"), "Hello World!", null);
    XQResultSequence rs = xqpe.executeQuery();
    while(rs.next())
      System.out.println(rs.getItemAsString(null));
    conn.close();
  }
}
```

Reference

- Core Java™ Volume II–Advanced Features, Eighth Edition
  - by Cay S. Horstmann; Gary Cornell
  - Publisher: Prentice Hall
  - Print ISBN-13: 978-0-13-235479-0
- Sedna XML Database
  - http://www.sedna.org/

Thank You!