Relational Databases

CPSC 315 – Programming Studio

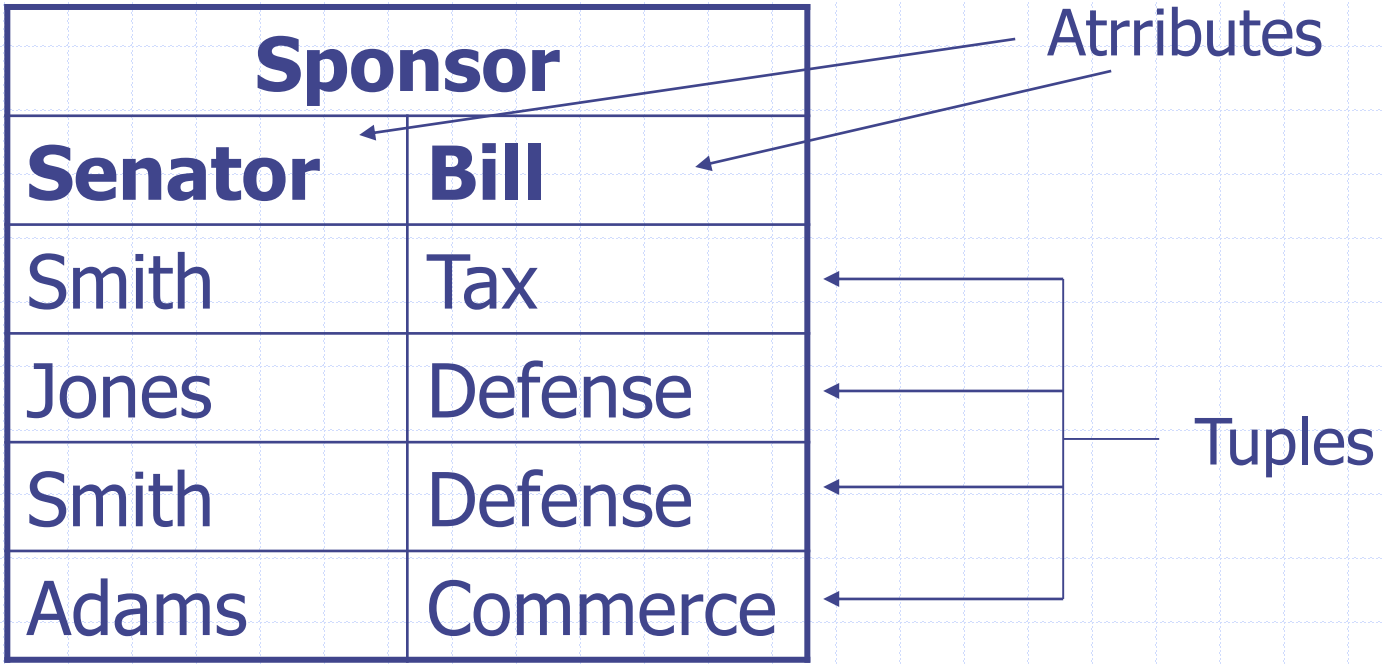
Spring 2017

Project 1, Lecture 2

Slides adapted from those used by
Jeffrey Ullman, via Jennifer Welch

Relational Data Model

- Relations are stored in tables
  - e.g. Sponsor(Senator,Bill)



