

## Relational Schema

- Employee(SSN, FName, MInit, LName, BDate, Sex)
- EmployeeLifecycle(SSN, FromDate, ToDate)  
SSN references Employee(SSN)
- EmployeeSalary(SSN, Salary, FromDate, ToDate)  
SSN references Employee(SSN)
- EmployeeAddress(SSN, Street, City, Zip, Country, FromDate, ToDate)  
SSN references Employee(SSN)
- Engineer(SSN, EngineerType, FromDate, ToDate)  
SSN references Employee(SSN)

In this table the lifecycle of Engineer is kept as well as the attribute EngineerType. There will be redundancy if the lifecycle of Engineer is not continuous.

- EngineerDiplomas(SSN, Diploma)  
SSN references Engineer(SSN)
- AdministrativeLifecycle(SSN, FromDate, ToDate)  
SSN references Employee(SSN)
- AdminDependent(SSN, Name, Relationship, Sex, BirthDate, FromDate, ToDate)  
SSN references AdministrativeLifecycle(SSN)

It is supposed that an employee does not have two dependents of the same name and the same relationship. An alternative will be to put BirthDate instead of Relationship as part of the key.

- Supervision(SSN, SuperSSN, FromDate, ToDate)  
SSN references Employee(SSN)  
SuperSSN references Employee(SSN)
- Affiliation(SSN, JobTitle, DNumber, FromDate, ToDate)  
SSN references Employee(SSN)

It is supposed that the temporality of attribute JobTitle is the same as the lifecycle of the association. In this case two different tables are not necessary. To obtain the lifecycle of the association independently of attribute JobTitle a temporal projection is needed.

- Department(DNumber, DName, MgrSSN, MgrStartDate, FromDate, ToDate)  
MgrSSN references Employee(SSN)

It is supposed that the lifecycle of departments is continuous. In this case an additional table for the lifecycle is not necessary.

- DeptLocations(DNumber, Location, FromDate, ToDate)  
DNumber references Department(DNumber)
- DepartmentBudget(DNumber, DBudget, FromDate, ToDate)  
DNumber references Department(DNumber)
- DepartmentNbEmp(DNumber, NbEmp, FromDate, ToDate)  
DNumber references Department(DNumber)
- Project(PNumber, PName, PLocation, PBudget, FromDate, ToDate)  
It is supposed that the lifecycle of Project is continuous.
- Controls(PNumber, DNumber, FromDate, ToDate)  
PNumber references Project(PNumber)  
DNumber references Department(DNumber)

- WorksOn(ESSN, PNo, Hours, FromDate, ToDate)  
PNo references Project(PNumber)  
ESSN references Employee(SSN)

It is supposed that the temporality of attribute hours is the same as the lifecycle of the association. In this case two different tables are not necessary. To obtain the lifecycle of the association independently of the attribute hours a temporal projection is needed.

# Example Database

Partial schema where not all entities and attributes are taken into account.

Employee

| <u>SSN</u> | FName    | MInit | LName   | BDate      | Sex |
|------------|----------|-------|---------|------------|-----|
| 123456789  | John     | B     | Smith   | 09-05-1955 | M   |
| 333445555  | Franklin | T     | Wong    | 08-12-1945 | M   |
| 999887777  | Alicia   | J     | Zelaya  | 19-07-1958 | F   |
| 987654321  | Jennifer | S     | Wallace | 20-06-1931 | F   |
| 666884444  | Ramesh   | K     | Narayan | 15-09-1952 | M   |
| 453453453  | Joyce    | A     | English | 31-07-1962 | F   |
| 987987987  | Ahmad    | V     | Jabbar  | 29-03-1959 | M   |
| 888665555  | James    | A     | Borg    | 10-11-1927 | M   |

EmployeeLifecycle

| <u>SSN</u> | <u>FromDate</u> | <u>ToDate</u> |
|------------|-----------------|---------------|
| 123456789  | 01-01-1985      | 01-01-2079    |
| 333445555  | 01-01-1982      | 01-01-2079    |
| 999887777  | 01-01-1985      | 01-01-2079    |
| 987654321  | 01-01-1982      | 01-01-2079    |
| 666884444  | 01-01-1985      | 01-01-2079    |
| 453453453  | 01-01-1985      | 01-01-2079    |
| 987987987  | 01-01-1985      | 01-01-2079    |
| 888665555  | 01-01-1980      | 01-01-2079    |

