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E/R diagrams

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Database Systems I. Seminar

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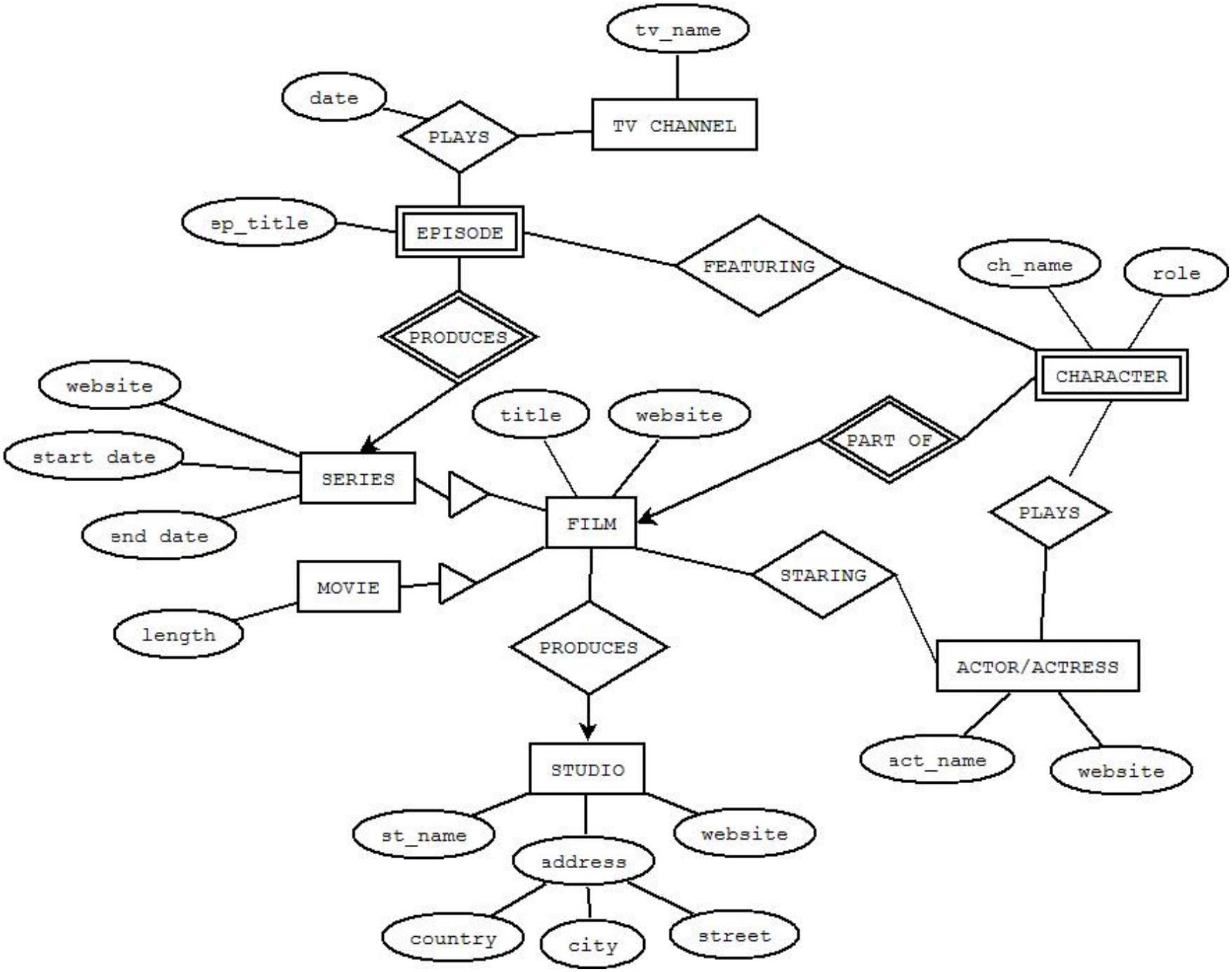
Recap

