

Administrivia

Project I Part I

Meetings this week and next

Who hasn't signed up yet?

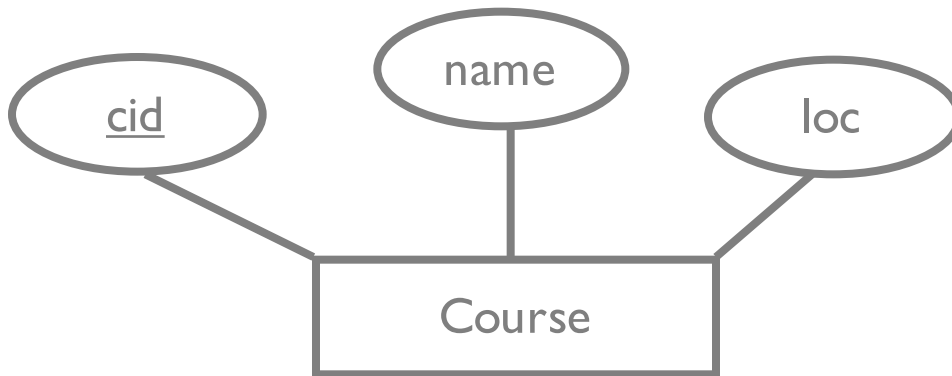
Extra OH after class today to go over DataBass

Set up environment before coming!

(See DataBass readme)

Translating ER \rightarrow Relational Models

Entity Set → Relation



```
CREATE TABLE Course(  
  cid int,  
  name text,  
  loc text,  
  PRIMARY KEY (cid)  
)
```

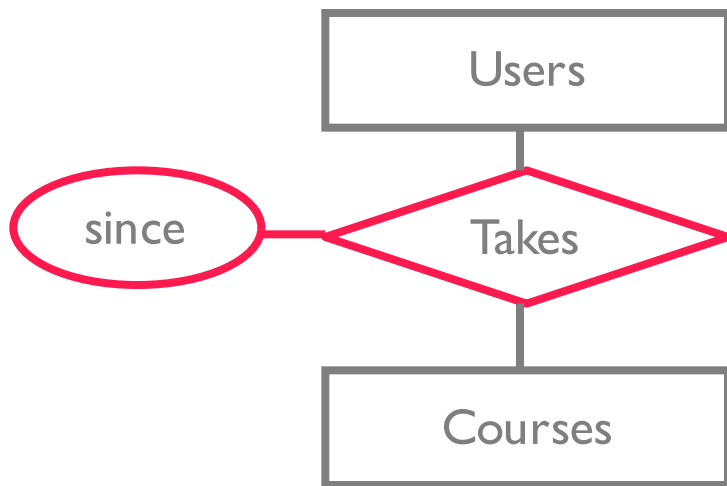
Relationship Set w/out constraint → Relation

Relation must include

Keys for each entity set as foreign keys

these form superkey for relation

All attributes of the relationship set



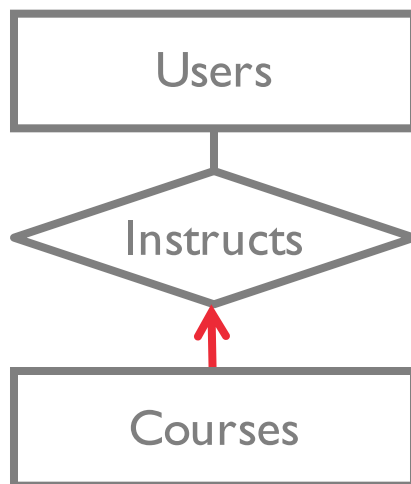
```
CREATE TABLE Takes(  
  uid int,  
  cid int,  
  since date,  
  PRIMARY KEY (uid, cid),  
  FOREIGN KEY (uid) REFERENCES Users,  
  FOREIGN KEY (cid) REFERENCES Courses  
);
```

Key Constraint → Relation

Note only cid is a Key

Why don't we have UNIQUE(uid, cid)?

