Introduction to XML

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Content

- Defining XML
- XML structure
- Application areas
- XML rules: well-formed XML
- DTD and schema
- Publishing process

XML = Extensible Markup Language

- General mark-up language, a metalanguage
- forms a family of standards
- based on SGML
- has many uses and possibilities when combined with other standards, languages and products
- W3C recommendation
  - version 1.0
  - 6.10.2000
  - a set of rules to combine, exchange and publish information

XML – metalanguage

- the universal format for structured documents and data on the Web
- XML makes it easy for a computer to generate data, read data, and ensure that the data structure is unambiguous
- readable for both human and computer:
- text format: it allows people to look at the data without the program that produced it: no parser needed
- platform and programming language independent

W3C World Wide Web Consortium

- created in October 1994 to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability
- about 400 Member organizations
- ”The World Wide Web Consortium (W3C) develops interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential as a forum for information, commerce, communication, and collective understanding. ”
- has developed more than 35 technical specifications (like HTML)
- open source software

XML –document instance

```
<!–Example of a document instance (part) -->
<university>
  <department>
       <name>
              Department of Genetic Engineering
       </name>
       <address>
              DNA St 2
       </address>
  </department>
</university>
```

XML is for structuring data:

- Structured data : spreadsheets, address books, configuration parameters, financial transactions, technical drawings, etc.
- XML is a set of rules (you may also think of them as guidelines or conventions) for designing text formats that let you structure your data.
- XML is not a programming language
- extensible, platform-independent, and supports internationalization and localization: XML is fully Unicode-compliant

XML looks a bit like HTML

- tags and attributes
- XML uses the tags only to delimit pieces of data, and leaves the interpretation of the data completely to the application that reads it
- <p>

XML files are text files that people shouldn't have to read

- the rules for XML files are strict,
- The official XML specification forbids applications from trying to second-guess the creator of a broken XML file
- XML is verbose by design

XML is a family of technologies

- XML 1.0
- Schemas
- Namespaces
- Xpath – language
- XSL and XSLT transformations
- Xlink, XPointer for hyperlinking
- DOM and SAX interfaces
- DTDs and CSS are used together with XML standards

- XML is license-free, platform-independent and well-supported!!

XML vs. HTML

- HTML has been created for a particular purpose: layout and formatting of pages
- XML has no one purpose, it can be used for almost any application
- HTML has a limited set of tags
- XML has no tags
- XML is strictly hierarchical and parser enforce it
- XML leads HTML to XHTML

XML application areas

- load on server can be reduced by collecting the data to a client XML file
- Web page contents -> transformations
- Data transfer
  - relational databases
  - EDI (Electronic Data Interchange)
- E-commerce: B2B and B2C, Web Services
- Publishing
  - Electronic documents
  - Metadata
- Semantic web

XML application areas

- At present ?
- Internal format in browsers
- Microsoft: .NET and internal format for Office
- Ajax and XMLHTTP, Googlemaps

XML –document instance

```
<?xml version="1.0"?>
<!-- Example of an document instance  -->
<university>
 <department>
    <name>
       Department of Genetic Engineering
    </name>
    <address>
       DNA St 2
    </address>
 </department>
</university>
```

Document instance

- contains the information of the document, marked-up according to agreed rules
- self-descriptive tags
- helps in interpretation of data
- elements and sub-elements
- text and comments

XML markup

Document instance

- elements and sub-elements
- attributes
- entities
- processing instructions
- text and comments

Elements

- Part of logical document structure
- delimiting tags
  - opening tag
  - closing tag
- element name
- element contents
  - sub-elements or text
- examples:

