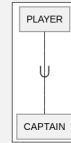


Key Points – Enhanced Entity-Relationship (EER)

- EER contains two additional concepts not present in the basic ER model

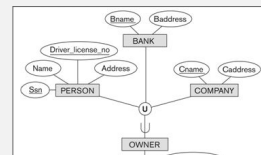
– specialization and generalization – is-a

- captures roles or kinds of – some members of an entity set may have additional attributes and/or be involved in additional relationships
 - e.g. a CAPTAIN is a role played by a PLAYER
 - e.g. a MANAGER is a role played by an EMPLOYEE
 - e.g. CAR and TRUCK are kinds of VEHICLE



– category (union) type

- captures common attributes and/or relationships of otherwise distinct kinds of entities
 - e.g. the OWNER of a vehicle could be a PERSON or a COMPANY or a BANK



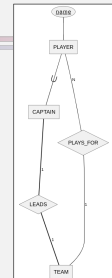
Key Points – Specialization

• is-a relationship

- subclass inherits all of the attributes and relationships of the superclass

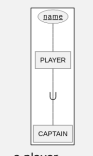
• subclass membership –

- predicate-defined* – the value of an attribute of the superclass determines membership for a subclass
 - attribute-defined* – the value of the same superclass attribute determines membership for all subclasses
- user-defined* – the user determines subclass membership when an entity is added to the database

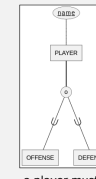


• subclass participation –

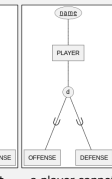
- total specialization* – every superclass entity belongs to at least one subclass
- partial specialization* – a superclass entity need not belong to any subclass



a player doesn't have to be a captain



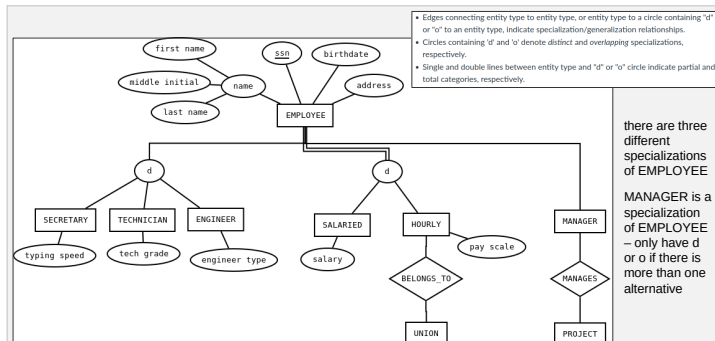
a player must be an offensive or a defensive player (or both)



a player cannot be both an offensive and a defensive player

• subclass overlap –

- disjoint* – a superclass entity belongs to at most one subclass
- overlap* – a superclass entity may belong to more than one subclass



Edges connecting entity type to entity type, or entity type to a circle containing 'd' or 'o' to an entity type, indicate specialization/generalization relationships. Circles containing 'd' and 'o' denote disjoint and overlapping specializations, respectively. Single and double lines between entity type and 'd' or 'o' circle indicate partial and total categories, respectively.

there are three different specializations of EMPLOYEE
MANAGER is a specialization of EMPLOYEE – only have d or o if there is more than one alternative

- every person who is an employee must be a secretary or a technician or an engineer
- an employee can be both a secretary and a technician
- an engineer's attributes include engineer type, name, and ssn
- every employee is either salaried or hourly
- an employee can be either salaried or a secretary, but not both
- every employee is also a manager
- an employee's attributes include name, ssn, salary, and pay scale
- every manager is also an employee
- every technician is also an employee
- a manager cannot also be a secretary, technician, or engineer

Key Points – Shared Subclasses

A *shared subclass* is a subclass in multiple specializations derived from the same superclass.

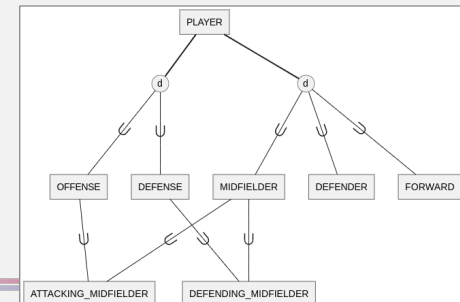
- the set of entities belonging to the shared subclass is a subset of the intersection of the parent entity sets
- the shared subclass inherits all attributes and relationship types from its parent entity types

ATTACKING_MIDFIELDER has all of the attributes and relationship types of PLAYER, MIDFIELDER, and OFFENSE

a player must be exactly one of forward, midfielder, defender

a player must be exactly one of offense, defense

an attacking midfielder is both a midfielder and an offensive player
a defending midfielder is both a midfielder and a defensive player

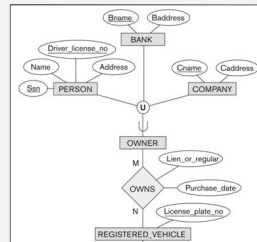


Key Points – Category Types

- a *category type* is an entity type whose entities can be one of several other entity types
 - category is a common role that can be taken on by otherwise different things

