CSC309 Tutorial -XML

TA: Lei Jiang

January 20, 2003

- XML DOCTYPE
- Element Declarations
- Attribute List Declarations
- Entity Declarations
- CDATA
- Stylesheet PI
- An Example

XML DOCTYPE Internal DTD

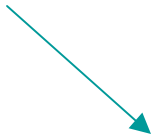
(1) <!DOCTYPE root [DTD]>

```
<?xml version="1.0" encoding="UTF-8"
standalone="yes"?>
<!DOCTYPE person [
  <!ELEMENT person (name)+>
  <!ELEMENT name (first, last)>
  <!ELEMENT first (#PCDATA)>
  <!ELEMENT last (#PCDATA)>
]>
<person>
  <name>
    <first>John</first>
    <last>Smith</last>
  </name>
</person>
```

XML DOCTYPE External DTD

(2) <!DOCTYPE root SYSTEM URL>

```
<?xml version="1.0" encoding="UTF-8"
standalone="no"?>
<!DOCTYPE person SYSTEM "person.dtd">
<person>
  <name>
    <first>John</first>
    <last>Smith</last>
  </name>
</person>
```



```
<?xml version="1.0" encoding="UTF-8"?>
<!-- File: person.dtd -->
<!ELEMENT person (name)+>
<!ELEMENT name (first, last)>
<!ELEMENT first (#PCDATA)>
<!ELEMENT last (#PCDATA)>
```

or using absolute URL

<!DOCTYPE person SYSTEM "http://www. .../person.dtd">

XML DOCTYPE External & Internal

(4) <!DOCTYPE root SYSTEM URL
[DTD]
>

```
<?xml version="1.0" encoding="UTF-8" standalone="no”?>
<!DOCTYPE person SYSTEM "person.dtd”
   [<!ATTLIST person sex (male|female) “male”>]
>
<person>
  <name>
    <first>John</first>
    <last>Smith</last>
  </name>
</person>
```

Element Declarations

<!ELEMENT name content>

content: EMPTY, ANY, (#PCDATA), child element, mixed,

(1) EMPTY: The element is declared to be an empty one - no content allowed.

<!ELEMENT empty_element EMPTY>

e.g., `<empty_element></empty_element>`

e.g., `<empty_element />`

(2) ANY: The element can have any element or character data.

<!ELEMENT any_element ANY>

e.g.,
```
<any_element>
      This is a line of characters.
      <other_element> ... </other_element>
  </any_element>
```

Element Declarations (cont'd)

(3) (#PCDATA): The content can be only character data.

<!ELEMENT first (#PCDATA)>
e.g., `<first> John </first>`

(4) mixed: The content may contain character data and/or child elements.

<!ELEMENT mix_element (#PCDATA | first | last)>

e.g.,
```
<mix_element>
      My first name is
      <first>John</first>
      and my last name is
      <last>smith </last>
   </mix_element>
```

Element Declarations (cont'd)

(5) child elements: The content can only contain the child elements (no character data). The sequence, alternative, and cardinality can be expressed using commas(,), pipes(|) and modifiers.

e.g. <!ELEMENT a (x,y,z)>: element a must have an element x, followed by y, followed by z.
e.g. <!ELEMENT b (x|y|z)>: element b must have an element x, or y, or z

Modifier: asterisk(*) stands for zero or more.
plus sign(+) stands for one or more.
question mark(?) stands for zero or one.

e.g. <!ELEMENT c (x*, y+, z?) >

Attribute List Declarations

Define which attributes may be associated with a particular element. An attribute can have a name, a type, whether optional, required or fixed, and possibly a default.

<!ATTLIST element_name
attribute_name attribute_type default_declaration>

attribute_type

String: CDATA

e.g. `<!ATTLIST student id CDATA #IMPLIED>`

Enumerated: (value1 | value2 | value3)

e.g. `<!ATTLIST car color (red|black|blue|white) #REQUIRED>`

ID: An ID type attribute must contain an value which is unique within the XML document. e.g., student id shown above.

IDREF: An IDREF type attribute refers to the ID type attribute of an another element in the document. It is often used to create relationships between elements.

e.g. <!ATTLIST student sid ID #REQUIRED>
<!ATTLIST course cid ID #REQUIRED>
<!ATTLIST enrolment sid IDREF #REQUIRED
cid IDREF #REQUIRED … >

Attribute List Declarations attribute_type

default_declaration

#REQUIRED, #IMPLIED, #FIXED, default value

#REQUIRED: Every occurrence of element must have this attribute.

```
<!ATTLIST person id ID #REQUIRED>
```

#IMPLIED: The attribute is optional.

```
<!ATTLIST person salary CDATA #IMPLIED>
```

#FIXED: The attribute must always have this value.

```
<!ATTLIST person language CDATA #FIXED "EN">
```

- The document is not valid if attribute language contains a value different from "EN".
- If element doesn't contain the attribute, the default value "EN" will be used.

default value: The attribute may or may not appear in the element. If not, using this value.

```
<!ATTLIST person contract (true|false) 'false'>
```

Entity Declarations Internal Entities

Internal Entities: associates a name with a text string.

