Foreign Key Constraints

In a FK – PK relationship

- The Primary Key column is often referred to as the Parent
- The Foreign Key column is often referred to as the Child

The Parent is found at the One end
of a M:1 relationship
- A child has one parent

The Child is found at the Many end
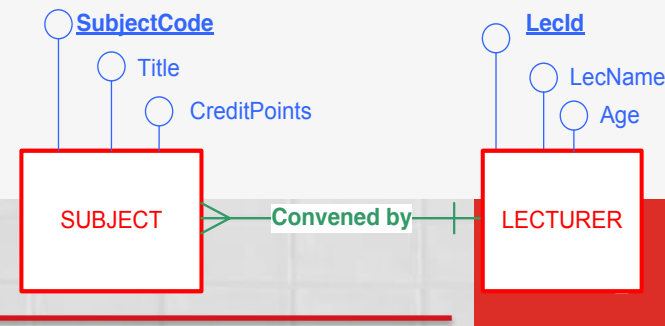of a M:1 relationship
- A parent may have many children

PK   LECTURER

LecID	LecName	Age
207	John Smith	37
119	Jane Pitt	26
345	Carol Kent	34

SUBJECT   FK

SubjectCode	Title	CreditPoints	LecId
INF11007	EBIS	12.5	345
AST80016	Astrophysics	12.5	222
INF11011	Cobol	12.5	345

SubjectCode
Title
CreditPoints

LecId
LecName
Age

SUBJECT — Convened by — LECTURER

Foreign Key Constraint

The FK constraint:

- Forces the RDBMS to validate the value entered into the Foreign Key column

- An error results if the Foreign Key value does not match the primary key of the related table

LECTURER

LecID	LecName	Age
207	John Smith	37
119	Jane Pitt	26
345	Carol Kent	34

SUBJECT

FK column

SubjectCode	Title	CreditPoints	LecId
INF11007	EBIS	12.5	**345**
AST80016	Astrophysics	12.5	**222**

... Inserted OK

... Error – Parent Key not Found

Foreign Key constraints messages

Sample results of validation of foreign key constraints in **iSQL Jr** :

INSERT INTO SUBJECT (SubjectCode, Title , CreditPoints, LecId)
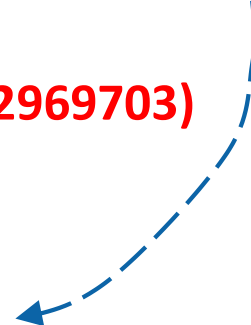**VALUES ('INF11007', 'EBIS', 12.5,   345) ;**

OK. 1 rows - cryptic message than means 1 row added successfully

---

INSERT INTO SUBJECT (SubjectCode, Title , CreditPoints, LecId)
VALUES ('AST80016', 'Astrophysics', 12.5, 222) ;

Error at line 1:

ORA-02291: integrity constraint (s1234567.SYS_C002969703)

violated - parent key not found

This message means that no parent (primary key)
value matched the value 222

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Parent / Child rules

The default situation in Oracle is that:

- A parent **cannot be deleted** if a child exists.

    I.e. A child **cannot** become **orphaned**

- A **parent** can only be deleted if the children **no longer exists**

- (Same rule applies in MS **Access** if you have ticked the Enforce Referential Integrity option in Relationship Diagram)

Parent / Child rules

Add lecturer Carol

> **INSERT INTO LECTURER (LecId, LecName, Age)**
> **VALUES (345, 'Carol Kent', 34) ;**

Add subject INF1107 where Carol is the covenor

> **INSERT INTO SUBJECT (SubjectCode, Title , CreditPoints, LecId)**
> **VALUES ('INF11007', 'EBIS', 12.5,   345) ;**

Attempt to delete Carol's record from the Lecturer table

> **DELETE FROM LECTURER WHERE LecId = 345;**
>
> **Oracle Error at line 3:**
> **ORA-02292: integrity constraint (s1234567.SYS_C002969703) violated -**
> **child record found**

This Oracle message means that you are attempting to orphan a child

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Null Foreign Keys

It is not uncommon for a Foreign Key to have a **NULL value**

- Nulls are **acceptable** as Foreign Key values

- Imagine that we plan for a **new subject** to begin next year
    - INF21009 Adv Facebook
    - **However**, the business does not yet know who the lecturer will be for that unit

INSERT INTO SUBJECT (SubjectCode, Title , CreditPoints, LecId)

           VALUES ('INF21009', 'Advanced Facebook', 12.5, Null) ;

LECTURER

LecID	LecName	Age
207	John Smith	37
345	Carol Kent	34

SUBJECT

SubjectCode	Title	CreditPoints	LecId
INF11007	EBIS	12.5	**345**
INF21009	Adv Facebook	12.5	

LecId has a NULL value is OK

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Null Constraint

- Imagine that a new business rule is introduced that says 'Every subject **MUST** have a convener'

  - A **null** value for the lecturer ID is **not acceptable**

- How can the be **enforced**?
  - Each column in a table can have a **Null constraint.**
  - It is usually defined in the **Create Table** statement
    - Although you can add a constraint at a later time

```
Create Table SUBJECT        (
  SubjectCode        varchar(10)     ,
  Title              varchar(100)    ,
  CreditPoints       number          ,
  LecId              number          Not Null,
  Primary Key        (SubjectCode)   ,
  Foreign Key        (LecId)   References LECTURER     ) ;
```

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Null Foreign Keys

The RDBMS will now generate an **error** if you attempt to
insert a row that breaks the **Not Null constraint**

INSERT INTO SUBJECT (SubjectCode, Title , CreditPoints, LecId)

VALUES ('INF21009', 'Advanced Facebook', 12.5, Null) ;

Error at line 1:
ORA-01400: cannot insert NULL into (s1234567.SUBJECT.LECID)

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Null Constraints

Many columns in a table may have **Not Null** constraints

```
Create Table SUBJECT          (
   SubjectCode          varchar(10)       ,
   Title                varchar(100)    Not Null ,
   CreditPoints         Number            ,
   LecId                Number          Not Null ,
   Primary Key          (SubjectCode)   ,
   Foreign Key          (LecId)   References LECTURER     ) ;
```

- **Three columns** in this table will generate an **error** if a Null is entered

  - NOTE: The **Primary Key** does **not** require a Not Null constraint

  - Primary Keys values cannot be null