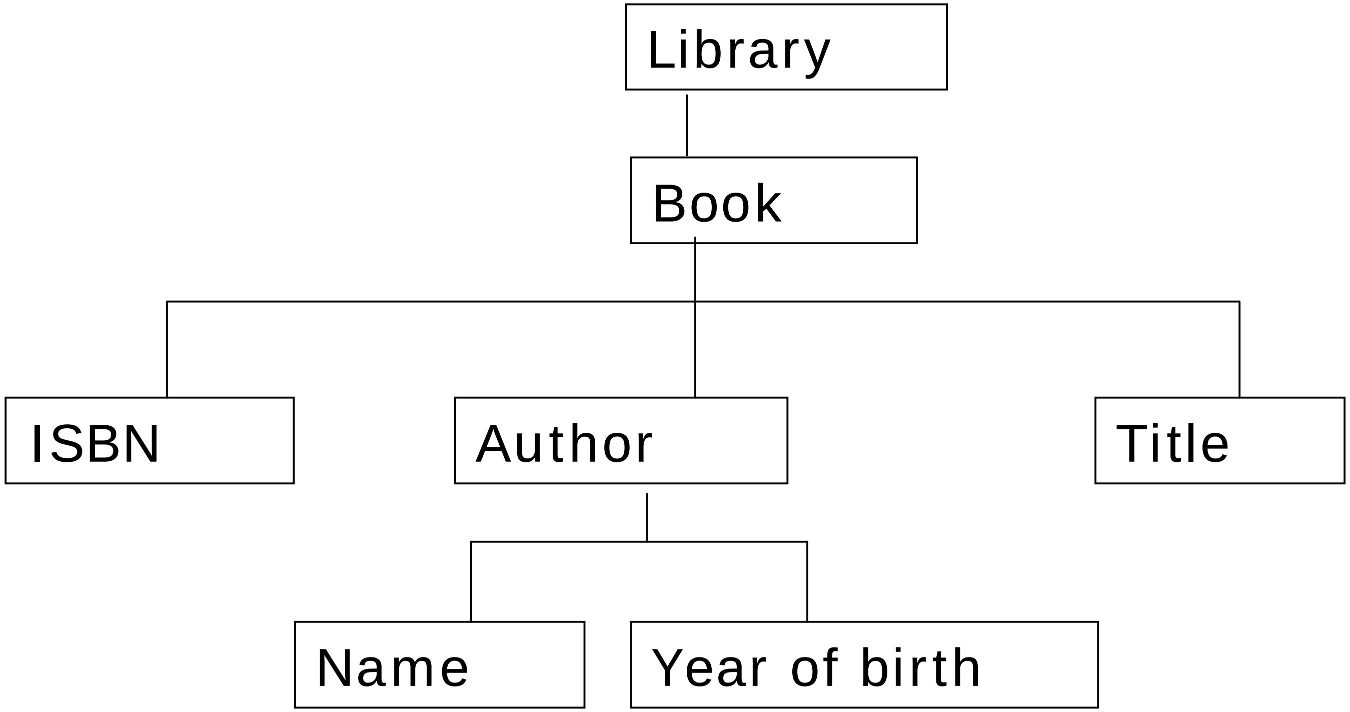
```
<capital>Helsinki</capital>

<country>
  <cname>Finland</cname>
  <capital>Helsinki</capital>
</country>
```

Element nesting: rules

- opening tag and closing tag must match
- element must be completely within another (no crossed tags)
- element hierarchy
  - root = document element - only one!
  - Tree structure

- case-sensitive: capitals are different characters than lower case letters
  - <chapter> not same as <Chapter>
- element names must follow XML rules
- = well-formed

Document tree



Library

Book

ISBN

Author

Title

Name

Year of birth

Element nesting

```
<small_example>
  <first>nesting is done</first>
  <second>ok</second>
</small_example>

<small_example>
  <first>nesting is <second>
  </first>all wrong</second>
</small_example>
```

XML elements must follow these naming rules

- Names can contain letters, numbers, and other characters
- must not start with a number or punctuation character
- must not start with the letters xml (or XML or Xml ..)
- cannot contain spaces or colons
- Follow these simple rules:
  - Any name can be used, no words are reserved, but the idea is to make names descriptive.
  - Examples: <first_name>, <last_name >.
- Which of the following are valid?
  - <first.name> <xml-root> <123> <Big Apple>
  - <p>paragraph</P>

Element contents

- An element can have
  - element content,
  - mixed content,
  - simple content, or
- empty content
  - <nothing></nothing>
  - <useless/>
- why
  - content could be elsewhere
  - the empty element has a reference

    <image file="pict.jpg"/>

Attributes

- Element property or contents
- attached to opening tags (or empty element tags)
  - attribute name
  - attribute value
- only one value
- the value can contain any characters
- are they needed ?

```
<book author= ”Oscar Wilde">
...
</book>

<book keywords="XML SGML">
...
</book>
```

Processing instructions

- Processing instruction is an instruction within the XML document (which is not part of the actual document but which is passed up to the application)
- delimiters <? and ?>
- example (almost): XML declaration:

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

  - version is 1.0
  - character set
  - no external definitions

Mark-up declarations

- Commands to the XML processor
  - start: <!
  - End: >
  - document type structure, document parts, etc.

