

CSCI235 – Database Systems

BSON Design

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3 October 2021

Acknowledgements

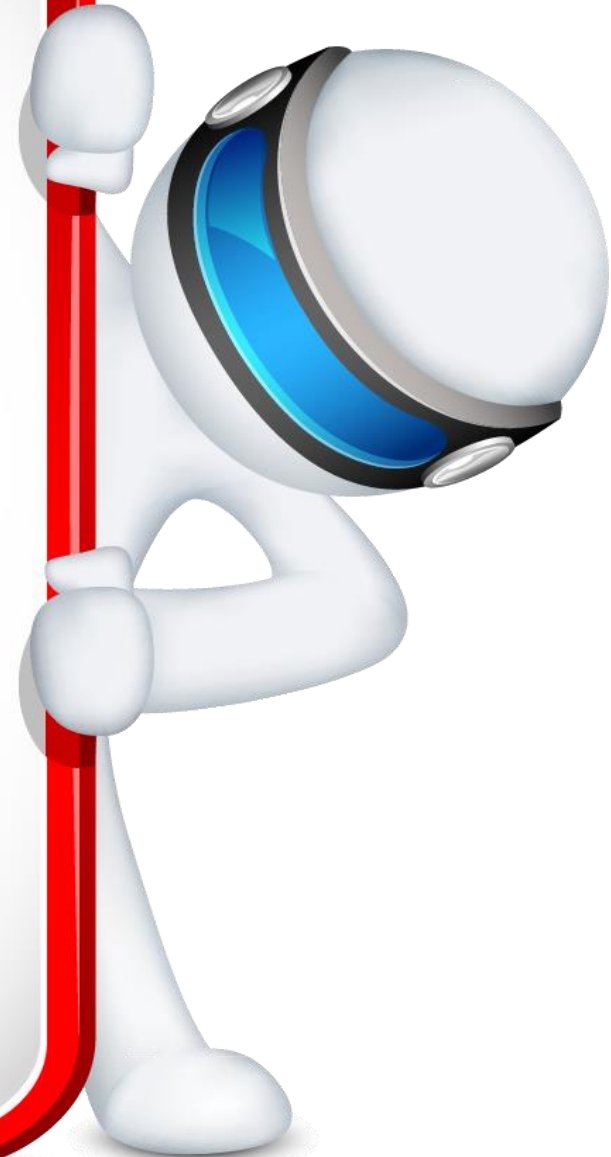
The following presentation were adapted from the lecture slides of:

CSCI235 – Database Systems,
17BSONDesign

By Dr Janusz R. Getta,
School of Computing and Information Technology
University of Wollongong, Australia

Outline:

- **Implementation of objects**
- Implementation of one-to-one association
- Implementation of one-to-many association
- Implementation of hierarchical structures
- Implementation of many-to-many association
- Implementation of network structure



Implementation of objects

Simplified

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

```
{ "name":"Wollongong",  
  "population":"80K",  
  "country":"Australia",  
  "state":"New South Wales" }
```

Implementation of objects

Extended

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

```
{  "CITY": { "name": "Wollongong",  
            "population": "80K",  
            "country": "Australia",  
            "state": "New South Wales" }  
}
```

Implementation of objects with multivalued attributes

Simplified

E123456: EMPLOYEE	
enum:	1234567
full-name:	Janusz R. Getta
salary:	200K
hobbies:	cooking, painting, gardening

```
{  "enum":1234567,
   "full-name":"Janusz R. Getta",
   "salary":"200K",
   "hobbies":[ "cooking",
                "painting",
                "gardening" ]
}
```

Implementation of objects with multivalued attributes

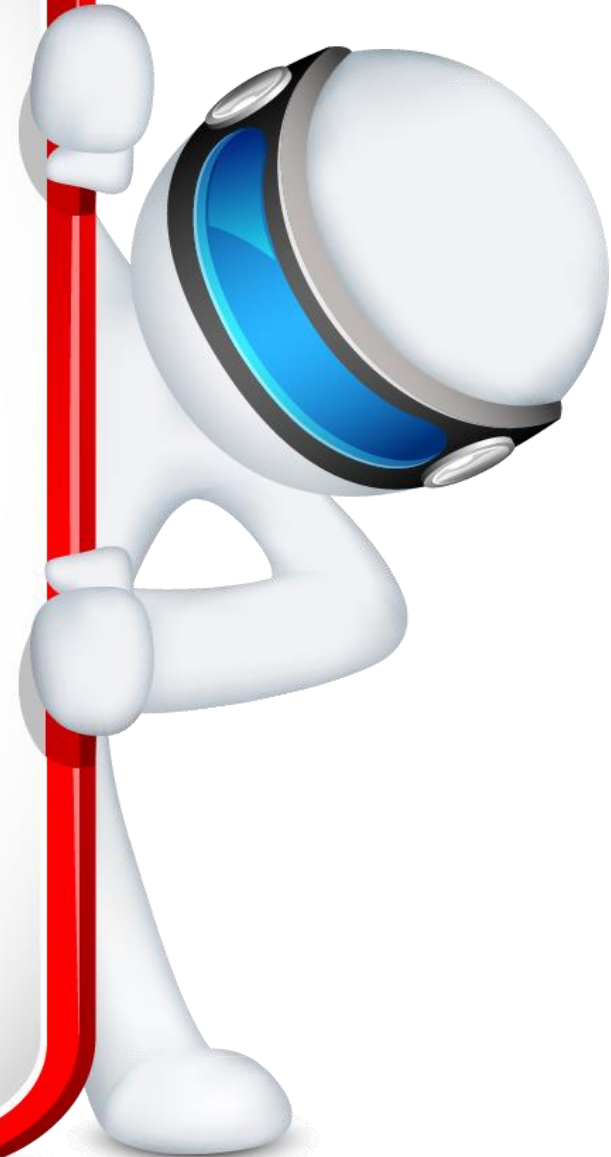
Extended

E123456: EMPLOYEE	
enum:	1234567
full-name:	Janusz R. Getta
salary:	200K
hobbies:	cooking, painting, gardening

```
{  "EMPLOYEE": {  "enum": 1234567,
    "full-name": "Janusz R. Getta",
    "salary": "200K",
    "hobbies": [  "cooking",
                  "painting",
                  "gardening" ] }
}
```