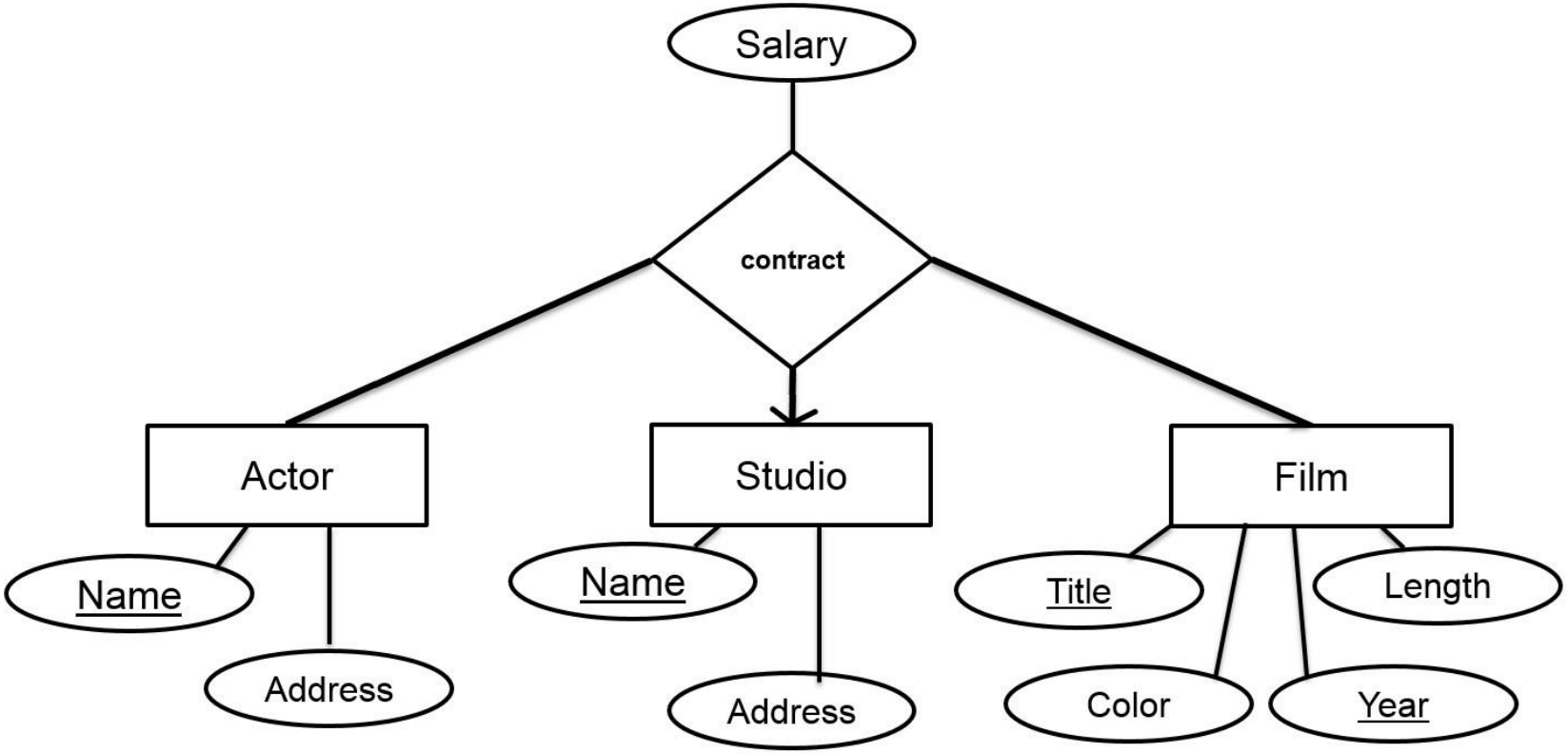
- Levels of database design
  - *View (external)*
  - *Logical (conceptual)*
  - *Physical (internal)*
- Entity, entity set, attributes, relationship, relationship set, super key, candidate key, primary key
- E/R model notations:
  - Entities, relationships, weak entities, weak relationships
  - Attributes
    - Composite
    - Multivalued
  - Primary key
  - Total participation


tv_name
date
PLAYS
TV CHANNEL
ep_title
EPISODE
FEATURING
ch_name
role
PRODUCES
CHARACTER
website
title
website
PART OF
start date
SERIES
FILM
PLAYS
end date
STARING
MOVIE
length
PRODUCES
ACTOR/ACTRESS
act_name
website
STUDIO
st_name
website
address
country
city
street