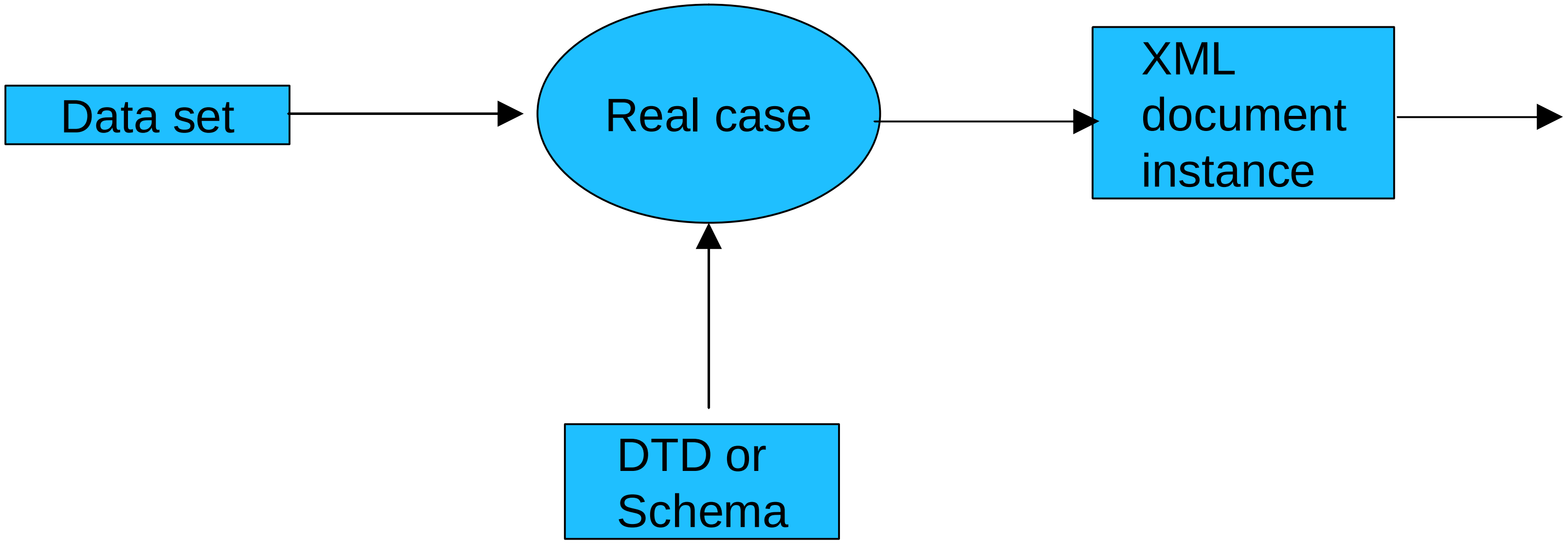
    <!DOCTYPE pizzas SYSTEM "pizzas.dtd">
- Comments
  - <!-- This is a comment -->

XML -processors

- A software module called an XML processor is used to read XML documents and provide access to their content and structure
- XML parser
  - finds errors
  - produces information for other applications

§ an XML processor is doing its work on behalf of another module, called the application

Document instance



DTD

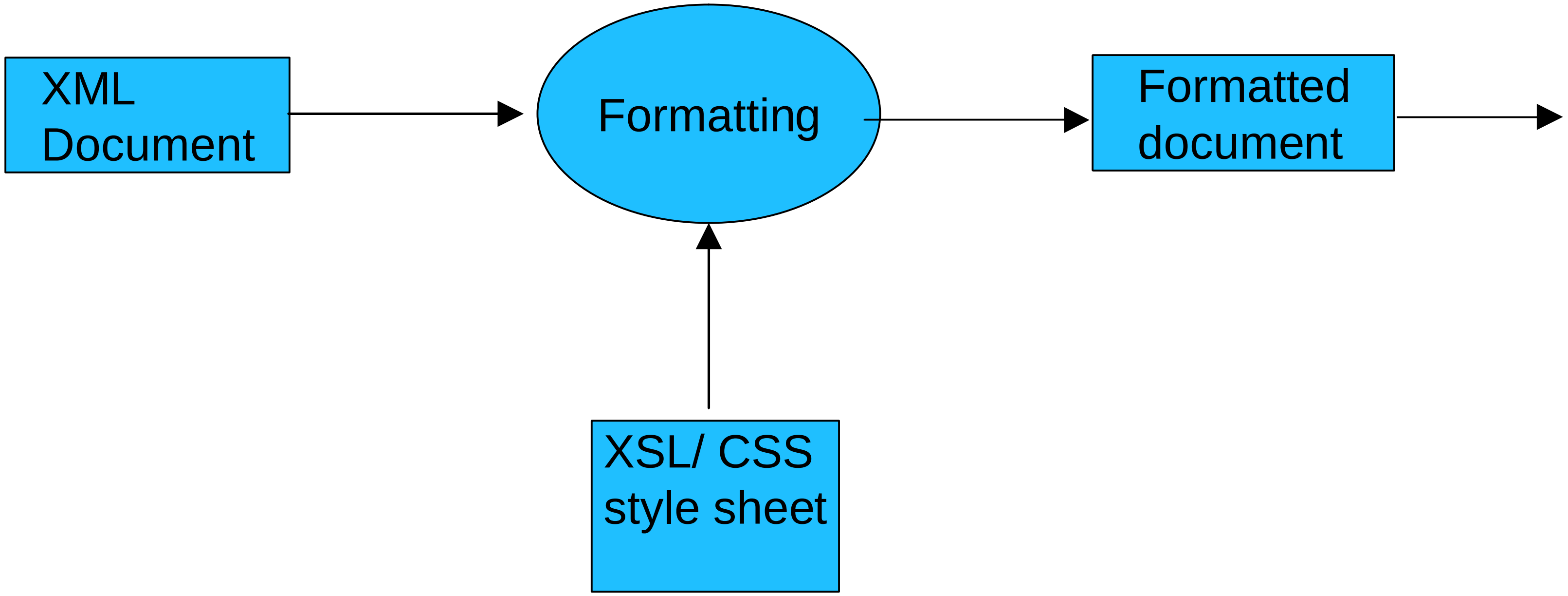
```
<!–Document type description (DTD) example (part) -->

<!ELEMENT university (department+)>
<!ELEMENT department (name, address)>
<!ELEMENT name (#PCDATA)>
<!ELEMENT address (#PCDATA)>
```

