

Converting ER Diagrams to Tables

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An ER diagram is a pictorial representation of the information that can be captured by a database. Such a “picture” serves two purposes:

- It allows database professionals to describe an overall design concisely yet accurately.
- (Most of) it can be easily transformed into the relational schema.

This lecture will talk about the second bullet.

Recall that an ER diagram consists of:

- Entity sets.
- Relationship sets.

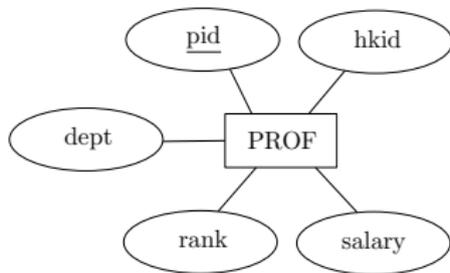
We will convert each entity/relationship set to a table, which involves deciding the table's

- attributes
- and candidate key.

Entity Set \Rightarrow Table

Given an entity set, create a table with the same attributes and candidate key.

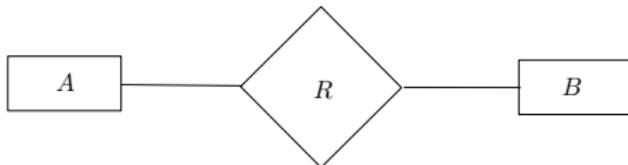
Example:



PROF (pid, hkid, dept, rank, salary)
where pid is set as a candidate key.

Relationship Set \Rightarrow Table

Let us first consider binary relationship sets. To convert R as shown below



we create a table whose attributes include:

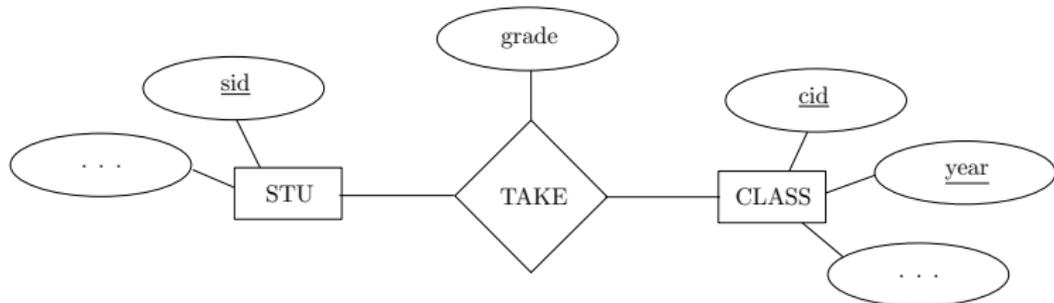
- the candidate keys of both A and B
- the attributes of R (if any).

The candidate key of the table, however, depends on the cardinality constraint of R . See the next few slides.

Relationship Set \Rightarrow Table

Many-to-many: The candidate key of R includes all the attributes in the candidate keys of A and B .

Example:

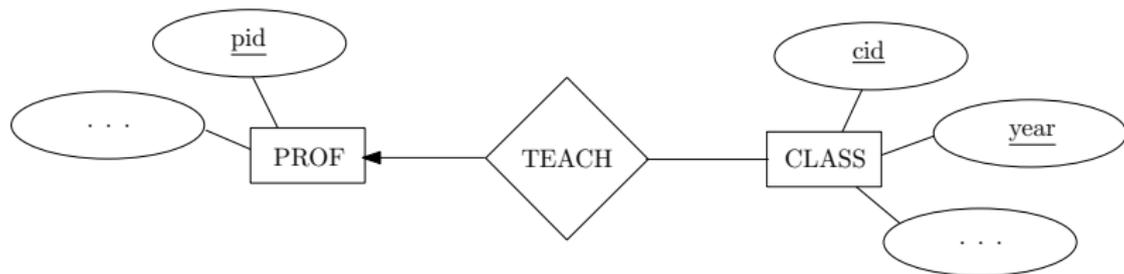


TAKE (sid, cid, year, grade)
where the candidate key is (sid, cid, year).

Relationship Set \Rightarrow Table

One-to-many: The candidate key of R is the same as B (i.e., the entity set on the “many” side).

Example:



TEACH (pid, cid, year)
where the candidate key is (cid, year).

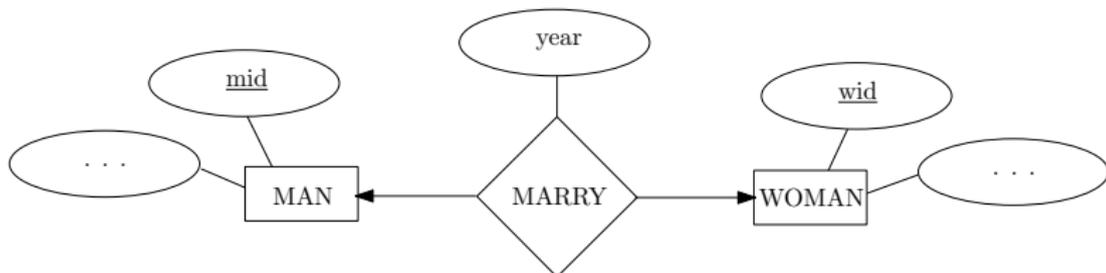
Think

Why?