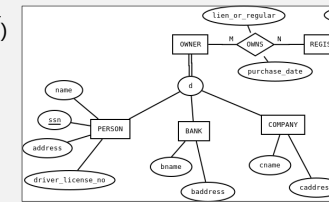
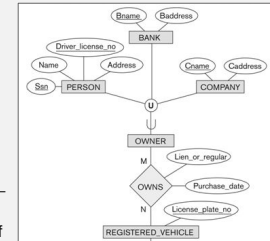
PERSON, BANK, COMPANY are separate things – the only thing they have in common is that they can all act as an owner

acting as an owner means they can participate in the OWNS relationship



Category vs Specialization

- OWNER is a category type
 - person, bank, and company are distinct groups – no entity would belong to more than one – but all can be an owner
- an OWNER entity is a person or a bank or a company
 - the attributes of an owner entity are those of PERSON, BANK, or COMPANY
 - there's no such thing as just an owner
- specialization
 - PERSON, BANK, COMPANY are different kinds of owners
- an OWNER entity is also a person or a bank or a company (or several or none)
 - OWNER is what PERSON, BANK, and COMPANY have in common – attributes and relationships are inherited
 - with total participation, there's no such thing as something that is only an owner
 - with disjoint, there's no overlap in the kinds of owners



Draw an EER diagram to capture the following:

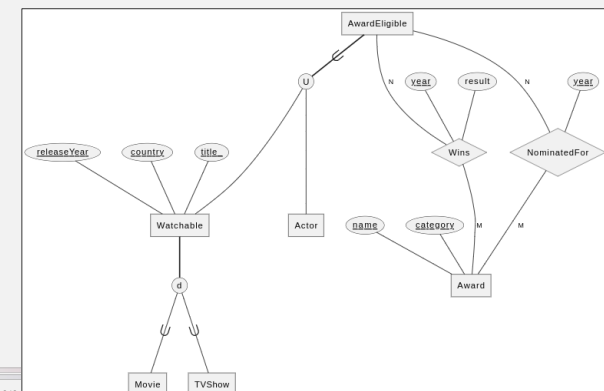
- Movies and TV shows are identified by a title, release year, and country.
- Movies, TV shows, and actors may have won or been nominated for awards (with the name of the award, year, category, and result - win or loss - included).

In particular, is specialization appropriate here? A category type? Explain.

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In particular, is specialization appropriate here? A category type? Explain.



Draw an ER/EER diagram to model the situation described below. Represent the situation as accurately as possible, including participation, cardinality, and key constraints as appropriate. Also identify any attributes which are required (i.e. should be NOT NULL). Note any constraints present that you did not capture in the diagram along with a reason why they were omitted. If necessary specifics are lacking in the description of the situation, make reasonable assumptions and state those assumptions.

- A horse has a registration number (by which it is identified), name, type (quarter horse or thoroughbred), gender, and trainer. A horse is only trained by one person, but a given trainer may train any number of horses. The heritage of every horse must also be maintained, if the information is available. For example, the mother (dam) and father (sire) should be recorded. It is also necessary to identify the offspring of a given horse.
- A stable is a company that breeds, trains, and sells/buys horses. A stable has a unique identifier, and a name, phone, and contact person.
- Information about people involved in the horse racing business should be maintained. An identifier, name, address, and phone number should be maintained about every person. If a person is a horse trainer, the salary of the trainer should be indicated along with the horses trained by the trainer. A horse trainer works for a specific stable. (A stable may employ many trainers.) If a person is a jockey, the weight of the jockey must be recorded, along with the date of the last recorded weight. It is sometimes necessary to know whether a person is both a trainer and a jockey. Name and contact information can also be maintained about people other than trainers and jockeys.
- A horse can have more than one owner. An owner can own more than one horse. Information is always recorded about the most recent date and purchase price of a horse by its current owner(s). Owners must also record their percentage of ownership of a horse (which should not add up to more than 100%). An owner can be either a stable or a person.
- Every race track has a race schedule indicating the date of each race day and the list of races for each race day. A race day typically has 10 scheduled races, where each race has a race number (from 1 to 10) and a purse. The purse is the amount of money awarded to the winner of the race.
- Every race has several entries. Each entry indicates the horse, jockey, and gate position of the horse at the start of the race. After the race, the entry records the finishing position of the horse (first, second, third, etc). Every horse and every jockey must be able to produce a history of the races in which they have participated.

Draw an EER diagram to capture the following:

- A movie is identified by a title, release year, and country.
- A movie additionally has a running time, a rating (which may be different in different countries), a director, at least one writer (who may be credited for particular things e.g. "book" or "screenplay"), at least one genre, a cast consisting of any number of actors playing at least one role each, and a crew where each person has at least one job title.
- A movie additionally may have a release date (month, day, and year) in each of multiple countries, and may have won or been nominated for awards (with the name of the award, year, category, and whether or not the movie won included).
- A TV show is identified by a title, release year, and country.
- A TV show additionally has at least one genre and a main cast consisting of any number of actors playing at least one role each. Each actor/role combination maybe associated with only particular seasons of the show.
- A TV show additionally may have won or been nominated for awards (with the name of the award, year, category, and whether or not the show won included).
- A TV show consists of episodes which are grouped into seasons. Individual episodes have a title, episode number, production number, original air date, running time, rating (which may be different in different countries), director, writer(s) (who may be credited for particular things e.g. "book" or "screenplay"), guest star(s) who play at least one role each, and a crew where each person has at least one job title.
- An actor or crew member is uniquely identified by name.
- An actor or crew member additionally may have a birthdate, birth place, and biography.
- An actor or crew member additionally may have alternate names he or she has been credited as in some movies or TV shows, and may have won or been nominated for awards (with the name of the award, year, category, and result listed).