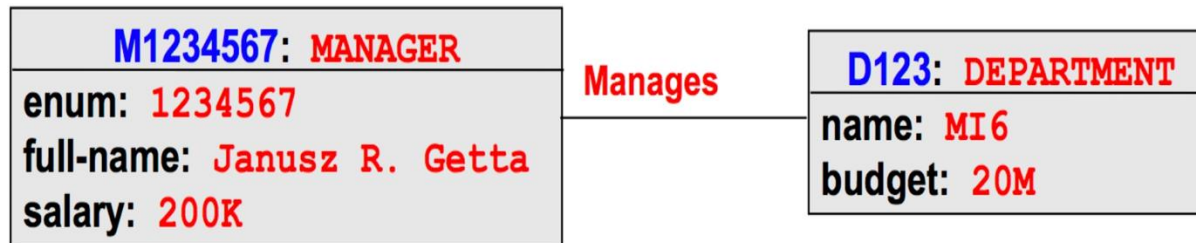
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Nested implementation of 1-1 associations

Simplified



```
{  "enum":1234567,  
  "full-name":"Janusz R. Getta",  
  "salary":"200K",  
  "name":"MI6",  
  "budget":"20M"  
}
```

Nested implementation of 1-1 associations

Extended



```
{  "MANAGER": {"enum":1234567,
               "full-name":"Janusz R. Getta",
               "salary":"200K",
               "Manages": { "DEPARTMENT": {"name":"MI6",
                                             "budget":"20M" }
                           }
             }
}
```

Nested implementation of 1-1 associations

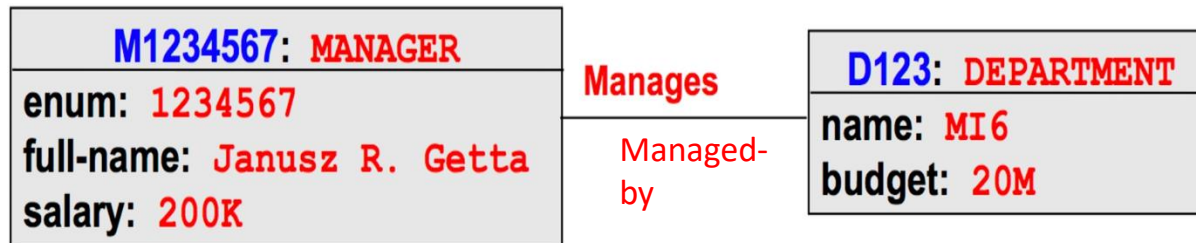
Extended



```
{  "DEPARTMENT": { "ID": "D123",
                  "name": "MI6",
                  "budget": "20M",
                  "Managed-by": { "MANAGER": { "ID": "M1234567",
                                                "enum": 12324567,
                                                "full-name": "Janusz R. Getta",
                                                "salary": "20K" }
                                }
                }
}
```

Association implementation of 1-1 associations

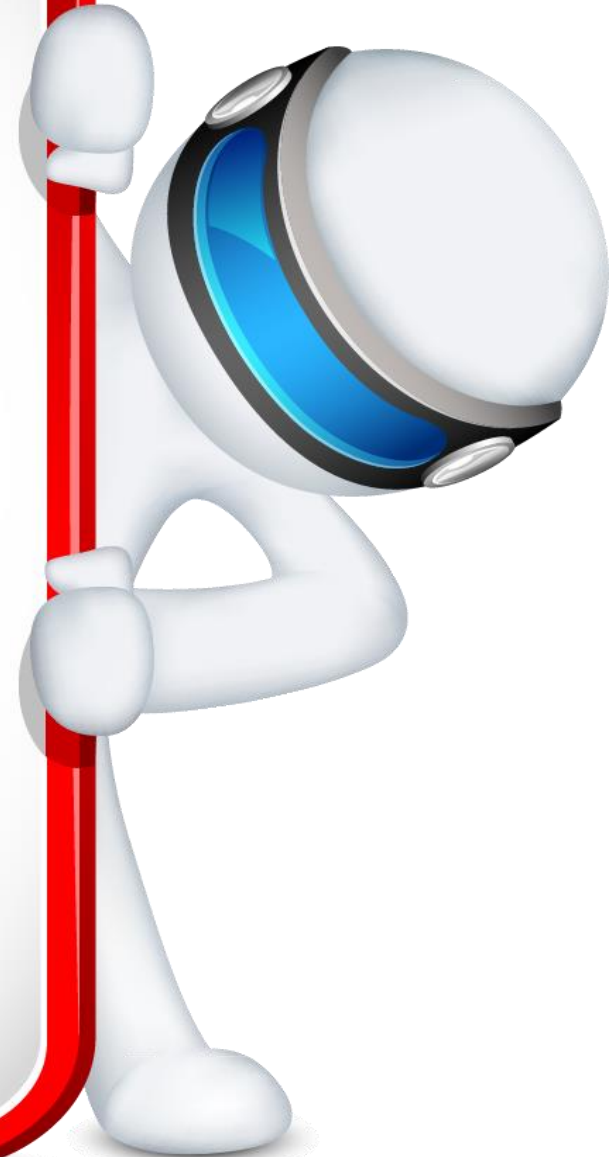
Extended



```
{ "managed-by": { "DEPARTMENT": { "ID": "D123",  
                                   "name": "MI6",  
                                   "budget": "20M" },  
                  "MANAGER": { "ID": "M1234567",  
                                "enum": 1234567,  
                                "fullName": "Janusz R Getta",  
                                "salary": "20K"}  
                  }  
}
```