Specification -> E/R - example 1

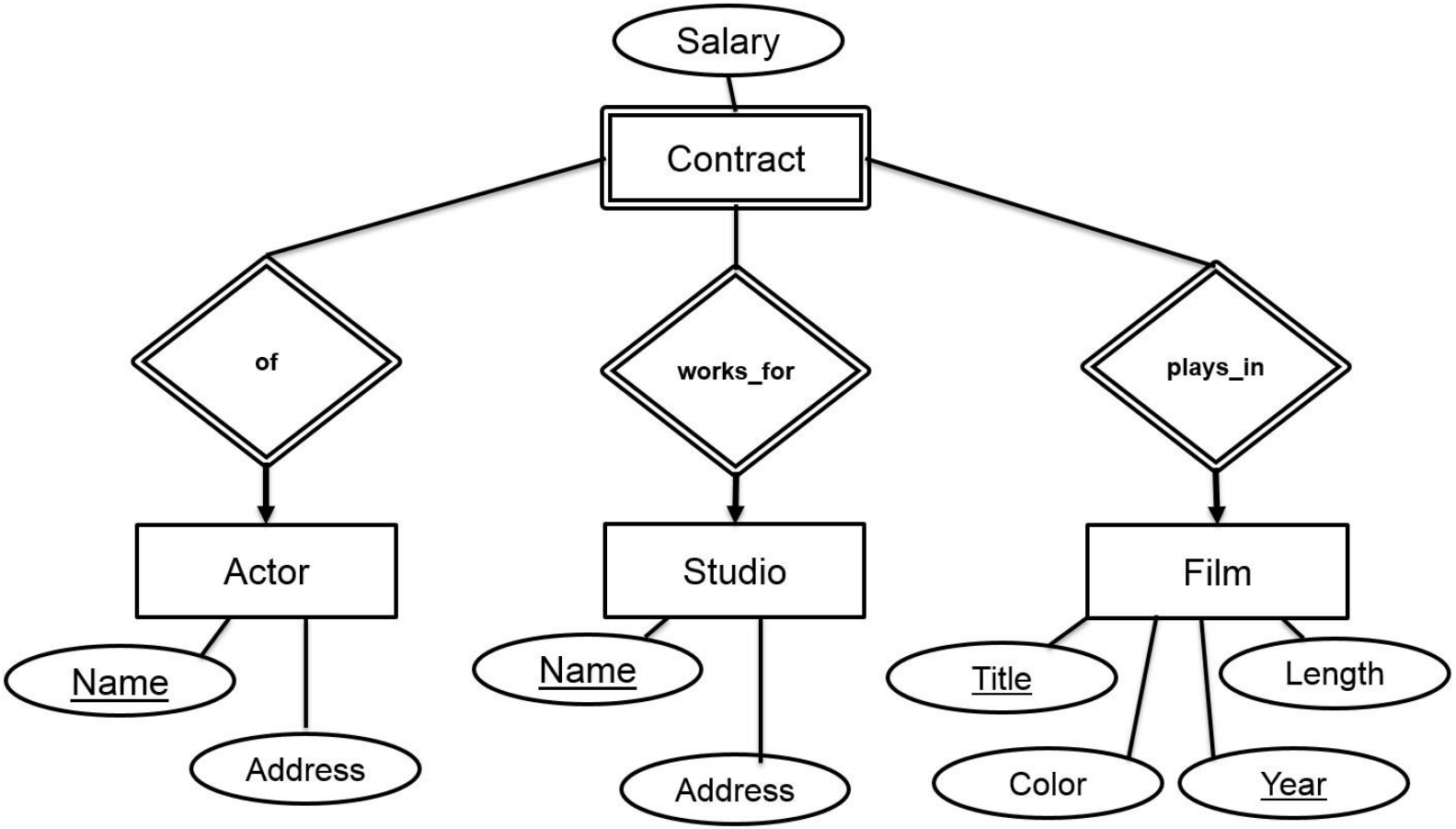
- Identify the entity sets, relationships, and attributes in the following specification. Draw an E/R diagram too.
- Library Catalog
  - In our small library catalog we would like to store the data of available books and also the customers, who can borrow books.
  - The title and author of a book is stored in the catalog along with a book identification number, which is a unique number for each book at the library.
  - We are keeping track of the start and end date of the loan period. Each book can be out many times and each borrower can borrow many books at a time.
  - We would like to store the borrower's name, address, and also the number of his/her library card.

Multi relation - example 2



Lets separate to binary relationships!

Binary relations - example 2



PTS - example 3

PUBLIC TRANSPORTATION SYSTEM (PTS)

We need to store personal data of employees, completed work hours, information about vehicle fleet and lines. Important data about employees are: name, birth date, address, hire date and monthly salary and phone numbers. For each employee we need to know her/his immediate boss, (the person to whom she/he reports). We need additional information on drivers. We need to know their types of driving license, how many kilometers have they driven, and how many accidents they have had. For the purpose of quality assurance, the number of accidents per kilometer is continuously monitored for drivers. Since our company has family incentives (e.g., free monthly tickets for family members, child care center, wives' club, etc.), we need to know the relatives of our employees. However, the only thing we really need is the family member status, that is spouse, child1, child2, mother, father, sibling, etc., and their names.

There are two purposes of storing data of our vehicle fleet. First, we want to be up-to-date about the maintenance history of each vehicle, with particular emphasis on the last maintenance performed, namely what kind of repair work was done. Second, we need to know the general status of our fleet, so we need the date of commission, manufacturer and model, vehicle identifier number, passenger capacity about each vehicle. For buses it is important to have the engine's eco-type (some areas can only be serviced by reduced pollution emitting buses), and the number of axes. For rail bound vehicles, we need to know the wheel base, the height of the electric wire, the voltage, and whether the vehicle has an engine or not. (There are engine-less cars of trams, subways, etc.) For every vehicle we need to know what type of license is required to drive it.

The system should be able to answer such questions as which drivers could substitute on given lines in case of sickness, or other emergencies. We also would like to store the number, the road map and the time table of each line, and customers should be able to query these data on our web page. For the purpose of proper performance based reimbursement, as well as the tracking of injuries or police actions, we need to know which employee drove which vehicle on which line at a given date and time, and what notes she/he made about it.