EmployeeSalary

| <u>SSN</u> | Salary | <u>FromDate</u> | <u>ToDate</u> |
|------------|--------|-----------------|---------------|
| 123456789  | 30000  | 01-01-1985      | 01-01-2079    |
| 333445555  | 40000  | 01-01-1982      | 01-01-1983    |
| 333445555  | 45000  | 01-01-1983      | 01-01-2079    |
| 999887777  | 25000  | 01-01-1985      | 01-01-2079    |
| 987654321  | 43000  | 01-01-1982      | 01-01-2079    |
| 666884444  | 38000  | 01-01-1985      | 01-01-2079    |
| 453453453  | 25000  | 01-01-1985      | 01-01-2079    |
| 987987987  | 25000  | 01-01-1985      | 01-01-2079    |
| 888665555  | 55000  | 01-01-1980      | 01-01-1981    |
| 888665555  | 58000  | 01-01-1981      | 01-01-2079    |

EmployeeAddress

| <u>SSN</u> | Street       | City     | Zip  | State | <u>FromDate</u> | <u>ToDate</u> |
|------------|--------------|----------|------|-------|-----------------|---------------|
| 123456789  | 731 Fondren  | Houston  | 1000 | TX    | 01-01-1985      | 01-01-2079    |
| 333445555  | 638 Voss     | Houston  | 1000 | TX    | 01-01-1982      | 01-01-2079    |
| 999887777  | 3321 Castle  | Spring   | 1000 | TX    | 01-01-1985      | 01-01-2079    |
| 987654321  | 291 Berry    | Bellaire | 1000 | TX    | 01-01-1982      | 01-01-2079    |
| 666884444  | 975 Fire Oak | Humble   | 1000 | TX    | 01-01-1985      | 01-01-2079    |
| 453453453  | 5631 Rice    | Houston  | 1000 | TX    | 01-01-1985      | 01-01-2079    |
| 987987987  | 980 Dallas   | Houston  | 1000 | TX    | 01-01-1985      | 01-01-2079    |
| 888665555  | 450 Stone    | Houston  | 1000 | TX    | 01-01-1980      | 01-01-2079    |

Supervision

| <u>SSN</u> | SuperSSN  | <u>FromDate</u> | <u>ToDate</u> |
|------------|-----------|-----------------|---------------|
| 123456789  | 333445555 | 01-01-1985      | 01-01-2079    |
| 333445555  | 888665555 | 01-01-1982      | 01-01-2079    |
| 999887777  | 987654321 | 01-01-1985      | 01-01-2079    |
| 987654321  | 888665555 | 01-01-1982      | 01-01-2079    |
| 666884444  | 333445555 | 01-01-1985      | 01-01-2079    |
| 453453453  | 333445555 | 01-01-1985      | 01-01-2079    |
| 987987987  | 987654321 | 01-01-1985      | 01-01-2079    |

Affiliation

| <u>SSN</u> | DNumber | <u>FromDate</u> | <u>ToDate</u> |
|------------|---------|-----------------|---------------|
| 123456789  | 1       | 01-01-1985      | 01-01-1986    |
| 123456789  | 5       | 01-01-1986      | 01-01-2079    |
| 333445555  | 4       | 01-01-1982      | 01-01-1984    |
| 333445555  | 5       | 01-01-1984      | 01-01-2079    |
| 999887777  | 4       | 01-01-1985      | 01-01-2079    |
| 987654321  | 4       | 01-01-1982      | 01-01-2079    |
| 666884444  | 5       | 01-01-1985      | 01-01-2079    |
| 453453453  | 5       | 01-01-1985      | 01-01-2079    |
| 987987987  | 4       | 01-01-1985      | 01-01-2079    |
| 888665555  | 1       | 01-01-1980      | 01-01-2079    |