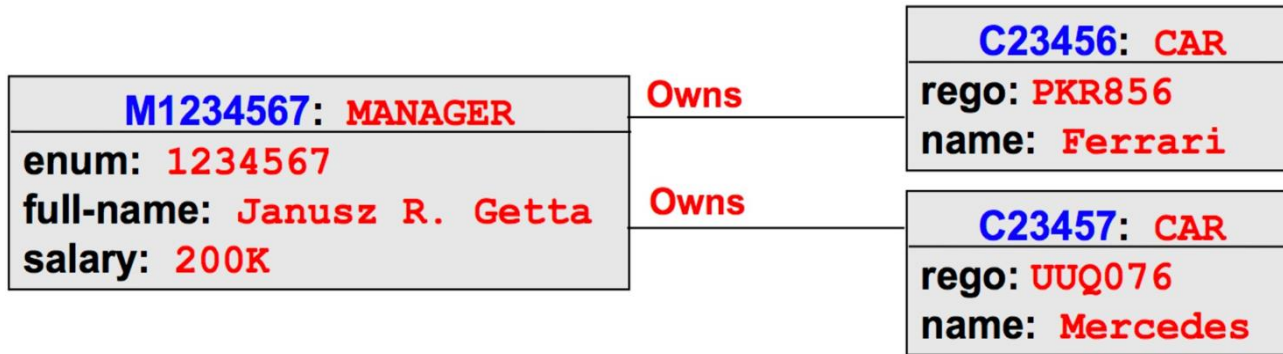
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Nested implementation of one-to-many associations

Simplified



```
{  "enum": 1234567,
  "full-name": "Janusz R Getta",
  "salary": "200K",
  "owns": [ {  "rego": "PKR856",
               "name": "Ferrari" },
            {  "rego": "UUQ076",
               "name": "Mercedes" } ]
}
```

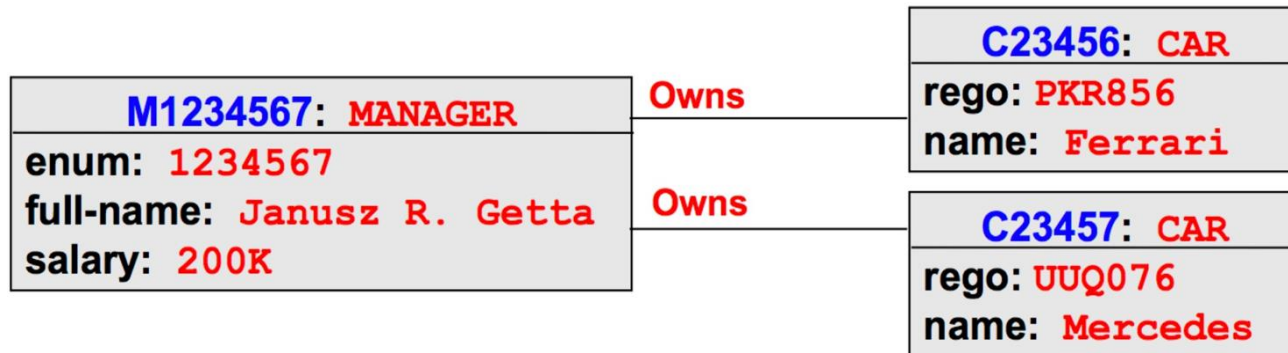
Nested implementation of one-to-many associations

Extended

[illegible]

Association Implementation of one-to-many associations

Simplified



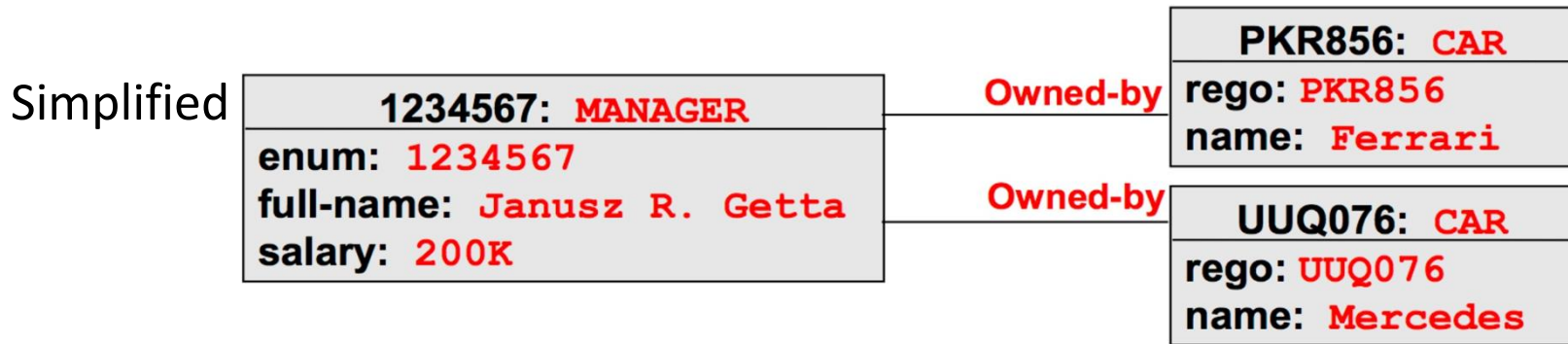
```
{  "enum": 1234567,  
  "full-name": "Janusz R Getta",  
  "salary": "200K",  
  "owns": [ "PKR856", "UUQ076" ] }  
{  "rego": "PKR856",  
  "name": "Ferrari" },  
{  "rego": "UUQ076",  
  "name": "Mercedes" }
```