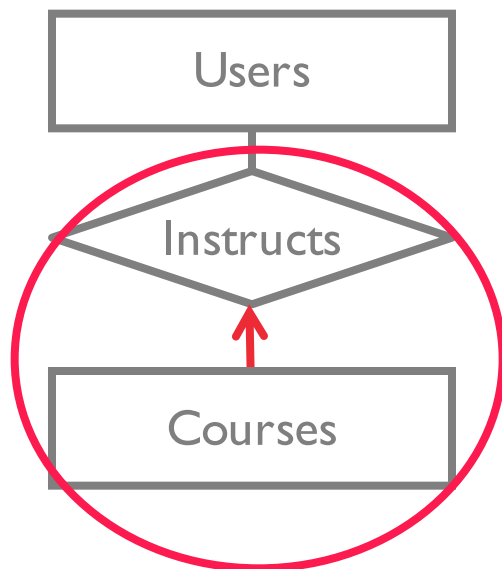
User and Courses are separate relations



```
CREATE TABLE Instructs(  
  uid int NOT NULL,  
  cid int,  
  PRIMARY KEY (cid),  
  FOREIGN KEY (uid) REFERENCES Users,  
  FOREIGN KEY (cid) REFERENCES Courses  
)
```

Key Constraint → Relation

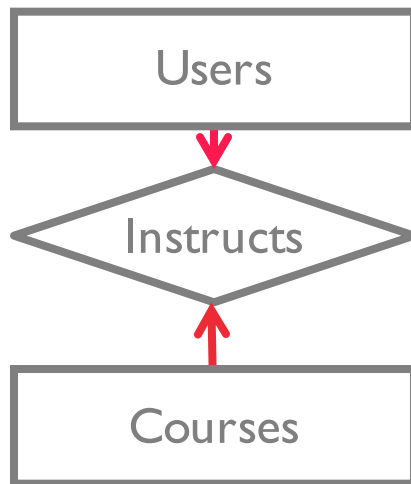
Alternatively combine Courses and Users
(this is the preferred way)



```
CREATE TABLE Course_Instructs(  
  cid int  
  uid int,  
  name text,  
  loc text,  
  PRIMARY KEY (cid),  
  FOREIGN KEY (uid) REFERENCES Users  
)
```

Key Constraint → Relation

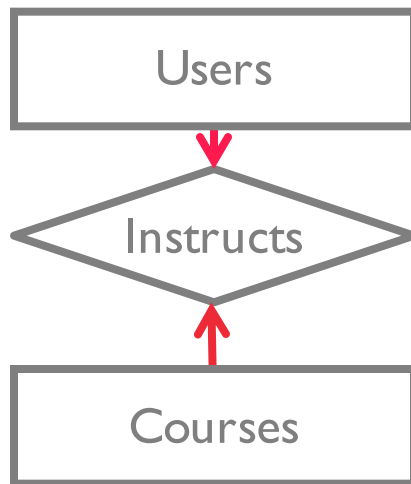
How to translate this ER diagram?



```
CREATE TABLE Course_Instructs(  
    ????  
)
```

Key Constraint → Relation

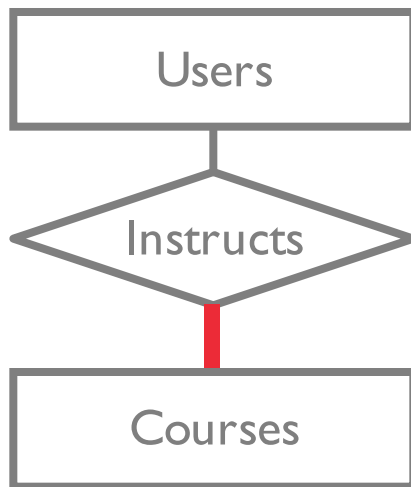
How to translate this ER diagram?



```
CREATE TABLE Course_Instructs_Users(  
    cid int  
    uid int,  
    name text,  
    loc text,  
    username text,  
    age text,  
    PRIMARY KEY (cid, uid)  
)
```


