Entity-Relationship Model

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Outline

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Entity-Relationship Model Building Blocks

▶ Entity sets

▶ Attriutes,

▶ Reltionships, and

▶ Constraints

Entity Sets

An entity is an abstract object of some sort, and a collection of similar entities forms an *entity set*.

▶ Example: let's design a movie database (for whom?)

  ▶ What are the nouns?
  ▶ Each movie is an entity, and the set of all movies constitutes an entity set
  ▶ Call the entity set Movies
  ▶ Each movie star (actor or actress) is an entity, the set of all movie stars is an entity set
  ▶ Call the entity set Stars

▶ Question: let's consider a database for an educational institution

  ▶ What are examples of entity and entity set?

Attributes

Entity sets have associated attributes, which are properties of the entities in that set.

► Example: let's continue to design the movie database
► What attributes can entity sets `Movies` and `Stars` have?
► Discussion: Are the attributes of primitive data types?

Relationships

Relationships are connections among two or more entity sets.

- ▶ Example: let's continue to design the movie database
- ▶ What are the verbs?
- ▶ Entity sets `Movies` and `Stars` can have a relationship called `Stars-in`
- ▶ Entity sets `Studios` and `Movies` can have a relationship called `Owns`
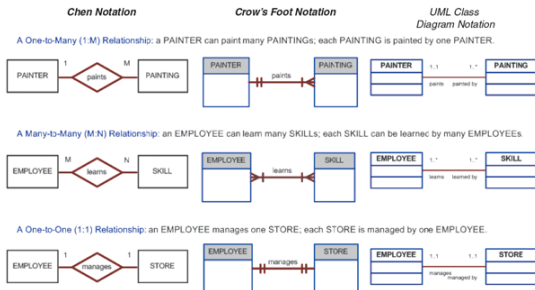
Outline

1 Entity-Relationship Modeling

2 Entity-Relationship Diagrams
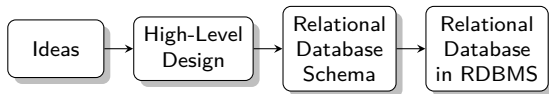
3 Modeling Relationships

4 Assignments

Entity-Relationship Diagrams

An Entity-Relationship Diagram (E-R Diagram) is a graph representing entity sets, attributes, and relationships. There are three popular notations to represent the graph.

- ▶ Chen notation (by Peter Chen)
- ▶ Crow's Foot notation
- ▶ UML notation

Overview

Instance of an E-R Diagram

E-R diagram is a notation for the model of data (or a database) and a database contains particular data, an "instance" of the database.

Students	Courses
Jane Doe	CISC 3115
John Doe	CISC 1115
Amy Doe	CISC 3130

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1 Entity-Relationship Modeling

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4 Assignments

Multiplicity of Binary E-R Relationships

- ▶ A binary relationship is a relationship between two entity set.
- ▶ There can be a restriction on the "multiplicity" of a relationship.
 - ▶ 1-to-1, 1-to-many, many-to-many
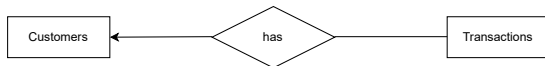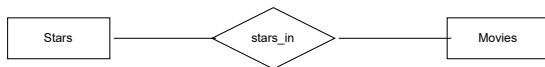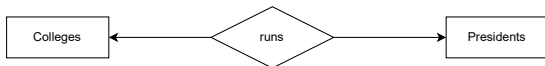
Multiway Relationships

▶ A relationship can involve more than two entity sets – multiway relationships

    ▶ In practice, ternary (3-way) or n-way ($n > 3$) relationships are rare, but they occasionally are necessary to reflect the true state of affairs
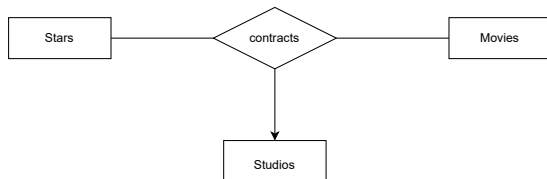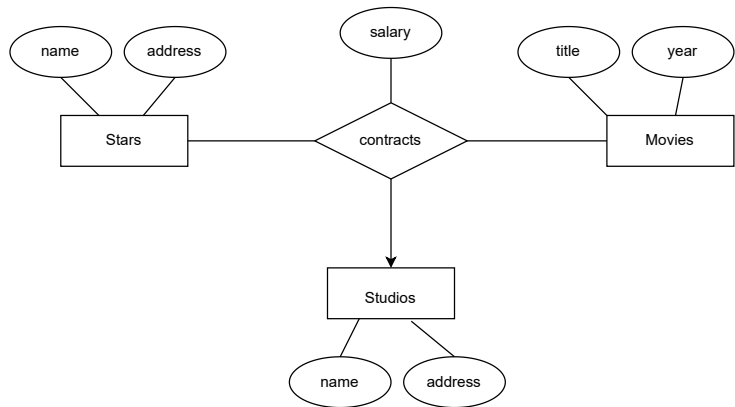
Roles in Relationships

▶ It is possible that one entity set appears two or more times in a single relationship, called "roles" of the relationship.