Association Implementation of one-to-many associations

Extended

```
{  "MANAGER": {  "ID": "M1234567",  
    "enum": 1234567,  
    "full-name": "Janusz R Getta",  
    "salary": "200K",  
    "owns": [ { "CAR": "C23456" },  
               { "CAR": "C23457" } ] ] }  
  
{  "CAR": {  "ID": "CS23456",  
    "rego": "PKR856",  
    "name": "Ferrari" } }  
  
{  "CAR": {  "ID": "C23457",  
    "rego": "UUQ076",  
    "name": "Mercedes" } }
```

Association Implementation of one-to-many associations



```
{  "enum": 1234567,
  "full-name": "Janusz R Getta",
  "salary": "200K" }
{  "rego": "PKR856",
  "name": "Ferrari",
  "owned-by": 1234567 }
{  "rego": "UUQ076",
  "name": "Mercedes",
  "owned-by": 1234567 }
```

Association Implementation of one-to-many associations

Extended

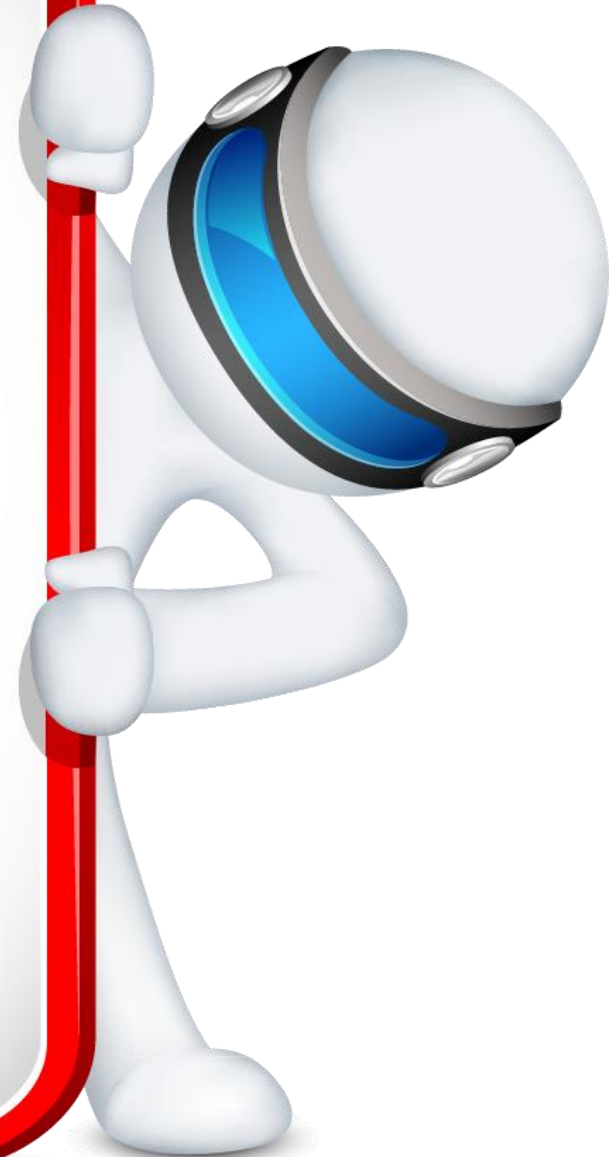
```
{  "MANAGER":{  "ID":"M1234567",
                "enum": 1234567,
                "full-name":"Janusz R Getta",
                "salary":"200K"  }}

{  "CAR":{  "ID":"CS23456",
            "rego":"PKR856",
            "name":"Ferrari",
            "owned-by":{  "MANAGER":1234567  }  }  }

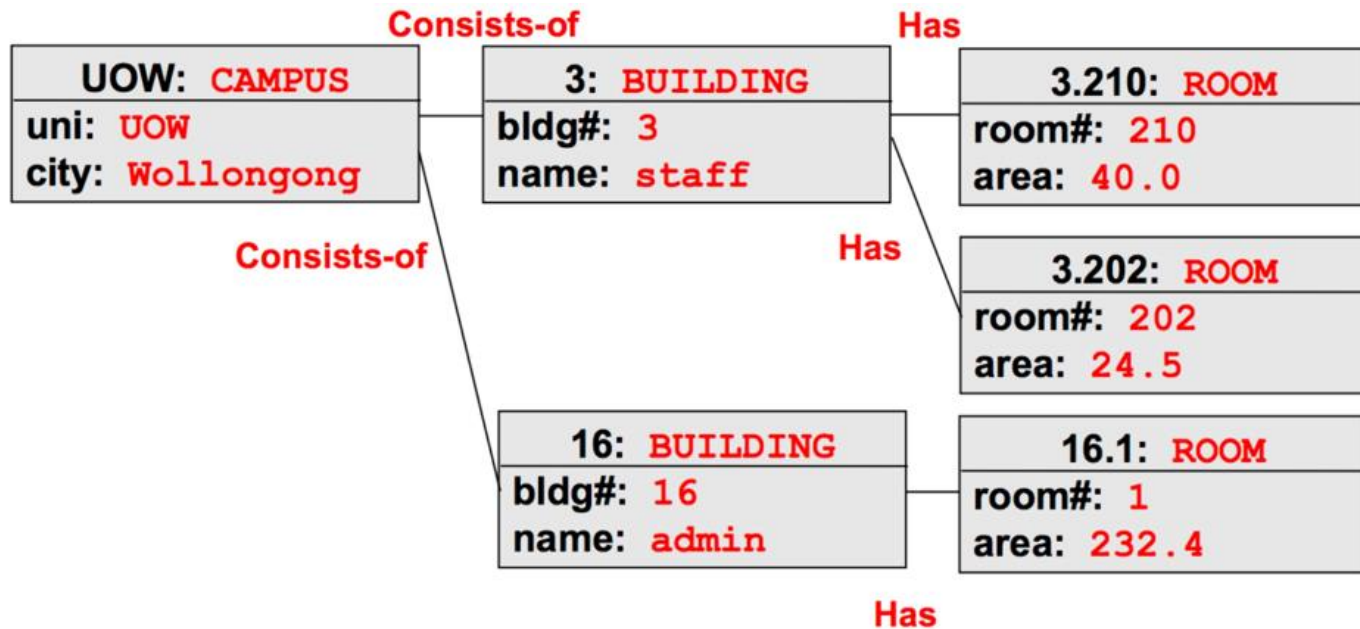
{  "CAR":{  "ID":"C23457",
            "rego":"UUQ076",
            "name":"Mercedes",
            "owned-by":{  "MANAGER":1234567  }  }  }
```