- Document type description, structural description
- one rule /element
  - name
  - content
- a grammar for document instances
- ”regular clauses"
- (not necessary)

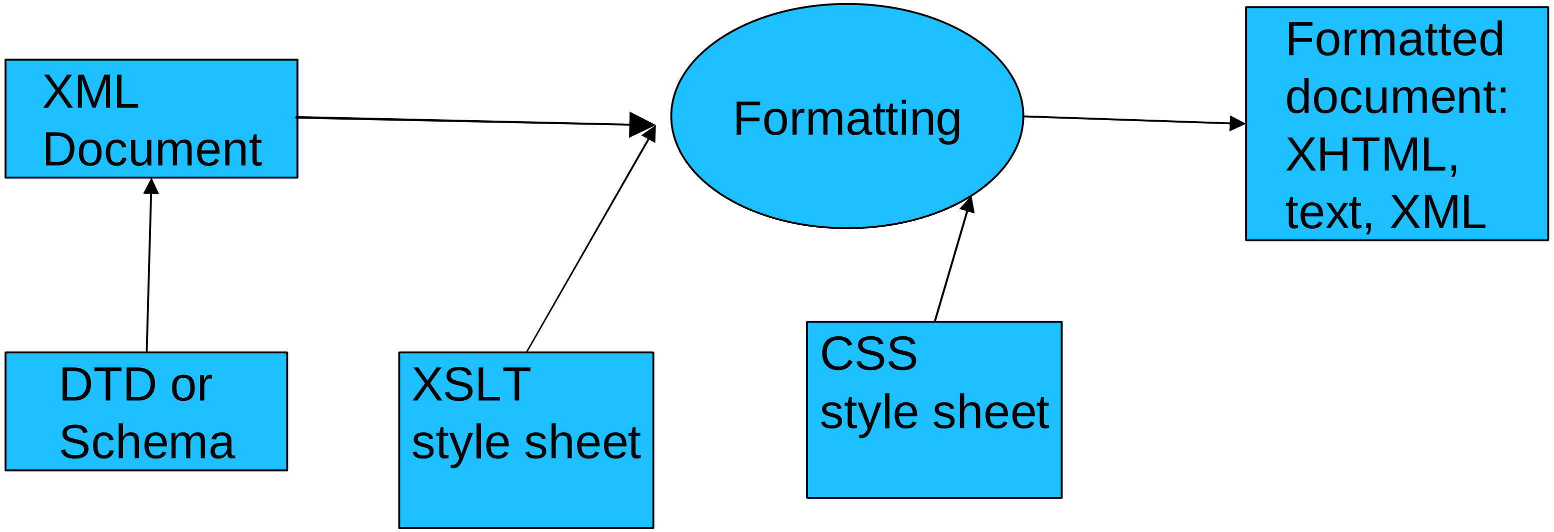
Style sheets

- for output formatting
- more than one style sheet /DTD or/and document
- Cascading Style Sheets (CSS)
- XML Stylesheet Language (XSL)

Publishing process



Using XML standards



XML Document

DTD or Schema

XSLT style sheet

Formatting

CSS style sheet

Formatted document: XHTML, text, XML