# Lecture 05
# Views, Constraints

Friday, October 6, 2006

# Outline

- Data Definition Language (6.6)
- Views (6.7)
- Constraints (Chapter 7)

# Defining Views

Views are relations, except that they are not physically stored.

For presenting different information to different users

Employee(ssn, name, department, project, salary)

```
CREATE VIEW  Developers AS
   SELECT name, project
   FROM  Employee
   WHERE department = "Development"
```

Payroll has access to Employee, others only to Developers

# Example

Purchase(customer, product, store)

Product(pname, price)

```
CREATE VIEW  CustomerPrice  AS
      SELECT  x.customer, y.price
      FROM    Purchase x, Product y
      WHERE   x.product = y.pname
```

CustomerPrice(customer, price)  "virtual table"

Purchase(customer, product, store)
Product(pname, price)
CustomerPrice(customer, price)

We can later use the view:

```
SELECT  u.customer, v.store
FROM    CustomerPrice u, Purchase v
WHERE   u.customer = v.customer  AND
        u.price > 100
```

# What Happens When We Query a View ?

```
SELECT  u.customer, v.store
FROM    CustomerPrice u, Purchase v
WHERE   u.customer = v.customer  AND
        u.price > 100
```

```
SELECT  x.customer, v.store
FROM    Purchase x, Product y, Purchase v,
WHERE   x.customer = v.customer  AND
        y.price > 100 AND
        x.product = y.pname
```

# Types of Views

- Virtual views:
  - Used in databases
  - Computed only on-demand – slow at runtime
  - Always up to date
- Materialized views
  - Used in data warehouses
  - Pre-computed offline – fast at runtime
  - May have stale data

# Updating Views: Part 1

Purchase(customer, product, store)

Product(pname, price)

```
CREATE VIEW  Expensive-Product AS
        SELECT  pname
        FROM    Product
        WHERE   price > 100
```

```
INSERT
INTO Expensive-Product
VALUES('Gizmo')
```

```
INSERT
INTO Product
VALUES('Gizmo', NULL)
```

Updateable view

# Updating Views: Part 2

Purchase(customer, product, store)

Product(pname, price)

```
INSERT
INTO Toy-Product
VALUES('Joe', 'Gizmo')
```

```
CREATE VIEW  AcmePurchase  AS
      SELECT  customer, product
      FROM     Purchase
      WHERE   store = 'AcmeStore'
```

```
INSERT
INTO Product
VALUES('Joe','Gizmo',NULL)
```

Updateable view

Note this

# Updating Views: Part 3

Purchase(customer, product, store)

Product(pname, price)

```
INSERT INTO CustomerPrice
VALUES('Joe', 200)
```

```
CREATE VIEW  CustomerPrice  AS
      SELECT  x.customer, y.price
      FROM    Purchase x, Product y
      WHERE   x.product = y.pname
```

? ? ? ? ?

Non-updateable view

Most views are non-updateable

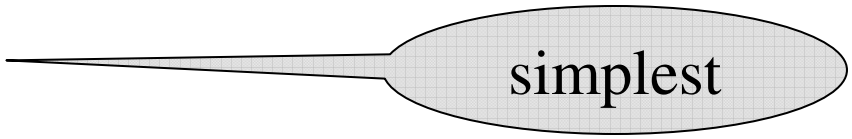
# Constraints in SQL

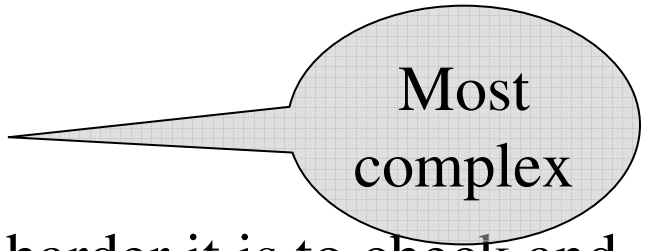
- A constraint = a property that we'd like our database to hold
- The system will enforce the constraint by taking some actions:
  - forbid an update
  - or perform compensating updates

# Constraints in SQL

Constraints in SQL:

- Keys, foreign keys
- Attribute-level constraints
- Tuple-level constraints
- Global constraints: assertions




The more complex the constraint, the harder it is to check and to enforce

# Keys

```
CREATE TABLE Product (
        name CHAR(30) PRIMARY KEY,
        category VARCHAR(20))
```

OR:

Product(<u>name</u>, category)

```
CREATE TABLE Product (
        name CHAR(30),
        category VARCHAR(20)
PRIMARY KEY (name))
```

# Keys with Multiple Attributes

```
CREATE TABLE Product (
        name CHAR(30),
        category VARCHAR(20),
        price INT,
    PRIMARY KEY (name, category))
```

| Name | Category | Price |
|---|---|---|
| Gizmo | Gadget | 10 |
| Camera | Photo | 20 |
| Gizmo | Photo | 30 |
| ~~Gizmo~~ | ~~Gadget~~ | ~~40~~ |