Participation Constraint → Relation

Only participation constraints with one entity set in binary relationship (others need CHECK constraint)

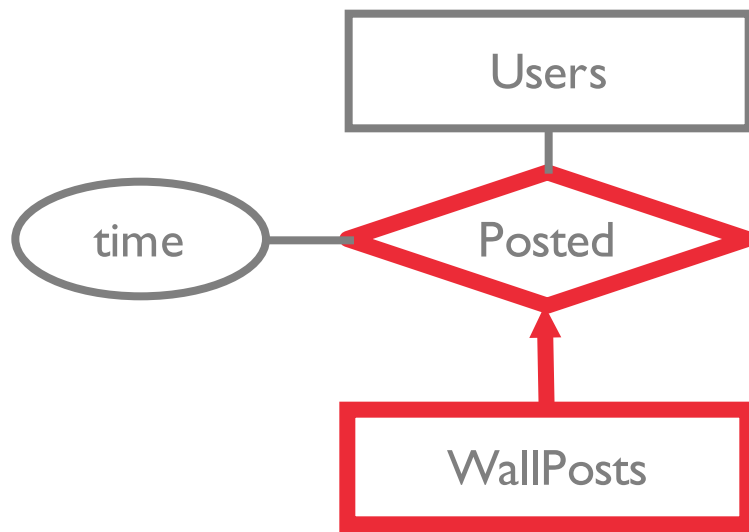


```
CREATE TABLE Course_Instructs(  
  cid int  
  uid int NOT NULL,  
  name text,  
  loc text,  
  PRIMARY KEY (cid),  
  FOREIGN KEY (uid) REFERENCES Users  
    ON DELETE NO ACTION  
)
```

Weak Entity → Relation

Weak entity set and identifying relationship set are translated into a single table.

When the owner entity is deleted, all owned weak entities must also be deleted.



```
CREATE TABLE Wall_Posted(  
    pid int  
    post_text text,  
    posted_at DATE,  
    uid int NOT NULL,  
    PRIMARY KEY (pid, uid),  
    FOREIGN KEY (uid) REFERENCES Users  
        ON DELETE CASCADE  
)
```

ISA Hierarchies

Option 1: Keep base relation

Instructors & Students recorded in Users

Extra info in Instructors or Students relation

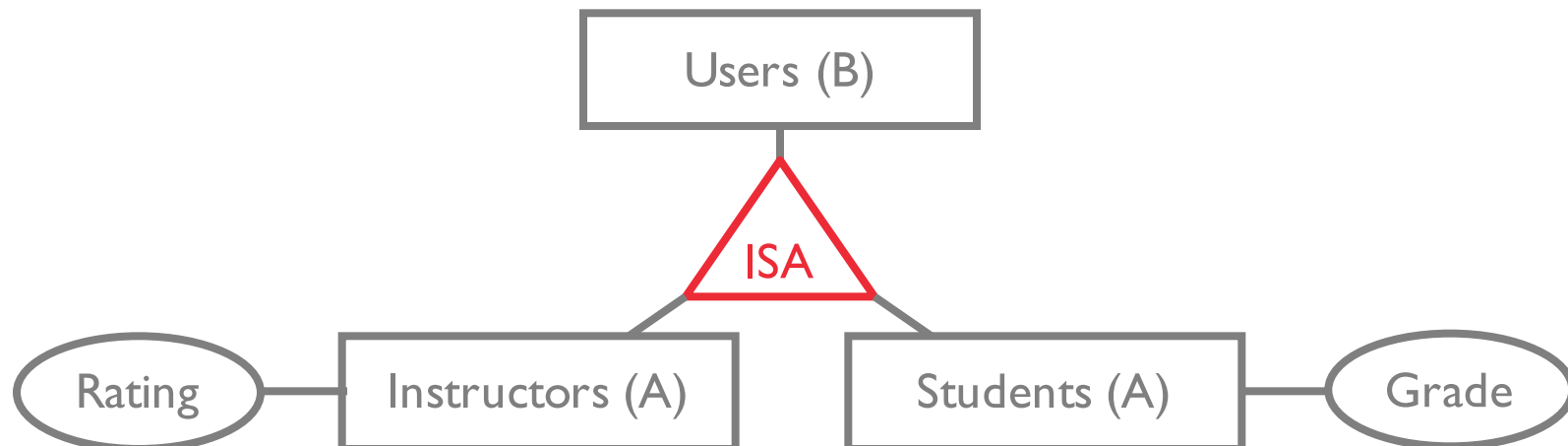
JOIN between child and base relations for all attributes