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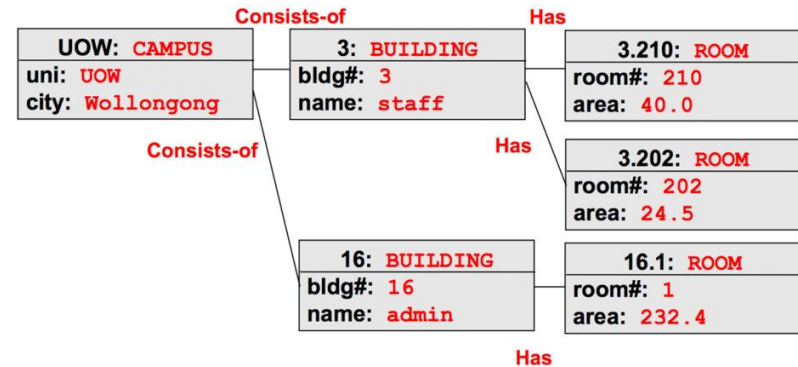


Implementation of hierarchical structures



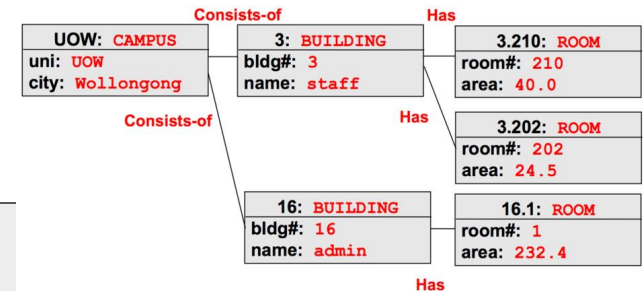
Simplified

```
{  "uni":"UOW",
   "city":"Wollongong",
   "Consists of": [ {  "bldg":3,
                        "name":"staff",
                        "Has":[ {"room#":210,
                                "area":40.0},
                               {"room#":202,
                                "area":24.5 } ]
                      },
                    {  "bldg.#":16,
                        "name":"admin",
                        "Has":[ {"room#":1,
                                "area":232.4} ]
                      }
                    ]
}
```



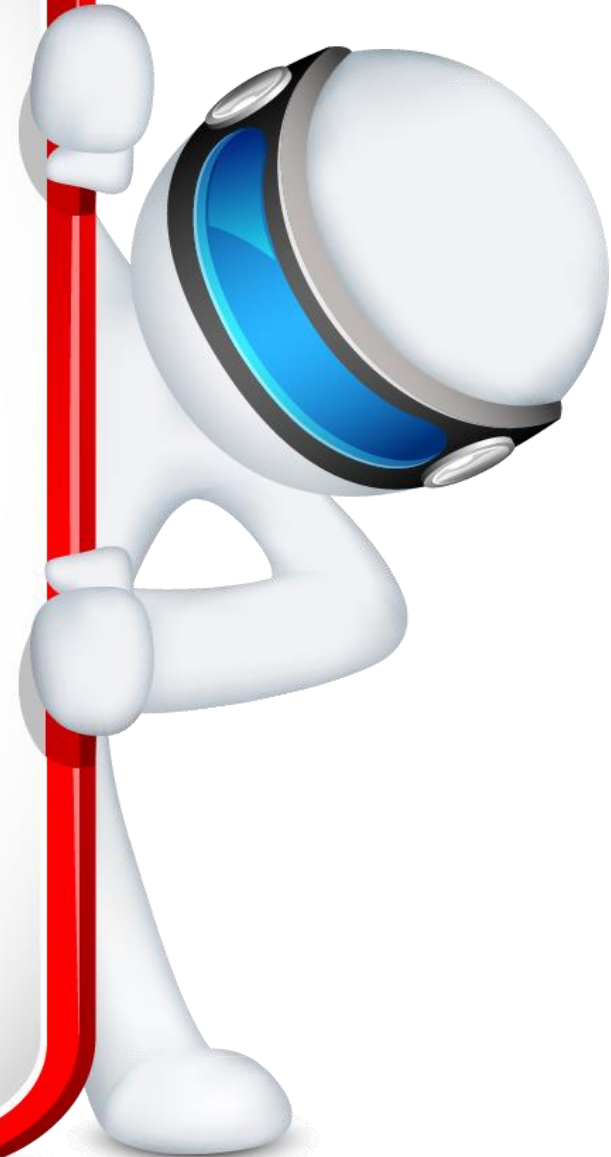
Extended

```
{ "CAMPUS": [ { "uni":"UOW",
  "city":"Wollongong",
  "Consists of": {"BUILDING": [ { "bldg":3,
    "name":"staff",
    "Has": {"ROOM": [ { "room#":210,
      "area":40.0 },
      { "room#":202,
        "area":24.5 } ] }},
    { "bldg":16,
      "name":"admin",
      "Has": {"ROOM": [ { "room#":1,
        "area":232.4 } ] } } ]
  } ]
}
```

