Constraints in Entity-Relationship Model

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Outline

1. Key Constraint
2. Referential Integrity Constraints
3. Degree Constraints
4. Weak Entity Set
5. Assignments

Entity-Relationship Model Building Blocks

- Entity sets,
- Attriutes,
- Reltionships, and
- Constraints

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Keys in E-R Model

A key denoted as K for an entity set E is a set of one or attributes that satisfy the following property

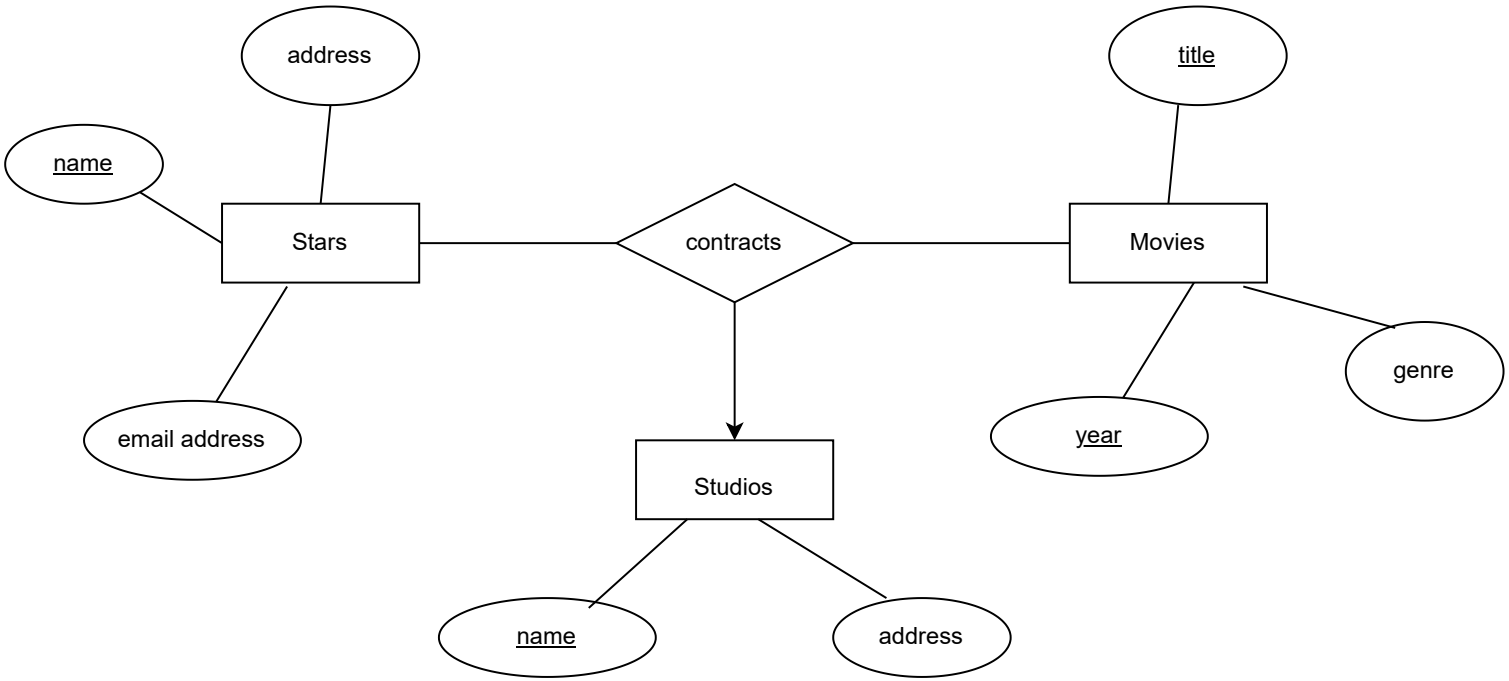
- For any $e_1, e_2 \in E, e1 \neq e2$, there must be a $k \in K$ such that e_1 and e_2 do not have identical values for k

It is important to note

- Every entity set *must* have a key
- There can be more than one possible key for an entity set
  - It is customary to pick one key as the "primary key"
- When an entity set is part of isa-hierarchy, the root entity is required to have all the attributes needed for a key.