Product(<u>name, category</u>, price)

# Other Keys

```
CREATE TABLE Product (
        productID  CHAR(10),
        name CHAR(30),
        category VARCHAR(20),
        price INT,
        PRIMARY KEY (productID),
        UNIQUE (name, category))
```

There is at most one PRIMARY KEY;
there can be many UNIQUE

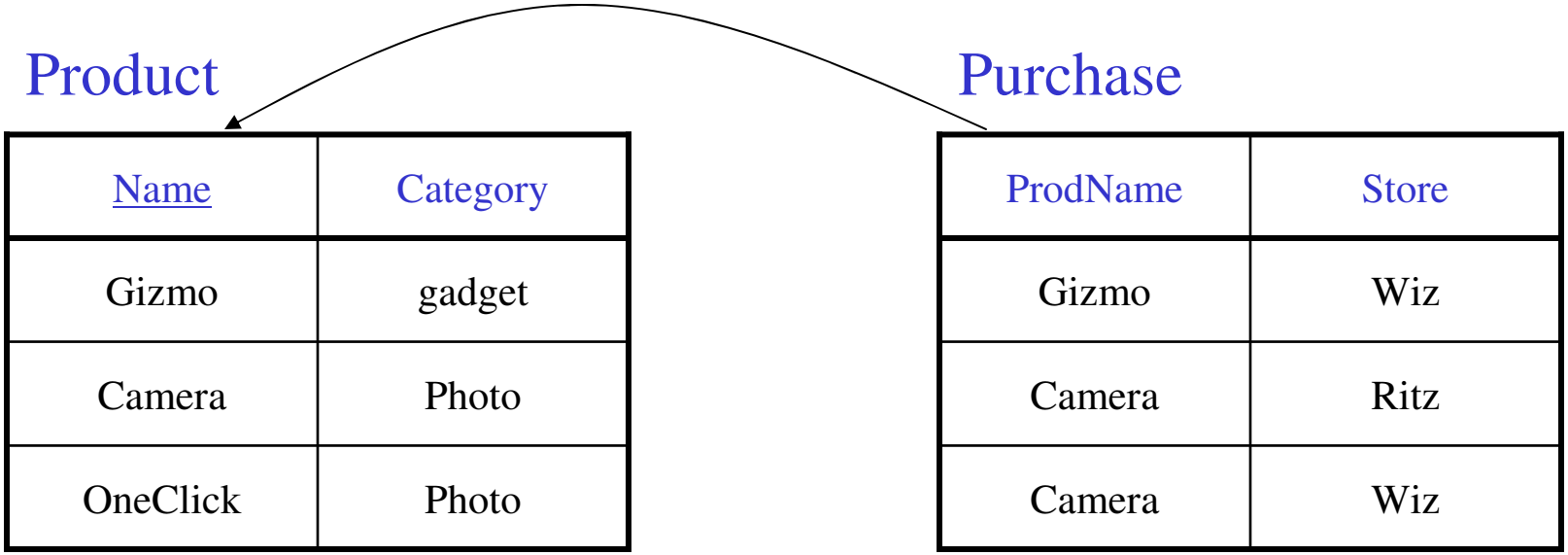
# Foreign Key Constraints

Referential integrity constraints

```
CREATE TABLE Purchase (
        prodName CHAR(30)
                REFERENCES Product(name),
        date DATETIME)
```

May write just Product (why ?)

prodName is a **foreign key** to Product(name)
name must be a **key** in Product


Product
Name
Category
Gizmo
gadget
Camera
Photo
OneClick
Photo
Purchase
ProdName
Store
Gizmo
Wiz
Camera
Ritz
Camera
Wiz

