# Design of XML documents





## Data modeling of hierachical structures

**Is it possible to apply conceptual modeling to design XML documents ?**

**XML documents can be designed in the following way:**

(1) First, we analyse a domain and we create a conceptual schema,

(2) Next, we translate a conceptual schema into a definition of structure of XML document (Document Type Declaration or XML Schema)

(3) Then, instances of objects and links are translated into XML documents





## Transformation of objects

| 913456-78: PERSON |
|---|
| ssno: 913456-78 |
| full name: Janusz R. Getta |
| date of birth: 03-OCT-1953 |
| address: 6 Barham Pl. |

```
<person>
   <ssno>913456-78</ssno>
   <full-name>Janusz R. Getta</full-name>
   <date-of-birth>03-OCT-1953</date-of-birth>
   <address>6 Barham Pl.</address>
</person>
```





## Transformation of objects

| AU.Wollongong:CITY |
|---|
| name: Wollongong |
| population: 80K |
| country: Australia |
| state: New South Wales |

```
<city>
   <name>Wollongong</name>
   <population>80K</population>
   <country>Australia</country>
   <state>New South Wales</state>
</city>
```





## Transformation of objects with multivalued attributes

| 1234567: EMPLOYEE |
|---|
| enum: 1234567 |
| full-name: Janusz R. Getta |
| salary: 200K |
| hobbies: cooking, painting, gardening |

```
<employee>
   <enum>1234567</enum>
   <full-name>Janusz R. Getta</full-name>
   <salary>200K</salary>
   <hobbies>
       <hobby>cooking</hobby>
       <hobby>painting</hobby>
       <hobby>gardening</hobby>
   </hobbies>
</employee>
```





## Transformation of 1-1 associations

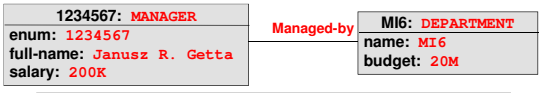
| 1234567: MANAGER |
|---|
| enum: 1234567 |
| full-name: Janusz R. Getta |
| salary: 200K |

Manages

| MI6: DEPARTMENT |
|---|
| name: MI6 |
| budget: 20M |

```
<manager>
   <enum>1234567</enum>
   <full-name>Janusz R. Getta</full-name>
   <salary>200K</salary>
   <manages>
      <department>
         <name>MI6</name>
         <budget>20M</budget>
      </department>
   </manages>
</manager>
```

## Transformation of 1-1 associations

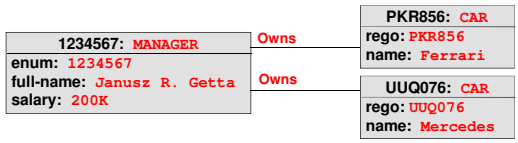



```
<department>
   <name>MI6</name>
   <budget>20M</budget>
   <managed-by>
      <manager>
         <enum>1234567</enum>
         <full-name>Janusz R. Getta</full-name>
         <salary>200K</salary>
      </manager>
   </managed-by>
</department>
```





## Transformation of 1-M associations







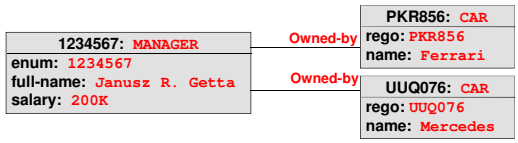

## Transformation of 1-M associations

```
<manager>
   <enum>1234567</enum>
   <full-name>Janusz R. Getta</full-name>
   <salary>200K</salary>
   <owns>
      <car>
         <rego>PKR856</rego>
         <name>Ferrari</name>
      </car>
      <car>
         <rego>UUQ076</rego>
         <name>Mercedes</name>
      </car>
   </owns>
</manager>
```





## Transformation of M-1 associations







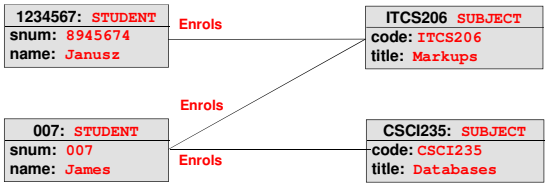

## Transformation of 1-M associations

```
<cars>
   <car>
      <rego>PKR856</rego>
      <name>Ferrari</name>
      <used-by>
      <owner-ref IDREF="1234567"/>
   </car>
   <car>
      <rego>UUQ076</rego>
      <name>Mercedes</name>
      <owner-ref IDREF="1234567"/>
   </car>
   <manager ID="1234567">
      <full-name>Janusz R. Getta</full-name>
      <salary>200K</salary>
   </manager>
</cars>
```