Department

| <u>DNumber</u> | DName          | MgrSSN    | MgrStartDate | FromDate   | ToDate     |
|----------------|----------------|-----------|--------------|------------|------------|
| 1              | Headquarters   | 888665555 | 19-06-1980   | 01-01-1980 | 01-01-2079 |
| 4              | Administration | 987654321 | 01-01-1982   | 01-01-1981 | 01-01-2079 |
| 5              | Research       | 333445555 | 22-05-1984   | 01-01-1982 | 01-01-2079 |

DepartmentNbEmp

| <u>DNumber</u> | NbEmp | FromDate   | ToDate     |
|----------------|-------|------------|------------|
| 5              | 4     | 01-01-1980 | 01-01-2079 |
| 4              | 3     | 01-01-1980 | 01-01-2079 |
| 1              | 1     | 01-01-1980 | 01-01-2079 |

DeptLocations

| <u>DNumber</u> | DLocation | FromDate   | ToDate     |
|----------------|-----------|------------|------------|
| 1              | Houston   | 01-01-1980 | 01-01-2079 |
| 4              | Stafford  | 01-01-1980 | 01-01-2079 |
| 5              | Bellaire  | 01-01-1980 | 01-01-2079 |
| 5              | Sugarland | 01-01-1980 | 01-01-2079 |
| 5              | Houston   | 01-01-1980 | 01-01-2079 |

Project

| <u>PNumber</u> | PName           | PLocation | FromDate   | ToDate     |
|----------------|-----------------|-----------|------------|------------|
| 1              | ProductX        | Bellaire  | 01-01-1980 | 01-01-2079 |
| 2              | ProductY        | Sugarland | 01-01-1980 | 01-01-2079 |
| 3              | ProductZ        | Houston   | 01-01-1980 | 01-01-2079 |
| 10             | Computerization | Stafford  | 01-01-1980 | 01-01-2079 |
| 20             | Reorganization  | Houston   | 01-01-1980 | 01-01-2079 |
| 30             | Newbenefits     | Stafford  | 01-01-1980 | 01-01-2079 |

Controls

| <u>PNumber</u> | DNumber | FromDate   | ToDate     |
|----------------|---------|------------|------------|
| 1              | 5       | 01-01-1980 | 01-01-2079 |
| 2              | 5       | 01-01-1980 | 01-01-2079 |
| 3              | 5       | 01-01-1980 | 01-01-2079 |
| 10             | 4       | 01-01-1980 | 01-01-2079 |
| 20             | 1       | 01-01-1980 | 01-01-2079 |
| 30             | 4       | 01-01-1980 | 01-01-2079 |

WorksOn

| <u>ESSN</u> | <u>PNo</u> | Hours | <u>FromDate</u> | <u>ToDate</u> |
|-------------|------------|-------|-----------------|---------------|
| 123456789   | 1          | 32.5  | 01-01-1980      | 01-01-2079    |
| 123456789   | 2          | 7.5   | 01-01-1980      | 01-01-2079    |
| 333445555   | 1          | 10    | 01-01-1980      | 01-01-2079    |
| 333445555   | 2          | 10    | 01-01-1980      | 01-01-2079    |
| 333445555   | 3          | 20    | 01-01-1980      | 01-01-2079    |
| 453453453   | 1          | 20    | 01-01-1980      | 01-01-2079    |
| 453453453   | 2          | 20    | 01-01-1980      | 01-01-2079    |
| 666884444   | 3          | 40    | 01-01-1980      | 01-01-2079    |
| 888665555   | 20         | 30.0  | 01-01-1980      | 01-01-2079    |
| 987654321   | 10         | 5.0   | 01-01-1980      | 01-01-2079    |
| 987654321   | 20         | 15.0  | 01-01-1980      | 01-01-2079    |
| 987654321   | 30         | 20.0  | 01-01-1980      | 01-01-2079    |
| 987987987   | 10         | 35.0  | 01-01-1980      | 01-01-2079    |
| 987987987   | 30         | 5.0   | 01-01-1980      | 01-01-2079    |
| 999887777   | 10         | 10.0  | 01-01-1980      | 01-01-2079    |
| 999887777   | 30         | 30.0  | 01-01-1980      | 01-01-2079    |