Option 2: Only keep child relations

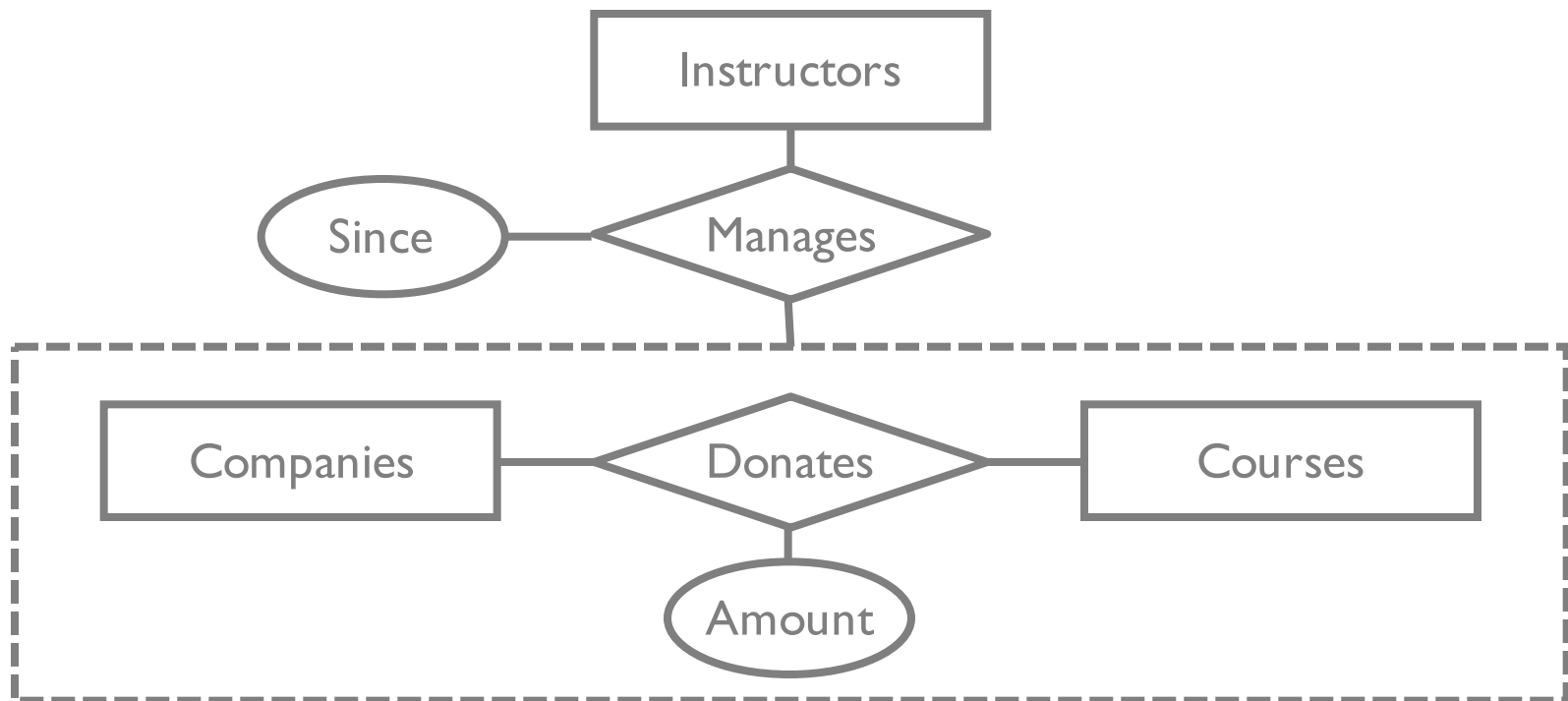
Instructors copies attributes from Users