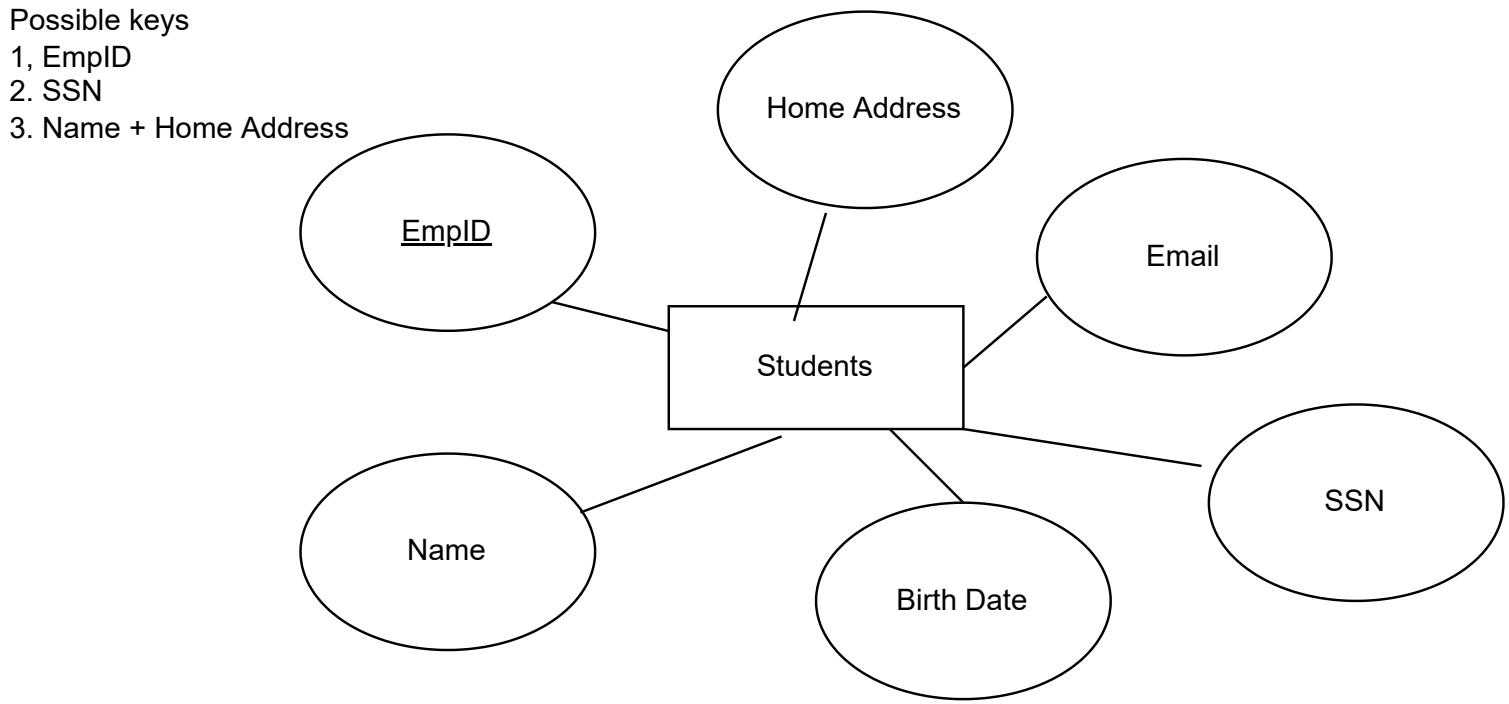
Representing Keys in E-R Diagram

To represent a key in E-R diagrams, we underline the attributes belonging to a key for an entity set.



Representing Keys in E-R Diagram

To represent a key in E-R diagrams, we underline the attributes belonging to a key for an entity set – what's your primary key?



