Physical Design (other issues)

Knowledge Objectives

1. Explain how candidate keys are implemented by a RDBMS
2. Explain the difference between immediate and deferred constraint checking
3. Enumerate two alternatives that allow to disable integrity constraints

Understanding Objectives

1. Explain why it is better to use the surrogate mechanisms provided by the DBMS than implementing it ad-hoc

Application Objectives

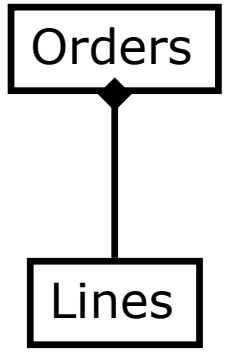
1. In an FK-deadlock situation, choose the best solution, given the data statistics and the involved operations
2. Given a UML class diagram, identify which constraints can be enforced by just the CREATE TABLE sentence

Candidate keys

- Primary
  - May not be available in our DBMS (rare)
  - Physically, it generates a B-tree index
- Alternatives
  - They are not part of standard SQL
  - Can be implemented by NOT NULL + UNIQUE

Surrogates (I)

- Introduced by E. F. Codd in RM/T
- Substitutes the external key if:
  - There is no such external key
  - Attributes in the external key change often
  - The external demands too much space

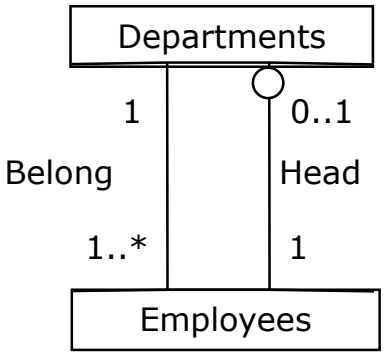


User surrogates in Oracle 11g

```
CREATE SEQUENCE <seqName>
   INCREMENT BY <int>
   START WITH <int>
   …;

SELECT <seqName>.CURRVAL FROM DUAL;

INSERT INTO <table> VALUES
   (<seqName>.NEXTVAL, …);

DROP SEQUENCE <seqName>;
```

- Multiple sequences can be used in the same table
- A sequence can be used in different tables

Deadlock in the definition of FK



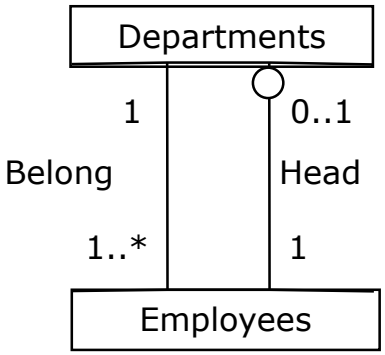
A.

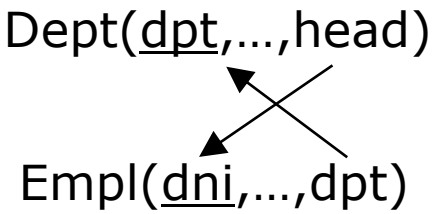
Dept(dpt,…,head)

Empl(dni,…,dpt)

B.

Deadlock in the definition of FK

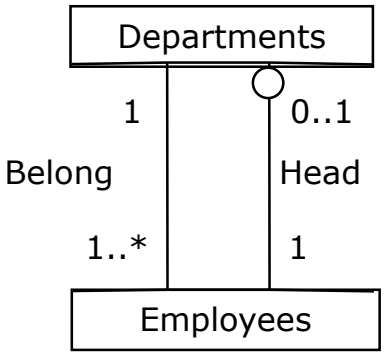




A. Modify the tables
   1) Create "Dept" without FK
   2) Create "Empl" with FK
   3) Alter "Dept" adding the FK

B.

Deadlock in the definition of FK



Dept(dpt,…,head)

Empl(dni,…,dpt)

A. Modify the tables
   1) Create "Dept" without FK
   2) Create "Empl" with FK
   3) Alter "Dept" adding the FK

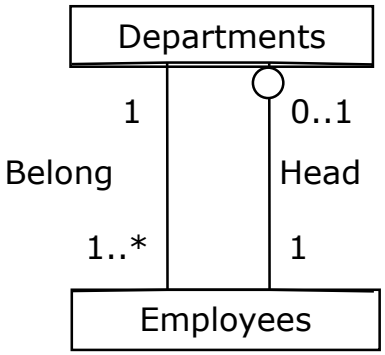
B. Create three tables
   1) Create "Dept" (it doesn't have FK)
   2) Create "Empl" with its FK
   3) Create "Head" with two FK

Dept(dpt,…)

Head(dpt,empl)

Empl(id,…,dpt)

Deadlock in the definition of FK



Dept(dpt,…,head)

