

# Design of XML documents

## Data modeling of hierarchical 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>
```

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### Transformation of 1-1 associations

1234567: <b>MANAGER</b> enum: 1234567 full-name: Janusz R. Getta salary: 200K	Managed-by	MI6: <b>DEPARTMENT</b> name: MI6 budget: 20M
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```
<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>
```

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### Transformation of 1-M associations

1234567: <b>MANAGER</b> enum: 1234567 full-name: Janusz R. Getta salary: 200K	Owns	PKR856: <b>CAR</b> rego: PKR856 name: Ferrari
	Owns	UUQ076: <b>CAR</b> rego: UUQ076 name: Mercedes

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### 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>
```

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### Transformation of M-1 associations

1234567: <b>MANAGER</b> enum: 1234567 full-name: Janusz R. Getta salary: 200K	Owned-by	PKR856: <b>CAR</b> rego: PKR856 name: Ferrari
	Owned-by	UUQ076: <b>CAR</b> rego: UUQ076 name: Mercedes

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### 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>
```

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### Transformation of M-N associations

1234567: <b>STUDENT</b> snum: 8945674 name: Janusz	Enrols	ITCS206 <b>SUBJECT</b> code: ITCS206 title: Markups
007: <b>STUDENT</b> snum: 007 name: James	Enrols	CSCI235: <b>SUBJECT</b> code: CSCI235 title: Databases

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## 02 Design of XML documents

### Transformation of M-N associations

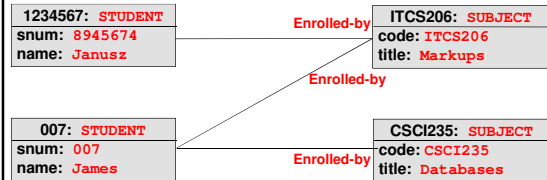
```
<enrolments>
  <student>
    <snum>8945674</snum>
    <name>Janusz</name>
    <enrols>
      <subject-ref IDREF="ITCS206"/>
    </enrols>
  </student>
  <student>
    <snum>007</snum>
    <name>James</name>
    <enrols>
      <subject-ref IDREF="ITCS206"/>
      <subject-ref IDREF="CSCI253"/>
  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

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## 02 Design of XML documents

### Transformation of M-N associations



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### Transformation of M-N associations

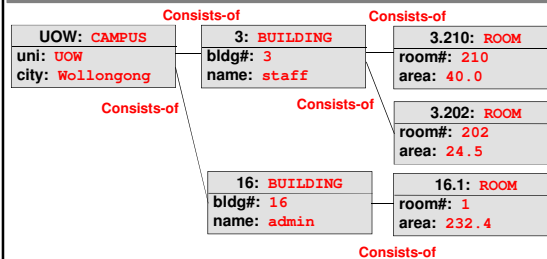
```
<enrolments>
  <subject>
    <code>ITCS206</code>
    <title>Markups</title>
    <enrolled-by>
      <student-ref IDREF="8945674"/>
      <student-ref IDREF="007"/>
    </enrolled-by>
  </subject>
  <subject>
    <code>CSCI235</code>
    <title>Databases</title>
    <enrolled-by>
      <student-ref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

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## 02 Design of XML documents

### Representation of hierarchical structures



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## 02 Design of XML documents

### Representation of hierarchical structures

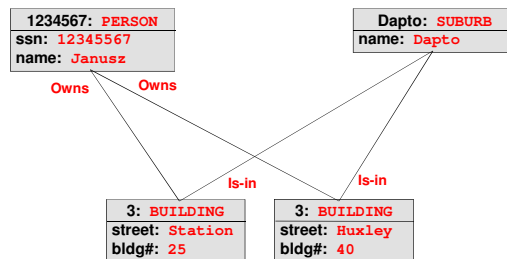
```
<campus>
  <uni>UOW</uni>
  <city>Wollongong</city>
  <building>
    <bldg#>3</bldg#>
    <name>staff</name>
    <room>
      <room#>210</room#>
      <area>40.0</area>
    </room>
    <room>
      <room#>202</room#>
      <area>24.5</area>
    </room>
  </building>
  <building>
    <bldg#>16</bldg#>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

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## 02 Design of XML documents

### Representation of network structures



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## 02 Design of XML documents

### Representation of network structures

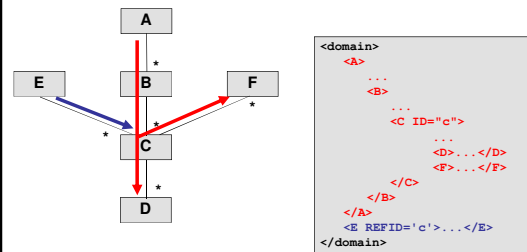
```
<real-estate>
  <suburb>
    <name>Dapto</name>
    <building ID="Station.25">
      <street>Station</street>
      <bldg#>25</bldg#>
    </building>
    <building ID="Huxley.40">
      <street>Huxley</street>
      <bldg#>40</bldg#>
    </building>
  </suburb>
  <person>
    <ssn>1234567</ssn>
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

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## 02 Design of XML documents

### Representation of network structures

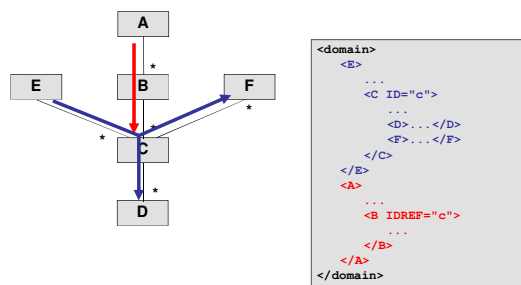


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### Representation of network structures



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