Instructors(uid, name, age, ..., rating)

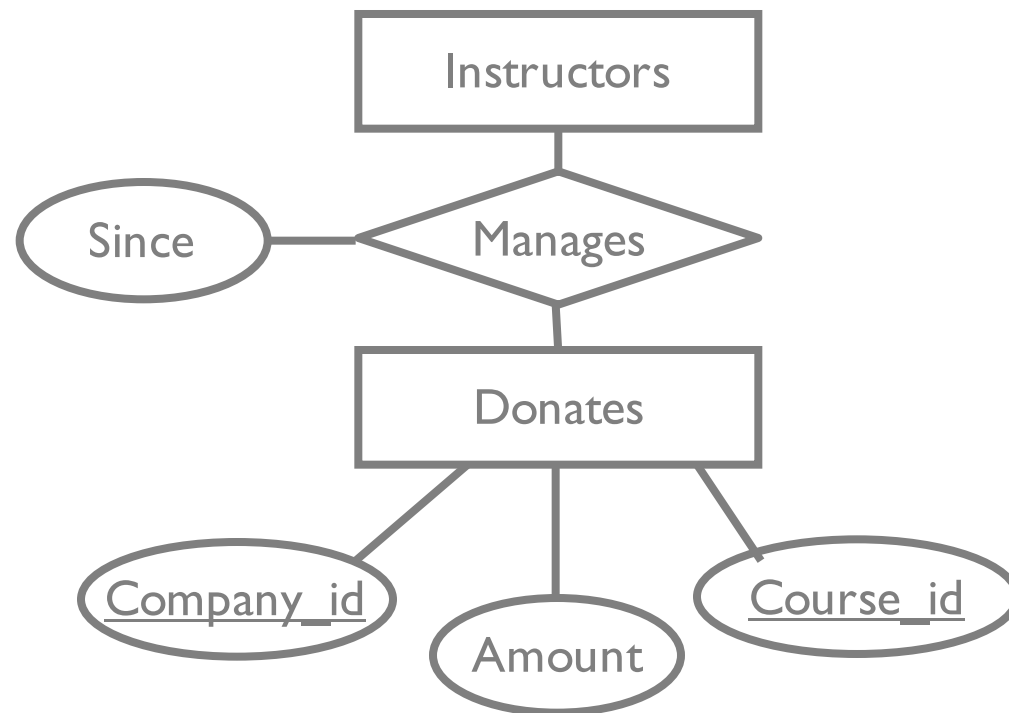
Only if covering
constraint = yes



Aggregation



Aggregation



in-class demo on instabase

<https://www.instabase.com/user/w4lll-nb/notebooks/ewu/w4lll-public/fs/Instabase%20Drive/Examples/lec5.ipynb>

note: the database doesn't support BEGIN transactions, so the cyclic references example doesn't run.

REVIEW OF ER AND RELATIONAL

ER Overview

Ternary relationships

Relationships constraints

- At most one

- At least one

- Exactly one

- Weak entities

Aggregation

Is-A

Relational Overview

Relations \sim Sets

Schema = structure

Instance = the data

Relational Review

Relations \sim Sets

Schema = structure

Instance = the data

"every relation is guaranteed to have a key" ?