Relationship Set \Rightarrow Table

One-to-one: R has two candidate keys. The first (second) one is the same as A (B).

Example:



MARRY (mid, wid, year)

where a candidate key is mid, and another is wid.

Think

Why?

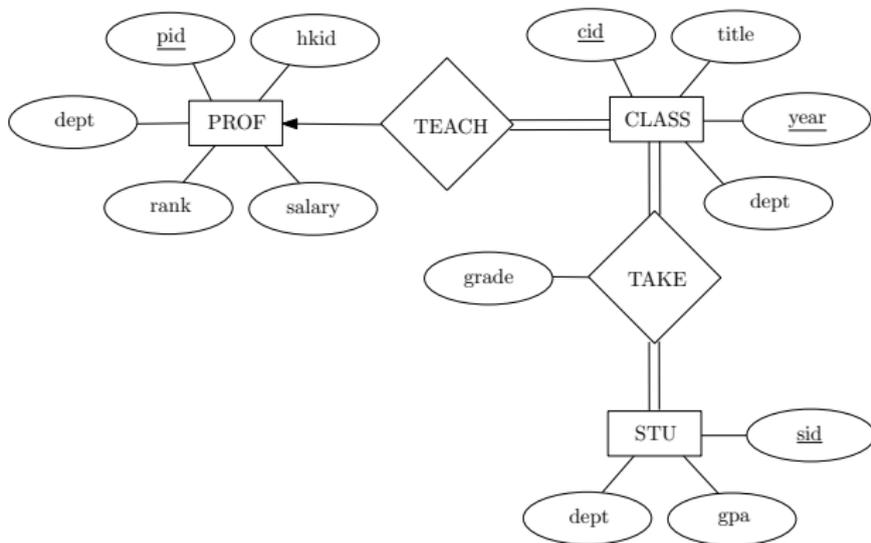
Relationship Set \Rightarrow Table

Multi-way relationship set R : Create a table that includes

- the candidate keys of the participating entity sets
- the attributes of R (if any).

The candidate key of the table includes all the attributes of the candidate keys of the participating entity sets.

Example



- PROF (pid, hkid, dept, rank, salary), candidate key pid
- CLASS (cid, title, year, dept), candidate key (cid, year)
- STU (sid, dept, gpa), candidate key sid
- TEACH (pid, cid, year), candidate key (cid, year)
- TAKE (cid, year, sid, grade), candidate key (cid, year, sid)

Example

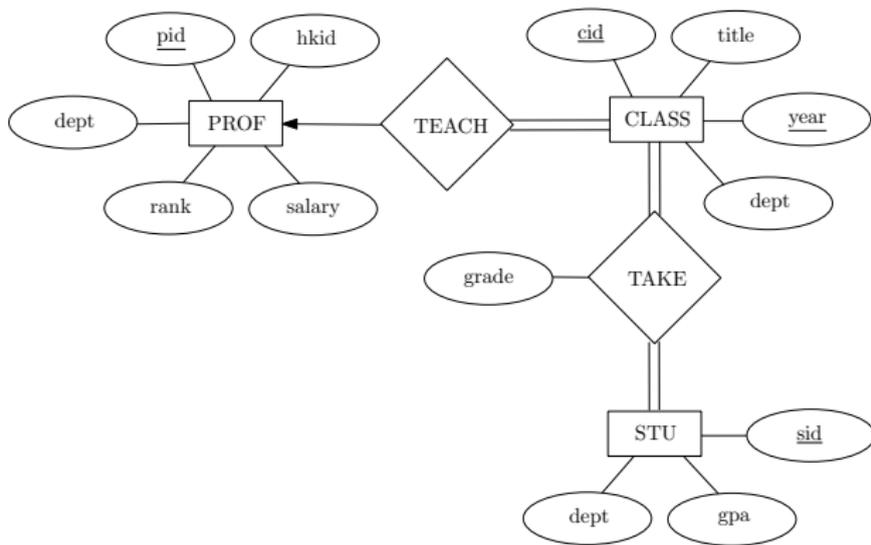
What has not been captured by our conversion?

Participation constraints! For example, how to ensure that every class is taken by at least one student?

Participation constraints can be checked whenever necessary with SQL queries. Think: how?

Interestingly, the total participation of CLASS in the relationship set TEACH can be captured with a clever conversion. See the next slide.

Example



- PROF (pid, hkid, dept, rank, salary), candidate key pid
- CLASS (cid, title, year, dept, pid), candidate key (cid, year)
- STU (sid, dept, gpa), candidate key sid
- TAKE (cid, year, sid, grade), candidate key (cid, year, sid)

Note that there is no explicit table for TEACH. Think: why doesn't the trick work for TAKE?