## Transformation of M-N associations



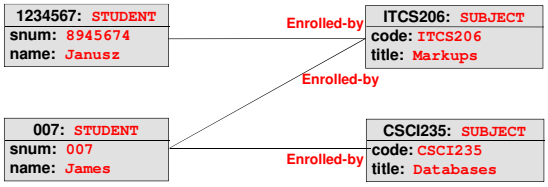
## Transformation of M-N associations

```
<enrolments>
  <student>
      <snumber>8945674</snumber>
      <name>Janusz</name>
      <enrols>
          <subject-ref IDREF="ITCS206"/>
      </enrols>
  </student>
  <student>
      <snumber>007</snumber>
      <name>James</name>
      <enrols>
          <subject-ref IDREF="ITCS206"/>
          <subject-ref IDREF="CSCI253"/>
      </enrols>
  </student>
  <subject ID="ITCS206">
      <title>Markups</title>
  </subject>
  <subject ID="CSCI253">
      <title>Databases</title>
  </subject>
</enrolments>
```





## Transformation of M-N associations







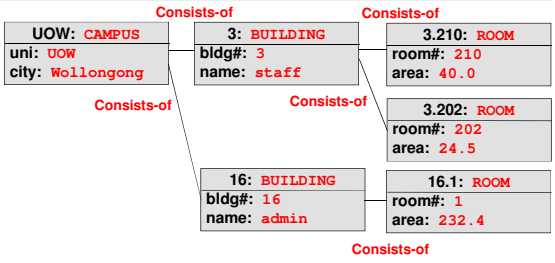

## Transformation of M-N associations

```
<enrolments>
    <subject>
        <code>ITCS206</code>
        <title>Markups</title>
        <enrolled-by>
            <student-ref IDREF="8945674"/>
            <student-ref IDREF="007"/>
        </enrolled-by>
    </subject>
    <subject>
        <code>CSCI235</code>
        <title>Databases</title>
        <enrolled-by>
            <student-ref IDREF="007"/>
        </enrolled-by>
    </subject>
    <student ID="8945674">
        <name>Janusz</name>
    </student>
    <student ID="007">
        <name>James</name>
    </student>
</enrolments>
```





## Representation of hierarchical structures







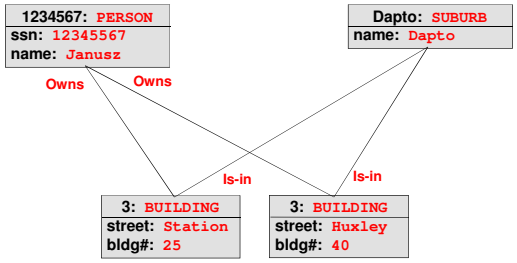

## Representation of hierarchical structures

```
<campus>
    <uni>UOW</uni>
    <city>Wollongong</city>
    <building>
        <bldg#>3</bldg#>
        <name>staff</name>
        <room>
            <room#>210</room#>
            <area>40.0</area>
        </room>
        <room>
            <room#>202</room#>
            <area>24.5</area>
        </room>
    </building>
    <building>
        <bldg#>16</bldg#>
        <name>admin</name>
        <room>
            <room#>1</room#>
            <area>232.4</area>
        </room>
    </building>
</campus>
```





## Representation of network structures



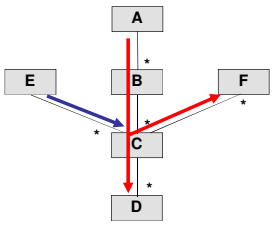
## Representation of network structures

```
<real-estate>
   <suburb>
      <name>Dapto</name>
      <building ID="Station.25">
         <street>Station</street>
         <bldg#>25</bldg#>
      </building>
      <building ID="Huxley.40">
         <street>Huxley</street>
         <bldg#>40</bldg#>
      </building>
   </suburb>
   <person>
      <ssn>1234567</ssn>
      <name>Janusz</name>
      <owns IDREF="Station.25"/>
      <owns IDREF="Huxley.40"/>
   </person>
</real-estate>
```





## Representation of network structures

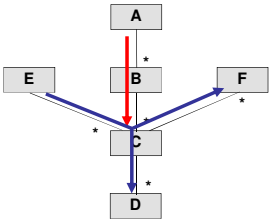



```
<domain>
   <A>
      ...
      <B>
         ...
         <C ID="c">
            ...
            <D>...</D>
            <F>...</F>
         </C>
      </B>
   </A>
   <E REFID='c'>...</E>
</domain>
```





## Representation of network structures




```
<domain>
   <E>
      ...
      <C ID="c">
         ...
         <D>...</D>
         <F>...</F>
      </C>
   </E>
   <A>
      ...
      <B IDREF="c">
         ...
      </B>
   </A>
</domain>
```