# Foreign Key Constraints

- OR

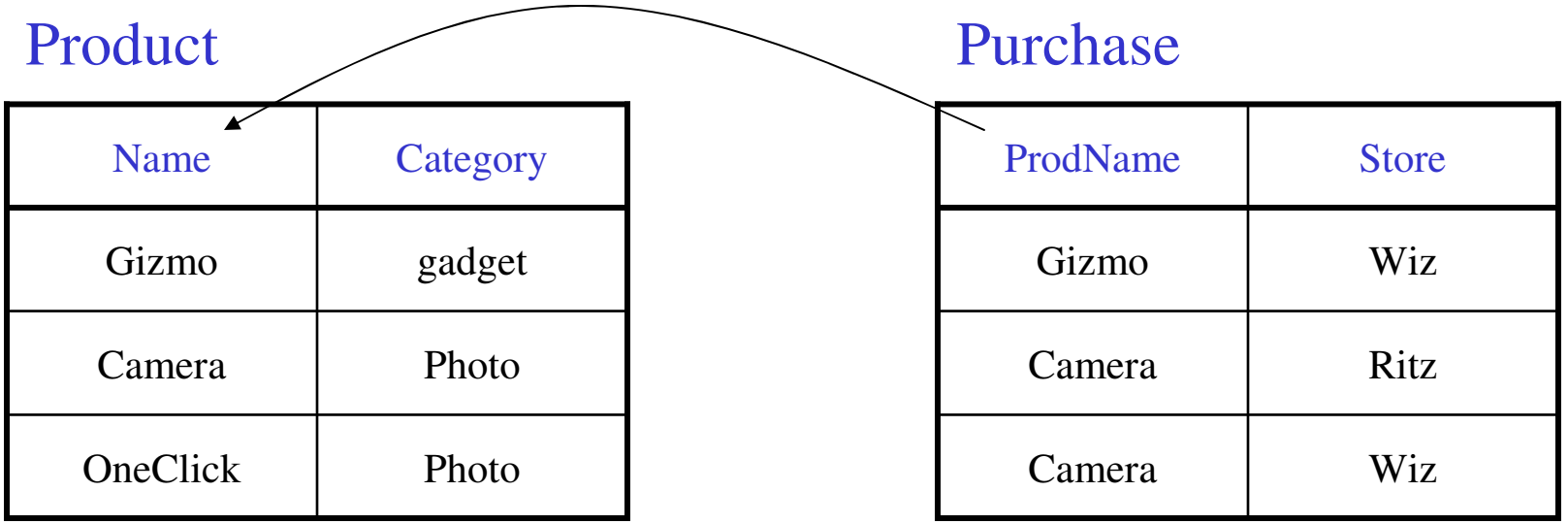
```
CREATE TABLE Purchase (
        prodName CHAR(30),
        category VARCHAR(20),
        date DATETIME,
        FOREIGN KEY (prodName, category)
          REFERENCES  Product(name, category)
```

- (name, category) must be a PRIMARY KEY

# What happens during updates ?

Types of updates:

- In Purchase: insert/update
- In Product: delete/update



Product

| Name | Category |
|---|---|
| Gizmo | gadget |
| Camera | Photo |
| OneClick | Photo |

Purchase

| ProdName | Store |
|---|---|
| Gizmo | Wiz |
| Camera | Ritz |
| Camera | Wiz |

# What happens during updates ?

- SQL has three policies for maintaining referential integrity:
- Reject violating modifications (default)
- Cascade: after a delete/update do a delete/update
- Set-null set foreign-key field to NULL

READING ASSIGNEMNT: 7.1.5, 7.1.6

# Constraints on Attributes and Tuples

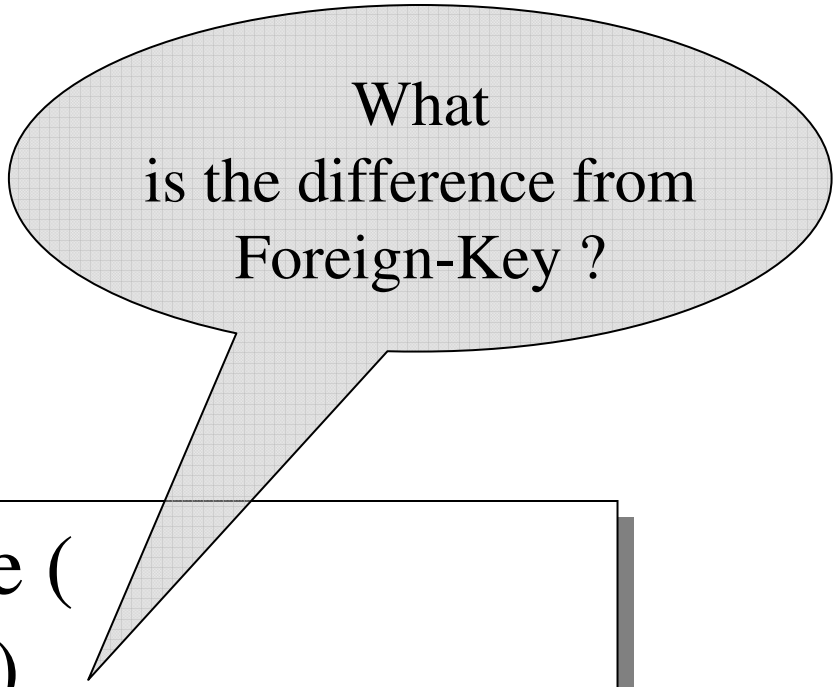
- Constraints on attributes:

  NOT NULL -- obvious meaning...

  CHECK condition -- any condition !

- Constraints on tuples

  CHECK condition




```
CREATE TABLE Purchase (
        prodName CHAR(30)
                CHECK (prodName IN
                        SELECT Product.name
                        FROM Product),
        date DATETIME NOT NULL)
```

# General Assertions

```
CREATE ASSERTION myAssert CHECK
  NOT EXISTS(
        SELECT Product.name
        FROM Product, Purchase
        WHERE Product.name = Purchase.prodName
        GROUP BY Product.name
        HAVING count(*) > 200)
```

# Final Comments on Constraints

- Can give them names, and alter later
  - Read in the book !!!
- We need to understand exactly *when* they are checked
- We need to understand exactly *what* actions are taken if they fail