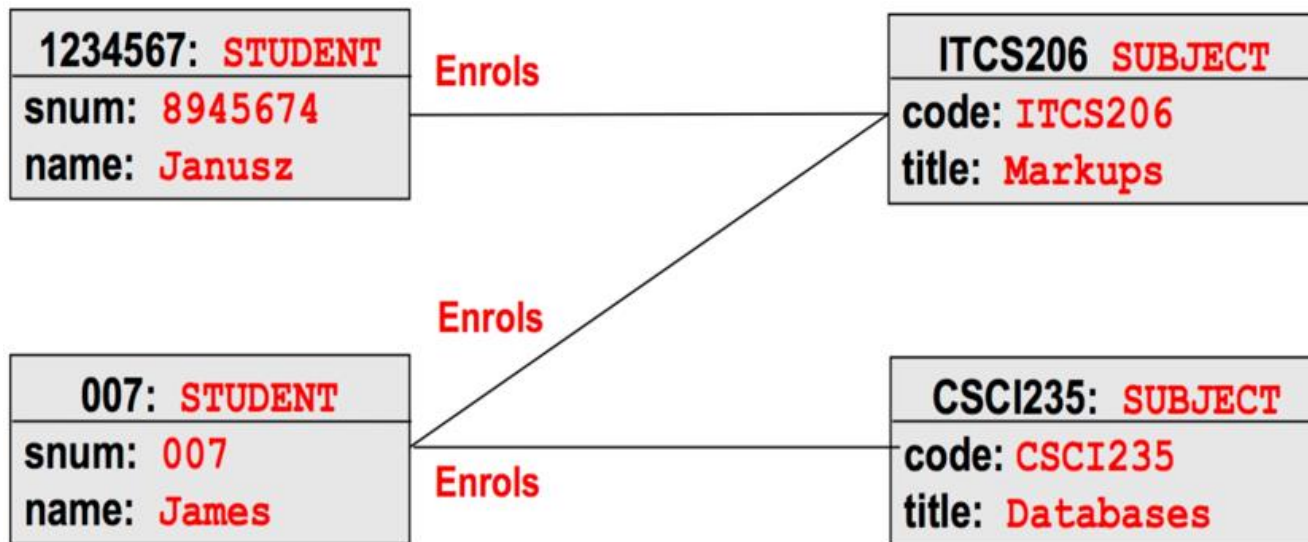


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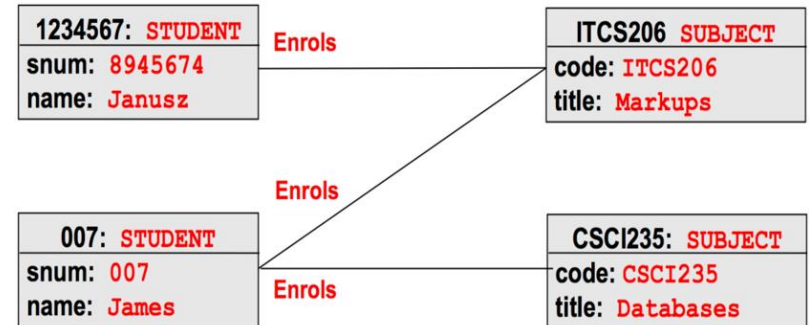
Implementation of many-to-many associations



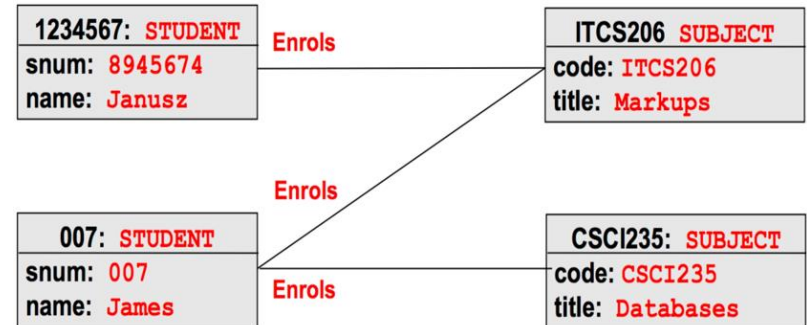
Implementation of many-to-many associations

Simplified

```
{ "snum":8945674,  
  "name":"Janusz",  
  "Enrols":["ITCS206"]}  
{ "snum":007,  
  "name":"James",  
  "Enrols":["ITCS206","CSCI235"] }  
{ "code":"ITCS206",  
  "title":"Markkups",  
  "Students enrolled":[8945674, 007]  
}  
{ "code":"CSCI235",  
  "title":"Databases",  
  "Students enrolled": [007]  }
```