e.g.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!DOCTYPE person [
   <!ELEMENT person ((name)+, university)>
   <!ELEMENT name (first, last)>
   <!ELEMENT first (#PCDATA)>
   <!ELEMENT last (#PCDATA)>
   <!ELEMENT university (#PCDATA)>
   <!ENTITY ut "university of toronto">
]>
<person>
  <name>
     <first>John</first>
     <last>Smith</last>
  </name>
  <university>&ut;</university>
</person>
```

Entity Declarations External Entities

External Entities: associates a name with the content of another file.

e.g.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE person [
  <!ELEMENT person ((name)+, university)>
  <!ELEMENT name (first, last)>
  <!ELEMENT first (#PCDATA)>
  <!ELEMENT last (#PCDATA)>
  <!ELEMENT university (#PCDATA)>
  <!ENTITY UofT SYSTEM "ut.xml">
]>
<person>
   <name>
      <first>John</first>
      <last>Smith</last>
   </name>
   &UofT;
</person>
```

File: ut.xml

```
<university>
    University of Toronto
</university>
```

Entity Declarations Parameter Entities

Parameter Entities can only be used within the DTD.

Declaration: **<!ENTITY %name "replacement text">**
Usage: **%name;**
e.g.,

```
<!ENTITY %week_attr "(Mon|Tue|Wed|Thu|Fri|Sat|Sun)">
<!ELEMENT day EMPTY>
<!ATTLIST day today %week_attr; "Mon">
<!ENTITY anyday %week_attr;>
```

Entity Declarations Predefined Entities

< produces the left angle bracket <
> produces the right angle bracket >
& produces the ampersand **&**
' produces a single quote character '
" produces a double quote character "

CDATA

Content in a CDATA section is not processed by the XML parser.

<![CDATA [content]]>

e.g.,

```
<![CDATA[
   if (this->getValue() < 3 && value[1] !=3 )
       cout << "error message"
]]>
```

If we don't use CDATA, we have to write as following:

```
if (this-&gt;getvalue() &lt; 3 &amp;&amp; value[1] != 3)
   cout &lt;&lt; &quot;error message&quot;
```

Stylesheet Processing Instruction

(1) Associate CSS (Cascading Style Sheets):

```
<?xml version="1.0" encoding="UTF-8″ standalone="no"?>
<?xml-stylesheet type="text/css" href="book.css"?>
<!DOCTYPE bookDatabase SYSTEM "book.dtd">
<bookDatabase>
 ...
</bookDatabase>
```

(2) Associate XSL (eXtensible Stylesheet Language)

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<?xml-stylesheet type="text/xsl" href="book.xsl"?>
<!DOCTYPE bookDatabase SYSTEM "book.dtd">
<bookDatabase>
 ...
</bookDatabase>
```

A Complete Example DTD

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- file: book.dtd -->
<!ELEMENT bookDatabase (book+)>
<!ENTITY %CH "(chapter, description)">
<!ELEMENT book (author+, image*, content+, newchapters*)>
<!ATTLIST book bookID ID #REQUIRED>
<!ELEMENT author (#PCDATA)>
<!ELEMENT image (#PCDATA)>
<!ELEMENT content %CH;>
<!ELEMENT newchapters %CH;>
<!ATTLIST newchapters added (true|false) "false">
<!ELEMENT chapter (#PCDATA)>
<!ATTLIST chapter number CDATA #REQUIRED>
<!ELEMENT description (section*, summary?)>
<!ELEMENT section (#PCDATA)>
<!ELEMENT resources (#PCDATA)>
<!ELEMENT summary (#PCDATA)>
<!ENTITY EH "Elliotte Rusty Harold">
<!ENTITY IF "Ian Foster">
<!ENTITY CK "Carl Kesselman">
```

A Complete Example XML

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE bookDatabase SYSTEM "book.dtd">
<bookDatabase>
  <book bookID="ISBN-0-13-xxx">
    <author>&EH;</author>
    <content>
      <chapter number="1">XML Structure, Syntax</chapter>
      <description>
        <section>XML Fundamentals</section>
      </description>
    </content>
    <content>
      <chapter number="2">Document Type Definitions</chapter>
      <description>
        <section>Element Declarations</section>
        <section>Attributes Declarations</section>
        <summary>summary of the chapter 2</summary>
      </description>
    </content>
 </book>
```

A Complete Example XML (cont'd)

```
  <book bookID="ISBN-0-586-xxx">
    <author>&IF;</author>
    <author>&CK;</author>
    <image>grid architecture</image>
    <content>
      <chapter number="1">Grids in Context</chapter>
      <description />
    </content>
    <newchapters>
      <chapter number="20">Network structure</chapter>
      <description>
        <section>The Future(1998-2005)</section>
      </description>
    </newchapters>
  </book>
</bookDatabase>
```

How to validate:

java -cp /u/csc309h/lib/xerces.jar:/u/csc309h/lib/ Validator book.xml

Last Words

- All elements must have a closing tag.
- Tags are case sensitive.
- All XML documents must have a root tag.
- Attribute values must always be quoted.