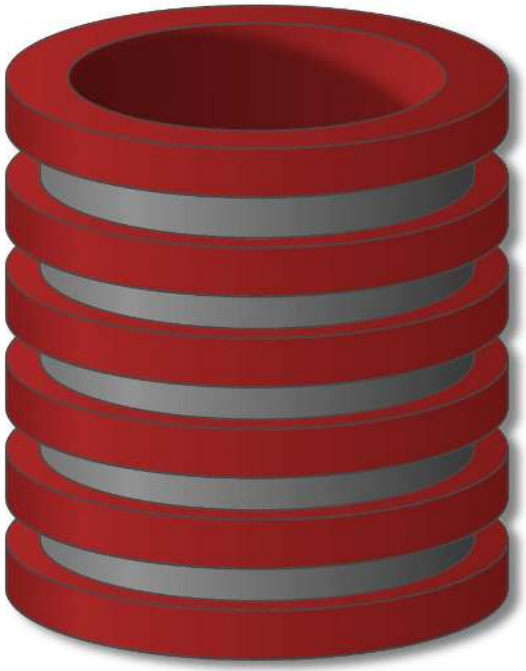

XML Data

DTDs,
IDs & IDREFs

"Well-Formed" XML

Adheres to basic structural requirements

- Single root element ✓
- Matched tags, proper nesting ✓
- Unique attributes within elements ✓

```
<?xml version="1.0" ?>
<!-- Bookstore with no DTD -->
- <Bookstore>
  - <Book ISBN="ISBN-0-13-713526-2" Price="85" Edition="3rd">
      <Title>A First Course in Database Systems</Title>
    - <Authors>
      - <Author>
          <First_Name>Jeffrey</First_Name>
          <Last_Name>Ullman</Last_Name>
        </Author>
      - <Author>
          <First_Name>Jennifer</First_Name>
          <Last_Name>Widom</Last_Name>
        </Author>
      </Authors>
    </Book>
  - <Book ISBN="ISBN-0-13-815504-6" Price="100">
      <Remark>Buy this book bundled with "A First Course" -- a great deal!</Remark>
      <Title>Database Systems: The Complete Book</Title>
    - <Authors>
```

"Valid" XML

Adheres to basic structural requirements

- Also adheres to content-specific specification
  - *Document Type Descriptor* (DTD)
  - *XML Schema* (XSD)

```
<?xml version="1.0" ?>
<!-- Bookstore with no DTD  -->
- <Bookstore>
  - <Book ISBN="ISBN-0-13-713526-2" Price="85" Edition="3rd">
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        </Author>
      - <Author>
          <First_Name>Jennifer</First_Name>
          <Last_Name>Widom</Last_Name>
        </Author>
      </Authors>
    </Book>
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      <Remark>Buy this book bundled with "A First Course" -- a great deal!</Remark>
      <Title>Database Systems: The Complete Book</Title>
    - <Authors>
```
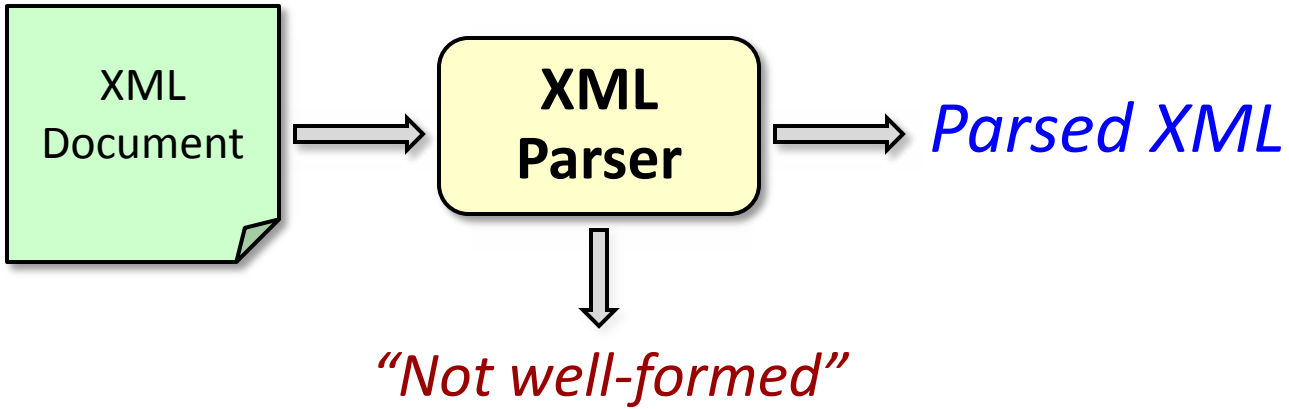