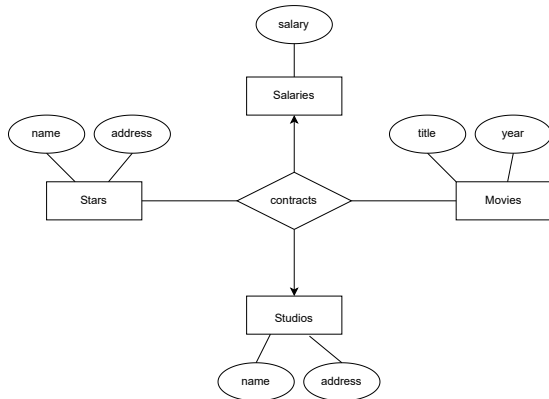▶ For each role, we connect the entity sets with a line, and label it with the role
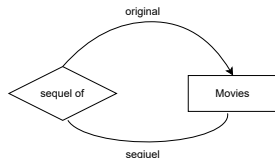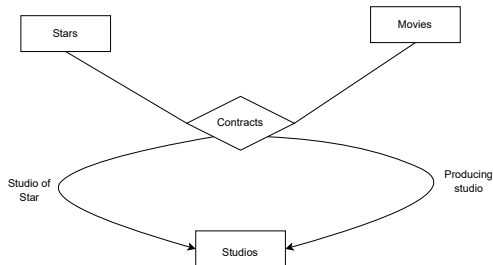
Attributes on Relationships

▶ Relationships can have attributes.

Attributes on Relationships

▶ Relationships can have attributes.
▶ But, we can also instead invent a new entity set
▶ Let's compare these two modeling choices

Converting Multiway Relationship to Binary

▶ Some data models, like those in UML limit relationships to binary.
▶ Why?
▶ E-R model does not require binary relationship.
▶ We can convert any n-way relationship to a collection of binary, many-to-one relationships.
▶ Method: introduce a new entity set whose entities are tuples of the relationship set for the n-way relationship; connect the entity sets

Examples: Convert to binary relationships
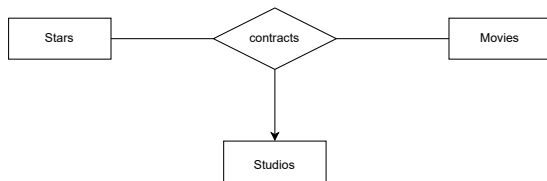
Result: next slide

Converting Multiway Relationship to Binary: Result
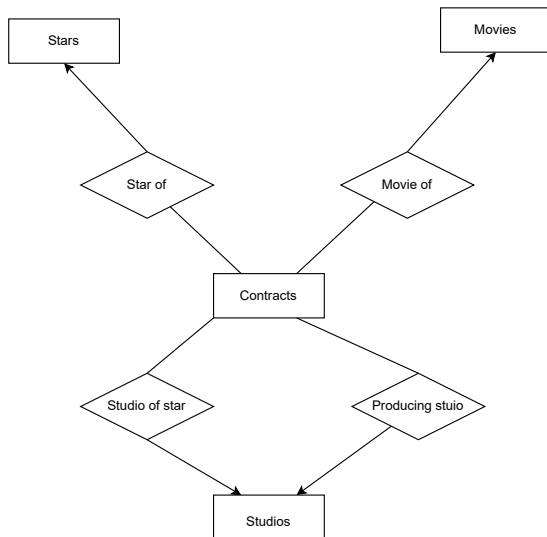
Modeling Subclasses in E-R Model

▶ Sometimes, an entity set contains entities that have special properties not universally associated with all members of the set.

▶ Like Object-oriented programming, we model it using subclasses

▶ We create an entity set with the special properties to an entity set.

▶ This is an "isa" relationship
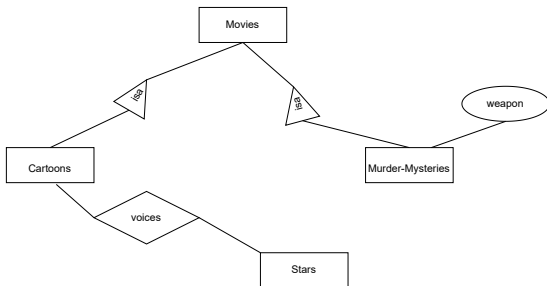
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Exercises (Assignments)

Let's work on some problems...

Summary

- ▶ E-R modeling
- ▶ Entity set and relationship set
- ▶ Exercises and homework assignment