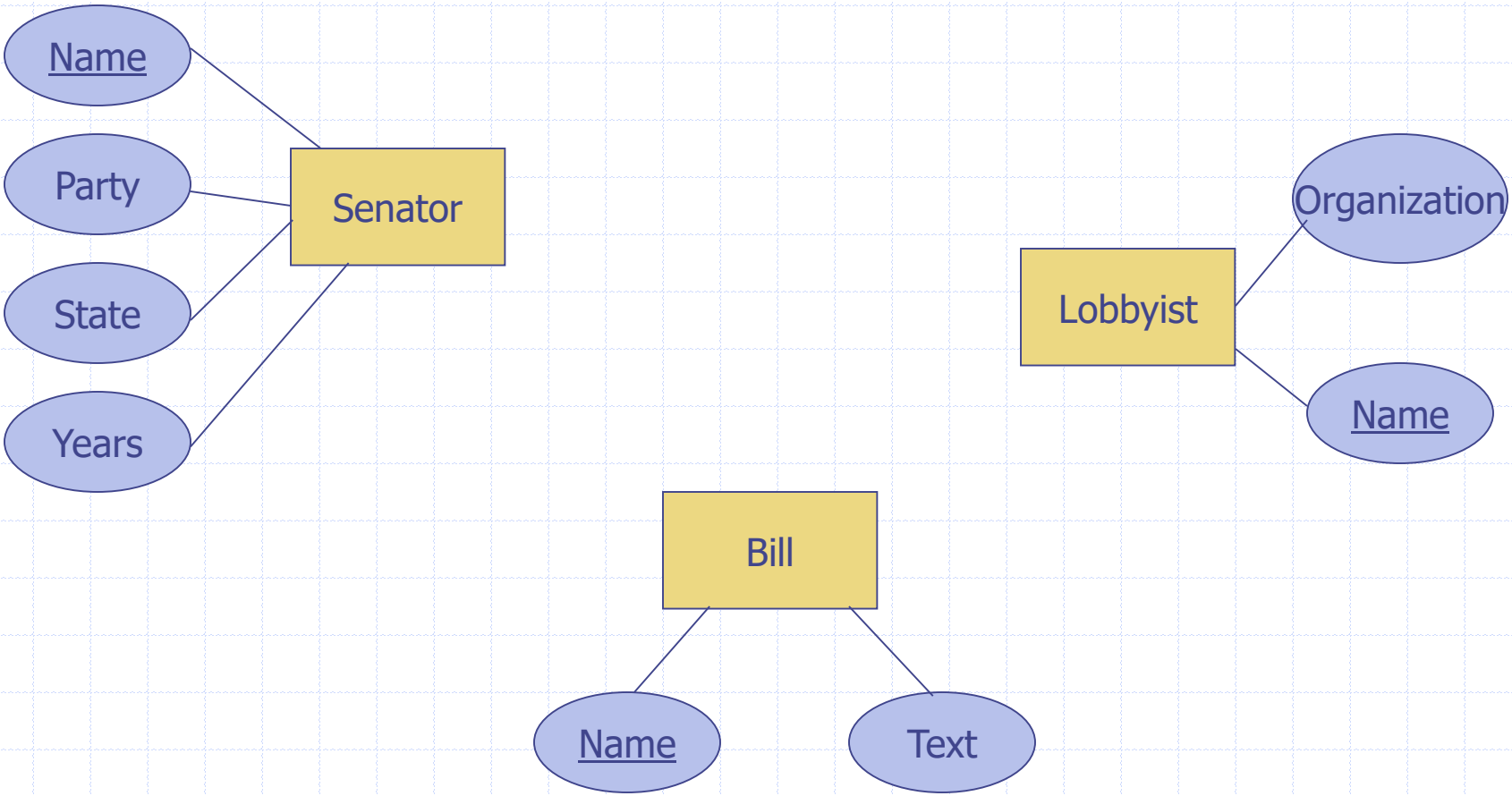
Schemas

- A ***relation schema*** is a *relation name* and a *list of attributes*
  - Sponsor(Senator,Bill)
- A ***database*** is a collection of relations
- A ***database schema*** is the set of *all* the relation schemas in the database

Converting from Entity-Relationship Model

- ER: Entity set -> relation
  - ER Attributes become Relational attributes
- ER: Relationship -> relation
  - Keys of connected ER entity sets become Relational attributes