Empl(dni,…,dpt)

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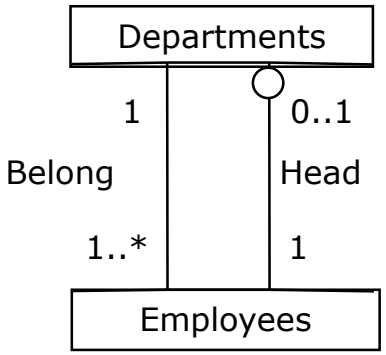
Dept(dpt,…)

Head(dpt,empl)

Empl(id,…,dpt)

Deadlock in the load of FK



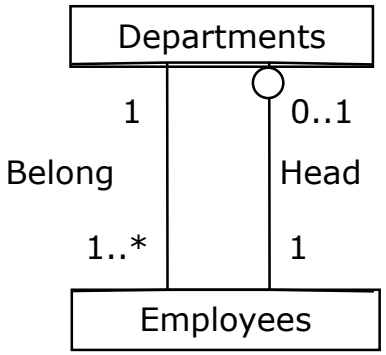
A.

Dept(dpt,…, head)
CS 1

Empl(dni,…, dpt)
1 CS

B.

Deadlock in the load of FK



Dept(dpt,…, head)
CS 1

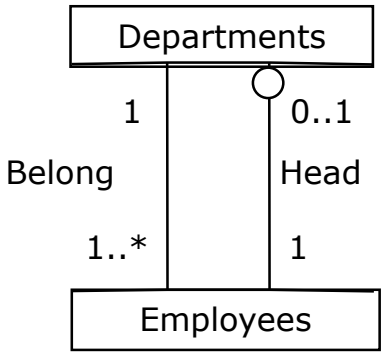
Empl(dni,…, dpt)
1 CS

A. Deactivate FK
   1) Alter "Dept" to drop FK
   2) Insert the department
   3) Insert all employees
   4) Alter "Dept" to add FK

SET CONSTRAINT <name>
[ENABLE|DISABLE];

B.

Deadlock in the load of FK



Dept(dpt,…, head)
CS 1

Empl(dni,…, dpt)
1 CS

A. Deactivate FK
   1) Alter "Dept" to drop FK
   2) Insert the department
   3) Insert all employees
   4) Alter "Dept" to add FK

SET CONSTRAINT <name>
[ENABLE|DISABLE];

B. Defer the FK checking

SET CONSTRAINT <name>
[IMMEDIATE|DEFERRED];

Implementing constraints

1. In the CREATE TABLE sentence

   Usually available, efficient, automatic and internal

2. Assertions

   Efficient, automatic and internal

LOGICAL DESIGN

PHYSICALDESIGN

3. Persistent Stored Modules
   1. Triggers

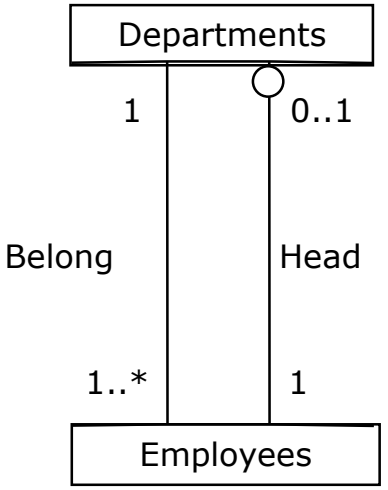
      Automatic and internal
   2. Procedures/functions

      Internal
4. Call Level Interface (Eg: ODBC, JDBC)

   Always available

Example of constraint implementation

- Constraints reflected in the conceptual schema
  - An employee is head of zero or one department
    Attribute "empl" in table "Head" is UNIQUE
  - Every department has exactly one head
    1. Attribute "empl" in table "Head" is FK and NOT NULL
    2. An assertion should be defined to check that each and every department has a head (we may also implement it with two tables)
  - An employee belongs to exactly one department
    Attribute "dpt" in table employee has been defined as FK and NOT NULL
  - Each and every department has at least one employee
    An assertion should be defined



Dept(<u>dpt</u>,…)
Head(<u>dpt</u>,<u>empl</u>)
Empl(<u>id</u>,…,dpt)

Summary

- Surrogates
- Deadlock
  - In the definition of FK
  - In the load of FK
- Integrity constraints

Bibliography

- J. Sistac. *Sistemes de Gestió de Bases de Dades*. Editorial UOC, 2002
- Jaume Sistac, et al. *Disseny de bases de dades*. Editorial UOC, 2002. Col·lecció Manuals, número 43
- T. Teorey et al. *Database modeling and design*. Morgan Kaufmann Publishers, 2006. 4th edition