Implementation of many-to-many associations



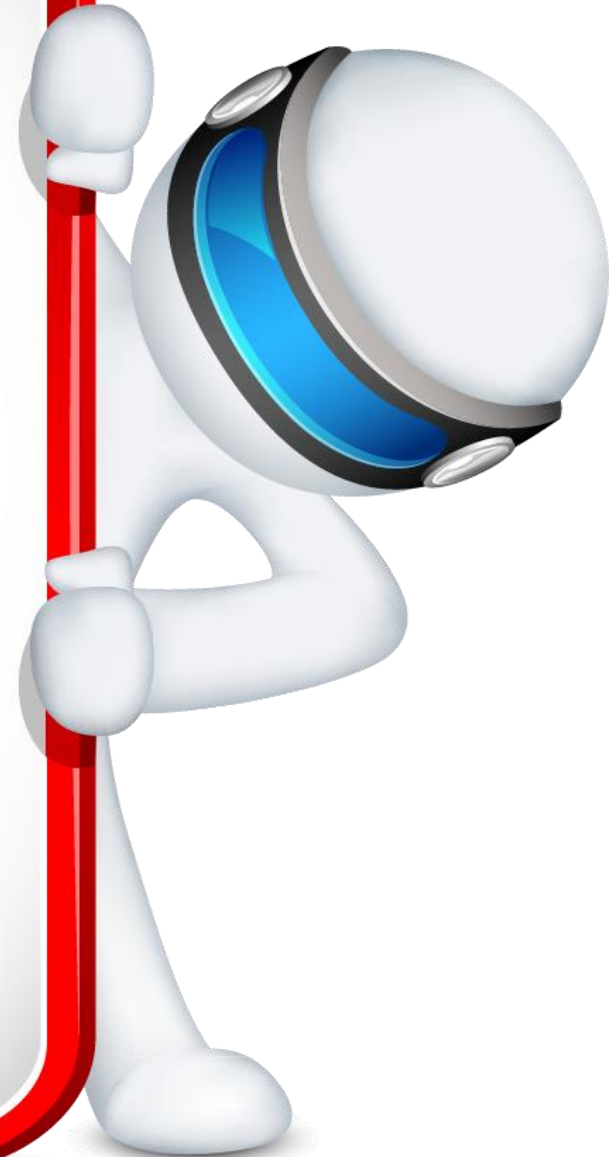
Extended

```
{ "STUDENT": { "snum":8945674,  
               "name":"Janusz",  
               "Enrols": ["ITCS206"]  } }  
  
{ "STUDENT": { "snum":007,  
               "name":"James",  
               "Enrols":["ITCS206","CSCI235"]  } }  
  
{ "SUBJECT": { "code":"ITCS206",  
               "title":"Markkups",  
               "Students enrolled":[8945674, 007]  } }  
  
{ "SUBJECT": { "code":"CSCI235",  
               "title":"Databases",  
               "Students enrolled": [007]  } }
```

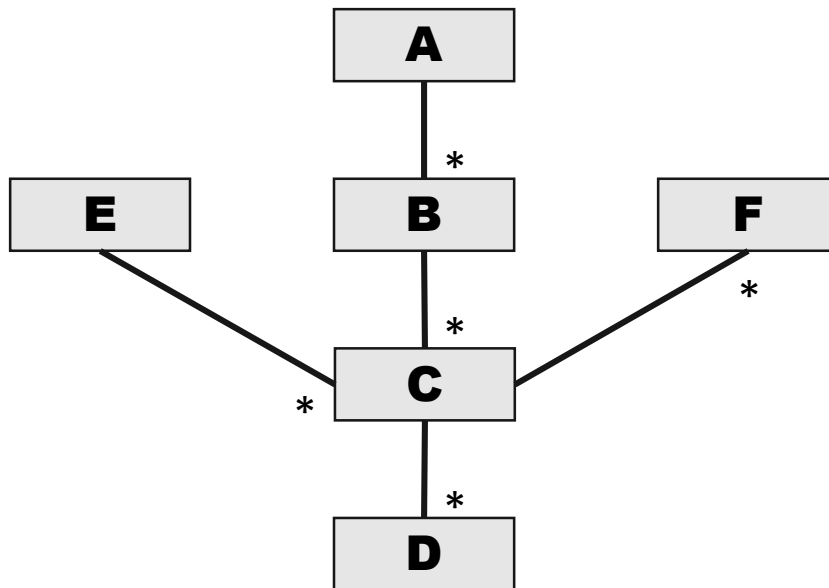


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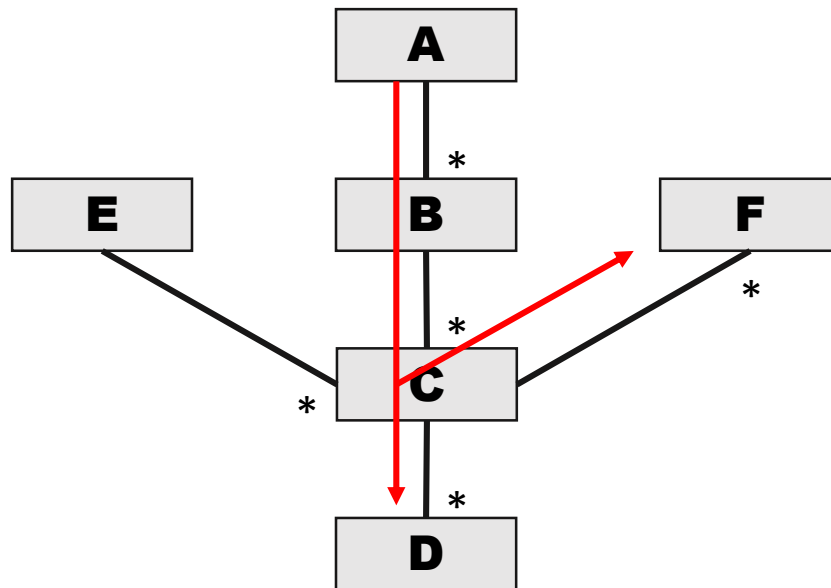
Representation of network structures



How to create JSON documents to capture the information of such network structures?