"Valid" XML

Adheres to basic structural requirements

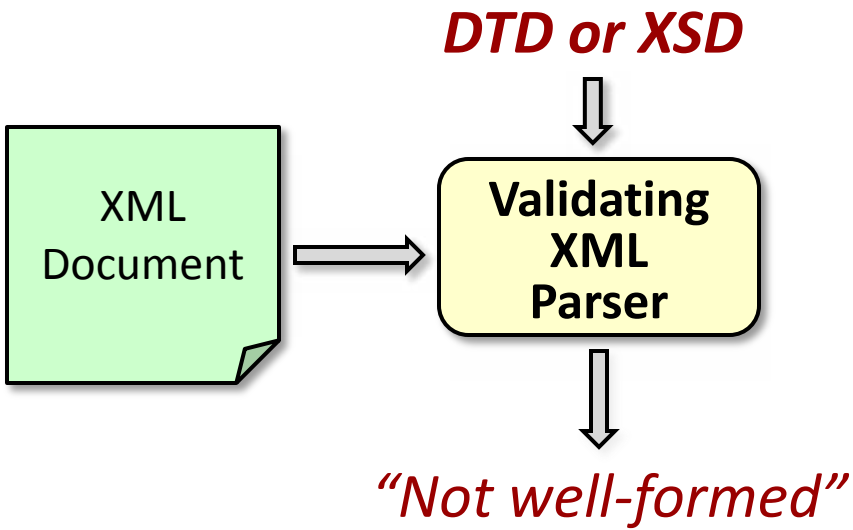
- Also adheres to content-specific specification



"Valid" XML

Adheres to basic structural requirements

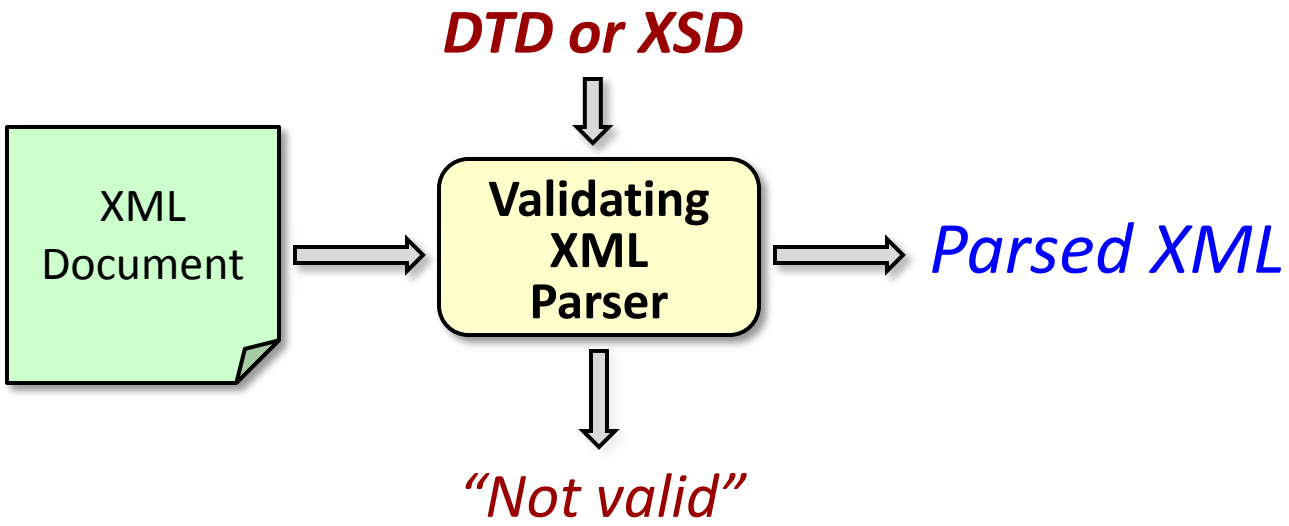
- Also adheres to content-specific specification



"Valid" XML

Adheres to basic structural requirements

- Also adheres to content-specific specification



Document Type Descriptor (DTD)

- Grammar-like language for specifying elements, attributes, nesting, ordering, #occurrences
- Also special attribute types ID and IDREF(S)

pointers

```
<!DOCTYPE Bookstore [
   <!ELEMENT Bookstore (Book*, Author*)>
   <!ELEMENT Book (Title, Remark?)>
   <!ATTLIST Book ISBN ID #REQUIRED
             Price CDATA #REQUIRED
             Authors IDREFS #REQUIRED>
   <!ELEMENT Title (#PCDATA)>
   <!ELEMENT Remark (#PCDATA | BookRef)*>
   <!ELEMENT BookRef EMPTY>
   <!ATTLIST BookRef book IDREF #REQUIRED>
   <!ELEMENT Author (First_Name, Last_Name)>
   <!ATTLIST Author Ident ID #REQUIRED>
   <!ELEMENT First_Name (#PCDATA)>
   <!ELEMENT Last_Name (#PCDATA)>
]>
```

DTD/XSD versus none (well-formed)

+ DTD/XSD

Programs can assume structure
"
Css/XSL
Specification – data exchange
Documentation

Benefits of "typing"

- DTD/XSD

Flexibility, ease of change
DTDs can be messy — irregular
XSDs

really

Benefits of "no typing"