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Referential Integrity in E-R Models

A referential integrity constraint asserts that a value appearing in one context also appears in another but related context.

Example: Students take Courses

- Entity sets `Students`, `Courses`
- Relationship set `takes`
- Referential constraint on relationship `takes`: a student appears in the `takes` relationship set must also appear in entity `Students` set
- Why?

Referential Integrity in E-R Diagram

Use rounded arrow

Suppose R is a relationship set from entity set E to entity F. A rounded arrow pointing to F indicates the entity set F related to a given entity of set E is required to exist.

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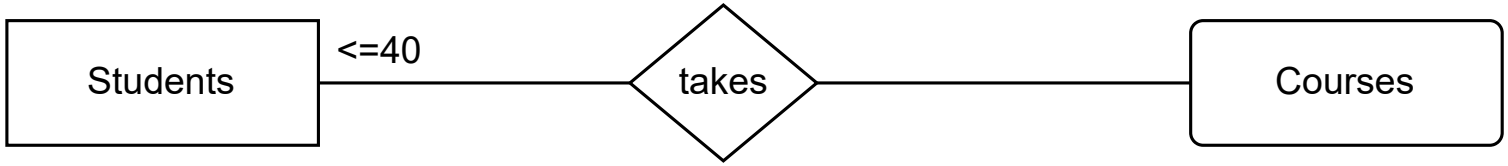
Degree Constraints

Degree constraints indicates limits on the number of entities that can be connected to any one entity of the related entity set.

- Entity sets `Students`, `Courses`
- Relationship set `takes`
- Degree constraints on `takes`: a course cannot have more than 40 students.

Degree Constraints in E-R Diagram

Attach a bounding number to the edges that connect a relationship set to an entity set



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Weak Entity Set

If some or all attributes of an entity's key belong to another entity set, the entity set is a weak entity set.

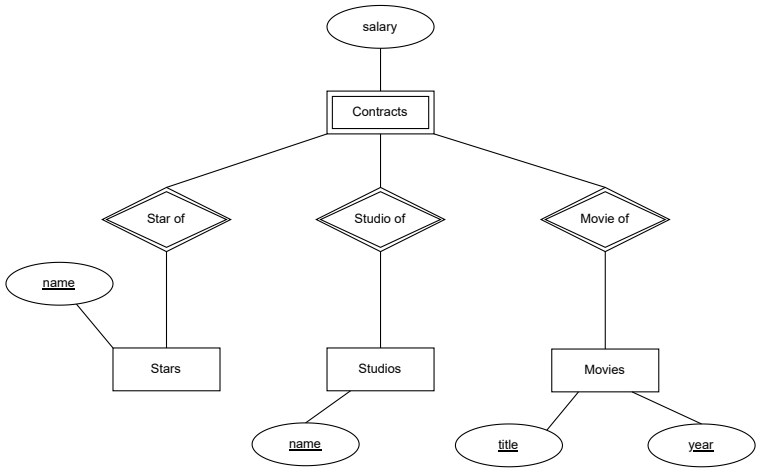
When does it occur?

- An entity set is a "subordinate" of another
- When we convert a multi-way relationship to a binary relationship

"Subordinate" Entity Set

Examples (also on draw.io).

- Students in multiple colleges, in each a student has a student ID.
- Basketball players in multiple teams, in each a player has a number.
- A species is designated by its genus and species names.
- Contracts among Studios, Stars, and Movies



Are there any important constraints we should add?

Weak Entity Set Notation

1. If an entity is weak, we show it as a rectangle with a double border
2. Its supporting many-one relationships will be diamonds with a double border
3. If an entity set supplies any attributes for its own key, those attributes will be underlined.

Summary

Constraints

- Key constriants
- Referential integrity constraints
- Degree constraints
- Exercises and homework assignment
  - Ternary relationship
  - Ternary relationship $\rightarrow$ binary relationships
  - Constraints

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Exercises (Assignments)

Let's work on some problems...