Integrity Constraints

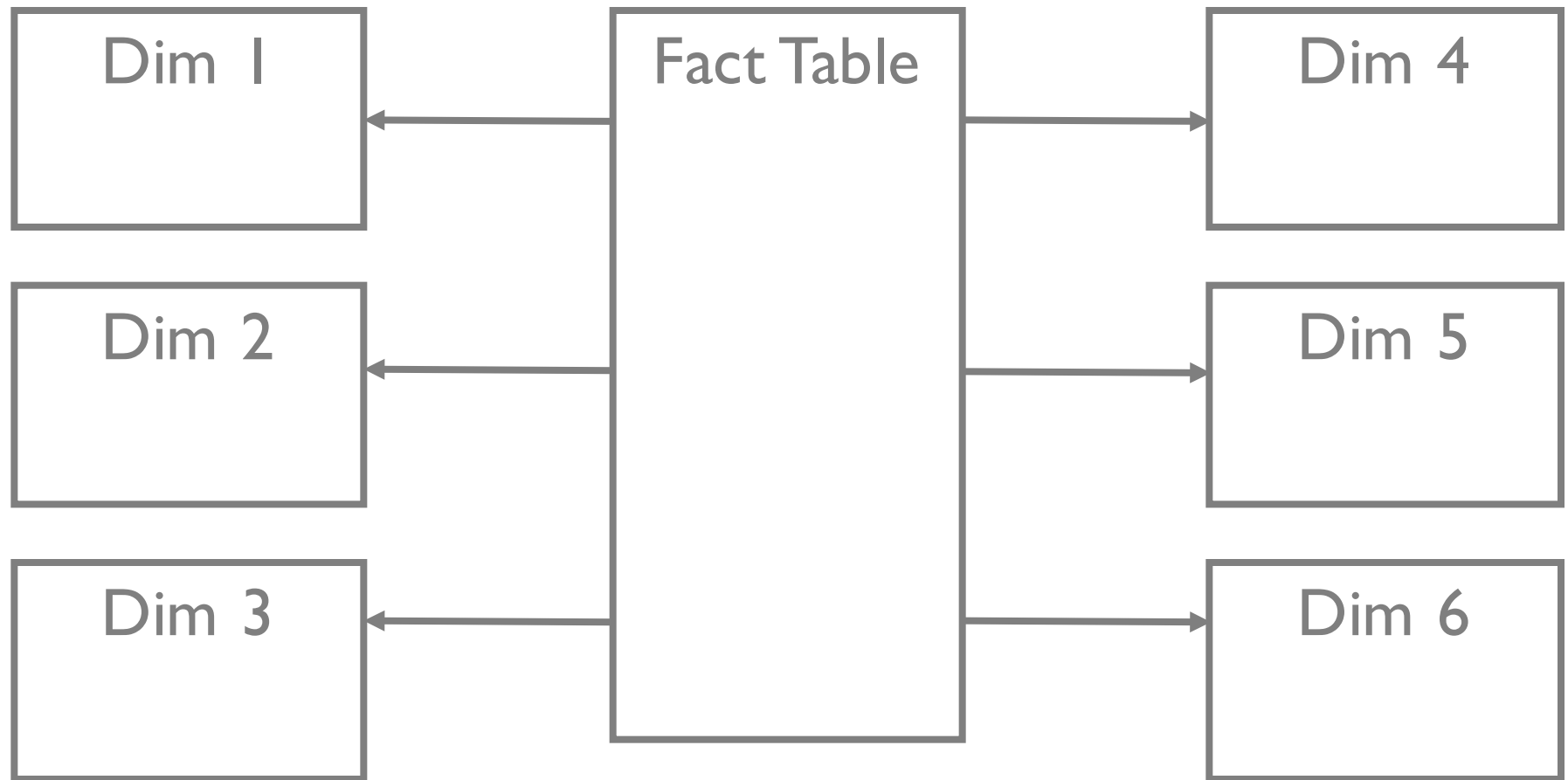
Candidate and primary keys

NOT NULL

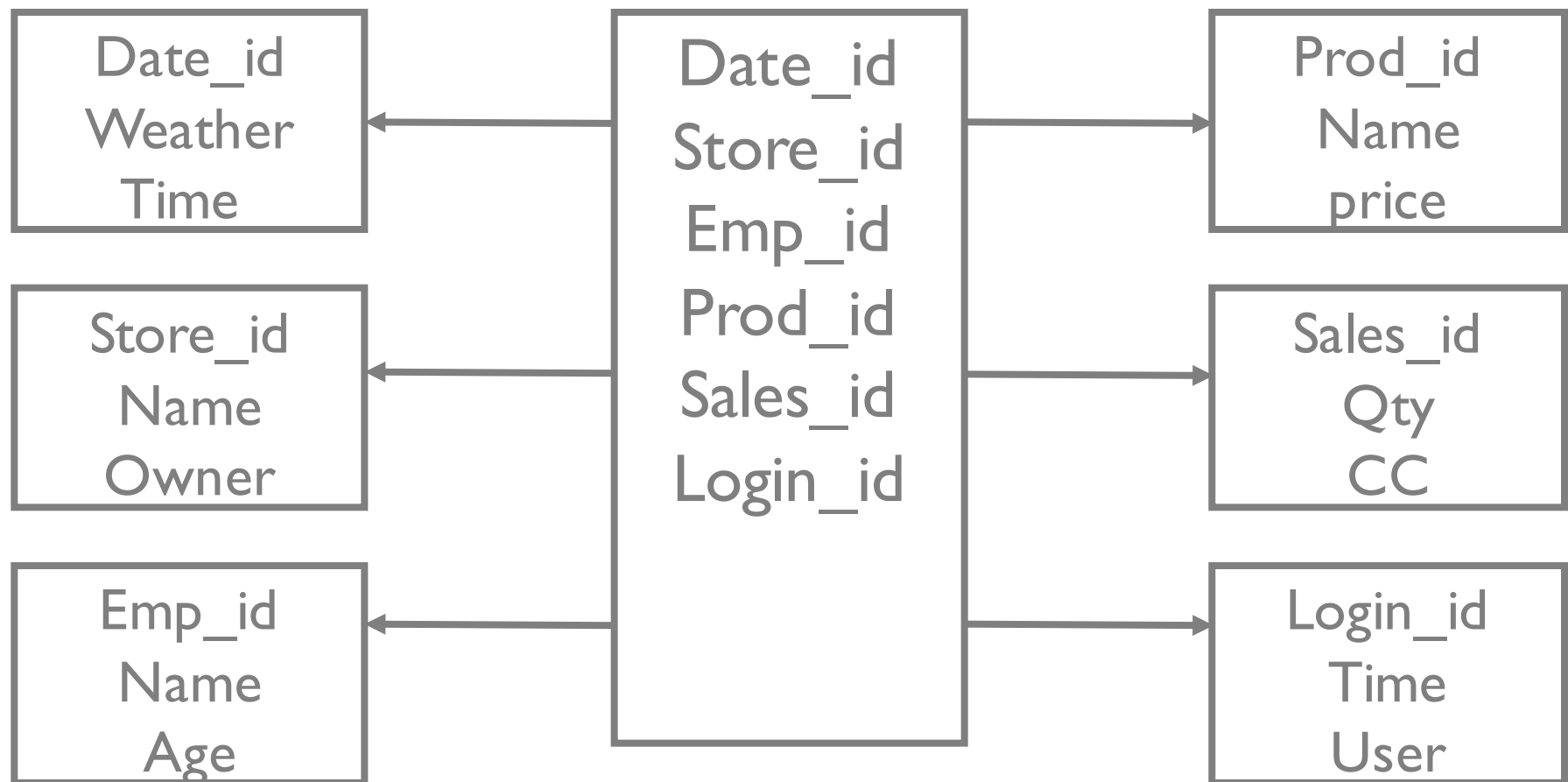
Referential integrity

How are foreign keys managed by the DBMS?

Star Schema



Star Schema



So What Happened?

1970 heated debates about CODASYL vs Relational
Network arguments

- low level languages more efficient (performance)

- relational queries would never be fast (performance)

Relational arguments

- data independence

- high level *simpler* languages

Market spoke.

Other models beyond relational!

Summary

Better than IMS/CODASYL

- allows us to talk about constraints!

- allows us to talk at a logical level

- declarative queries better than navigational programs

Everything is a relation (table)

DBA specifies ICs based on app, DBMS enforces

- Primary and Foreign Keys most used

- Types == Domain constraints

SQL