INFO-H-415 Advanced Databases
Temporal Databases Part 1
Traduction of EA schema to relational databases

23 octobre 2019
Relational model

In this model the principal concept is the relation (∼ table)

The entities, the associations and multivalued attributes are translated by relations

Model : Relation(Key(s), Attribute, Optionnal Attribute, . . . )

Translation :
Employee(SSN, Name)
(1) multivalued attributes

<table>
<thead>
<tr>
<th>Livre</th>
<th>ISBN</th>
<th>Auteur (1,n)</th>
</tr>
</thead>
</table>

**Question:** why (ISBN, Auteur) and not (ISBN, Auteur)?
(1) multivalued attributes

<table>
<thead>
<tr>
<th>Livre</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISBN</td>
</tr>
<tr>
<td>Auteur (1,n)</td>
</tr>
</tbody>
</table>

Livre(ISBN, . . . )
LivreAuteur(ISBN, Auteur)

▶ Question : why (ISBN, Auteur) and not (ISBN, Auteur) ?
(2) Translation of composed attributes

<table>
<thead>
<tr>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClientNo</td>
</tr>
<tr>
<td>Nom</td>
</tr>
<tr>
<td>Adresse</td>
</tr>
<tr>
<td>Rue</td>
</tr>
<tr>
<td>Ville</td>
</tr>
<tr>
<td>Pays</td>
</tr>
</tbody>
</table>
(2) Translation of composed attributes

<table>
<thead>
<tr>
<th>Table: Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClientNo</td>
</tr>
<tr>
<td>Nom</td>
</tr>
<tr>
<td>Adresse</td>
</tr>
<tr>
<td>Rue</td>
</tr>
<tr>
<td>Ville</td>
</tr>
<tr>
<td>Pays</td>
</tr>
</tbody>
</table>

Client(ClientNo, Nom, AdresseRue, AdresseVille, AdressePays)
(3) Translation of ‘one to one’ or ‘one to many’ associations

- Employee (SSN, Name) - (1,1) - WorksFor - (1,n) - Department (Dno, Name)
- Employee.Dno reference Department.Dno

- ‘one to one’ association: if one is optional, the reference goes to the mandatory side!
- ‘one to many’ association: the reference goes to the ‘one’ side
(3) Translation of 'one to one' or 'one to many' associations

- 'one to one' association: if one is optional, the reference goes to the mandatory side!
- 'one to many' association: the reference goes to the 'one' side

Department(DNo, Name)
Employee(SSN, Name, DNo)
  Employee.DNo reference Department.DNo
(3) Translation of 'many to many' associations

Employee(SSN, Name) - WorksOn(1,n) - Project(Pno, Name)

EmpProj(SSN, PNo)

EmpProj.SSN references Employee.SSN
EmpProj.PNo references Project.PNo

Careful, (SSN, PNo) \neq (SSN, PNo)
Employee(SSN, Name)
Project(PNo, Name)
EmpProj(SSN, PNo)

EmpProj.SSN references Employee.SSN
EmpProj.PNo references Project.PNo

▶ Careful, (SSN, PNo) ≠ (SSN, PNo)
(4) Translation of generalisations : solution 1

Employee (SSN, FName, MInit, LName, BirthDate)
Secretary (SSN, TypingSpeed)
Technician (SSN, TechGrade)
Engineer (SSN, EngType)

(t,e)
(4) Translation of generalisations: solution 1

Employee(SSN, FName, MInit, LName, BirthDate, Address)
Secretary(SSN, TypingSpeed)
Secretary.SSN reference Employee.SSN
Technician(SSN, TechGrade)
Technician.SSN reference Employee.SSN
Engineer(SSN, EngType)
Engineer.SSN reference Employee.SSN

▶ + integrity constraints
(4) Translation of generalisations : solution 2

Employee
- SSN
- Name
- BirthDate

(t,e)

Secretary
- TypingSpeed

Technician
- TechGrade

Engineer
- EngType

Secretary(SSN, FName, MInit, LName, BirthDate, Address, TypingSpeed)
Technician(SSN, FName, MInit, LName, BirthDate, Address, TechGrade)
Engineer(SSN, FName, MInit, LName, BirthDate, Address, EngType)

► + integrity constraints
Translation of generalisations: solution 3

Employee (SSN, FName, MInit, LName, BirthDate, Address, TypingSpeed, TechGrade, EngType)

- Secretary (TypingSpeed)
- Technician (TechGrade)
- Engineer (EngType)
(4) Translation of generalisations : solution 3

Employee(SSN, FName, MInit, LName, BirthDate, Address, TypingSpeed, TechGrade, EngType)

▶ + integrity constraints
(4) Translation of generalisations

- What can we say about these generalisations?
  - Total, non-exclusive?
  - Partial, exclusive?
  - Partial, non-exclusive?
(5) Translation sequences relations

Employee(name, startTime, birthDate, endTime)
EmployeeAddress(name, startTime, address, endTime)
EmployeeSalary(name, startTime, salary, endTime)
EmployeeProject(name, startTime, project, endTime)

▶ + integrity constraints

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Date Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter</td>
<td>Bd St Germain</td>
<td>[7/94-7/98]</td>
</tr>
<tr>
<td></td>
<td>Bd St Michel</td>
<td>[1/85-12/87]</td>
</tr>
<tr>
<td></td>
<td>Rue de la Paix</td>
<td>[1/88-12/94]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[1/95-now]</td>
</tr>
<tr>
<td>4000</td>
<td>[7/94-7/95]</td>
<td></td>
</tr>
<tr>
<td>5000</td>
<td>[8/95-now]</td>
<td></td>
</tr>
<tr>
<td>{MADS}</td>
<td></td>
<td>[7/94-8/95]</td>
</tr>
<tr>
<td>{MADS, HELIOS}</td>
<td></td>
<td>[9/95-now]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employee Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
</tr>
<tr>
<td>birthDate</td>
</tr>
<tr>
<td>address</td>
</tr>
<tr>
<td>salary</td>
</tr>
<tr>
<td>projects (1,n)</td>
</tr>
</tbody>
</table>
Employee(name, startTime, birthDate, endTime)
EmployeeAddress(name, startTime, address, endTime)
EmployeeSalary(name, startTime, salary, endTime)
EmployeeProject(name, startTime, project, endTime)

+ integrity constraints