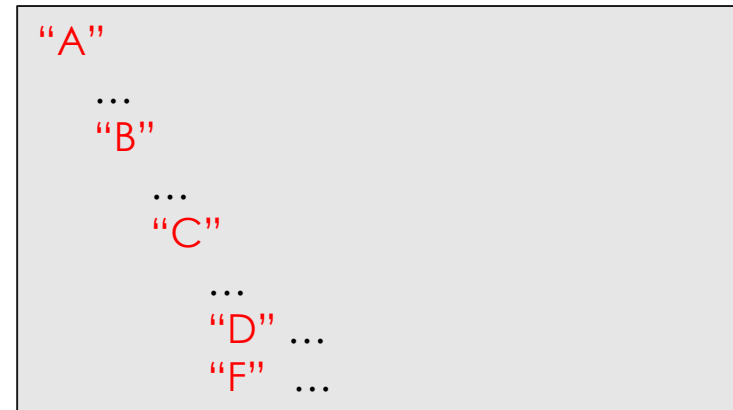


Representation of network structures

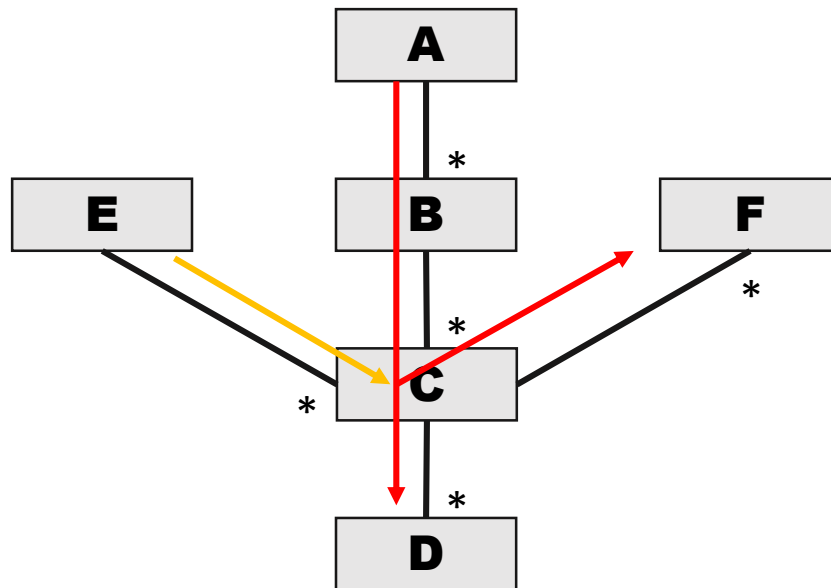


One possible way:

- Starting with an entity to contain many other entities (one-to-many association.)



Representation of network structures



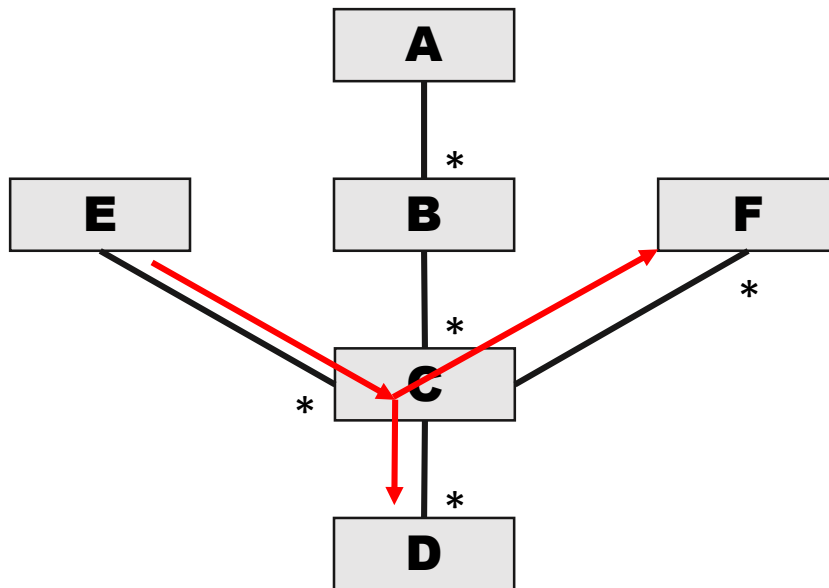
One possible way:

- Starting with an entity to contain many other entities (one-to-many association.)

```
"A"  
...  
"B"  
...  
"C":{"ID": "c"},  
...  
"D" ...  
"F" ...  
"E":[{"REF": "c"},...]
```

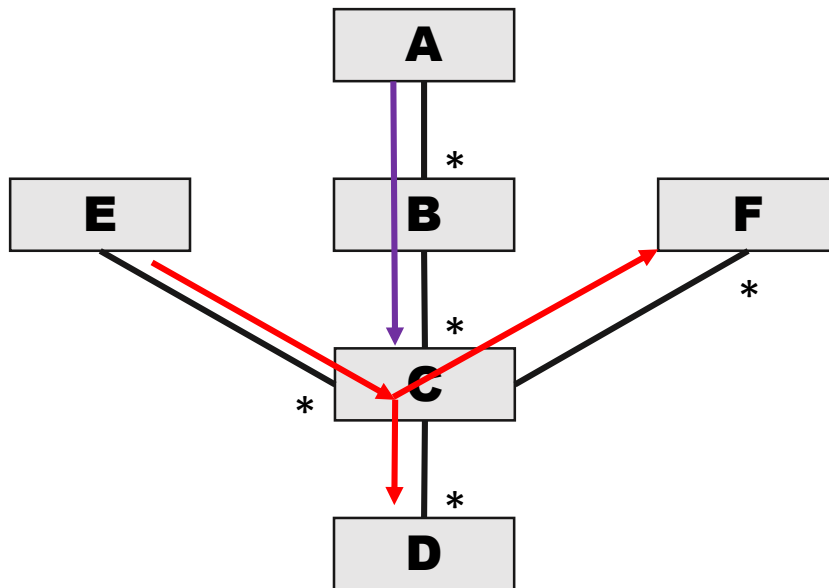
Representation of network structures

Alternatively, we can:



Representation of network structures

Alternatively, we can:



```
"E"  
...  
"C": {"ID": "c"}  
...  
"D" ...  
"F" ...  
"A"  
...  
"B": [{"REF": "C"}, ...]
```

References

- Introducing JSON, <http://www.json.org/>
- BSON, <http://bsonspec.org/>
- <https://docs.mongodb.com/manual/>
- Chodorow K. MongoDB The Definitive Guide, O'Reilly, 2013