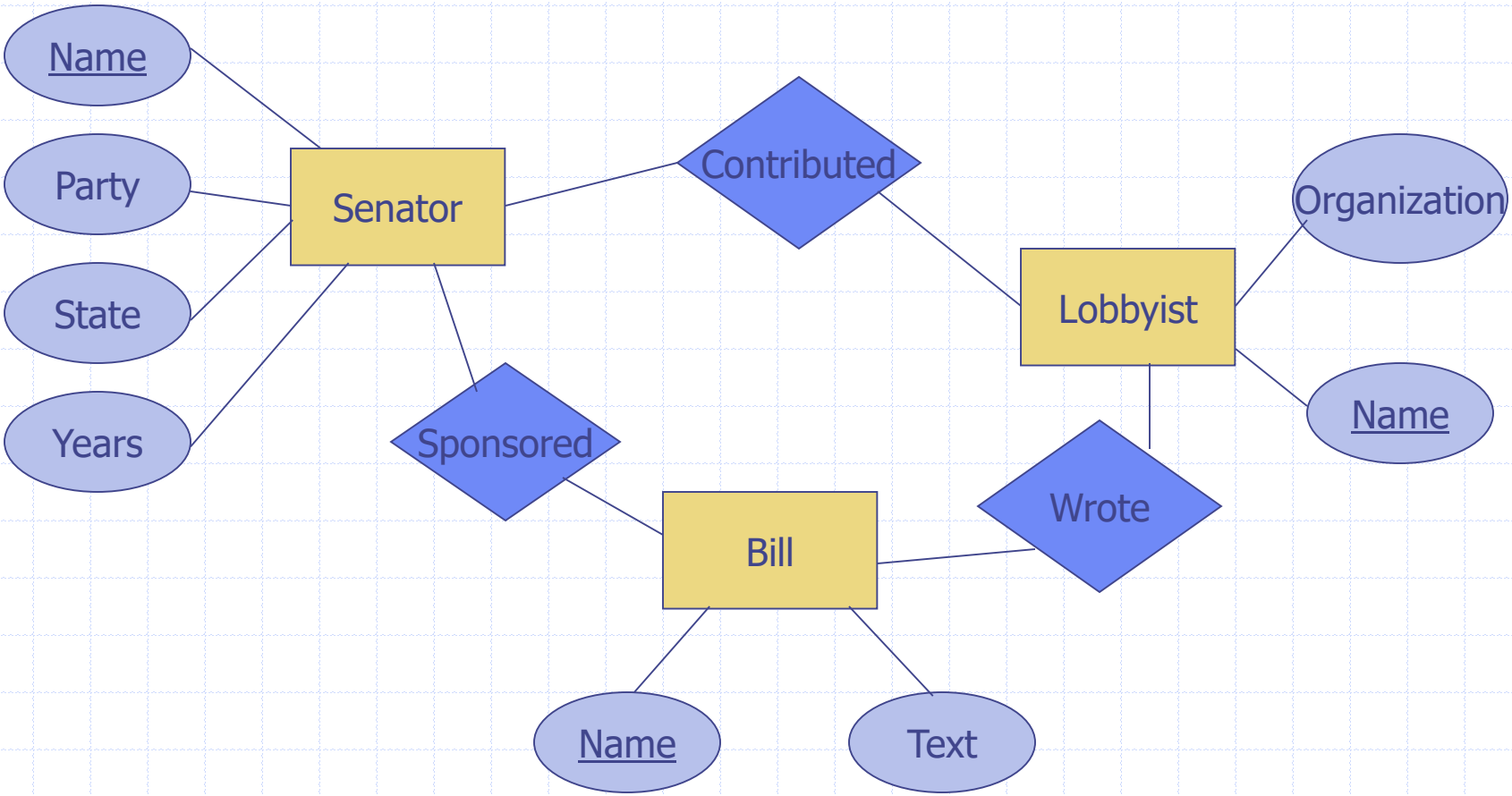
ER Entity Sets



Relations

- Senator(Name,Party,State,Years)
- Bill(Name,Text)
- Lobbyist(Name,Organization)

ER Relationships



Relations

- Sponsored(Senator,Bill)
- Wrote(Bill,Lobbyist)
- Contributed(Senator,Lobbyist)

- Remember, each of these is expressed as a table (with the columns given by the "parameters")
- Notice that columns can refer to "bigger" items, with even more attributes

Combining Relations

- Relations can sometimes be combined.
- Assume a "base" entity set with its relation.
- If there is a many-to-one relation, then it can be combined with the base entity set.
- Should **not** combine many-to-many
  - Would cause redundancy – each of the many stored

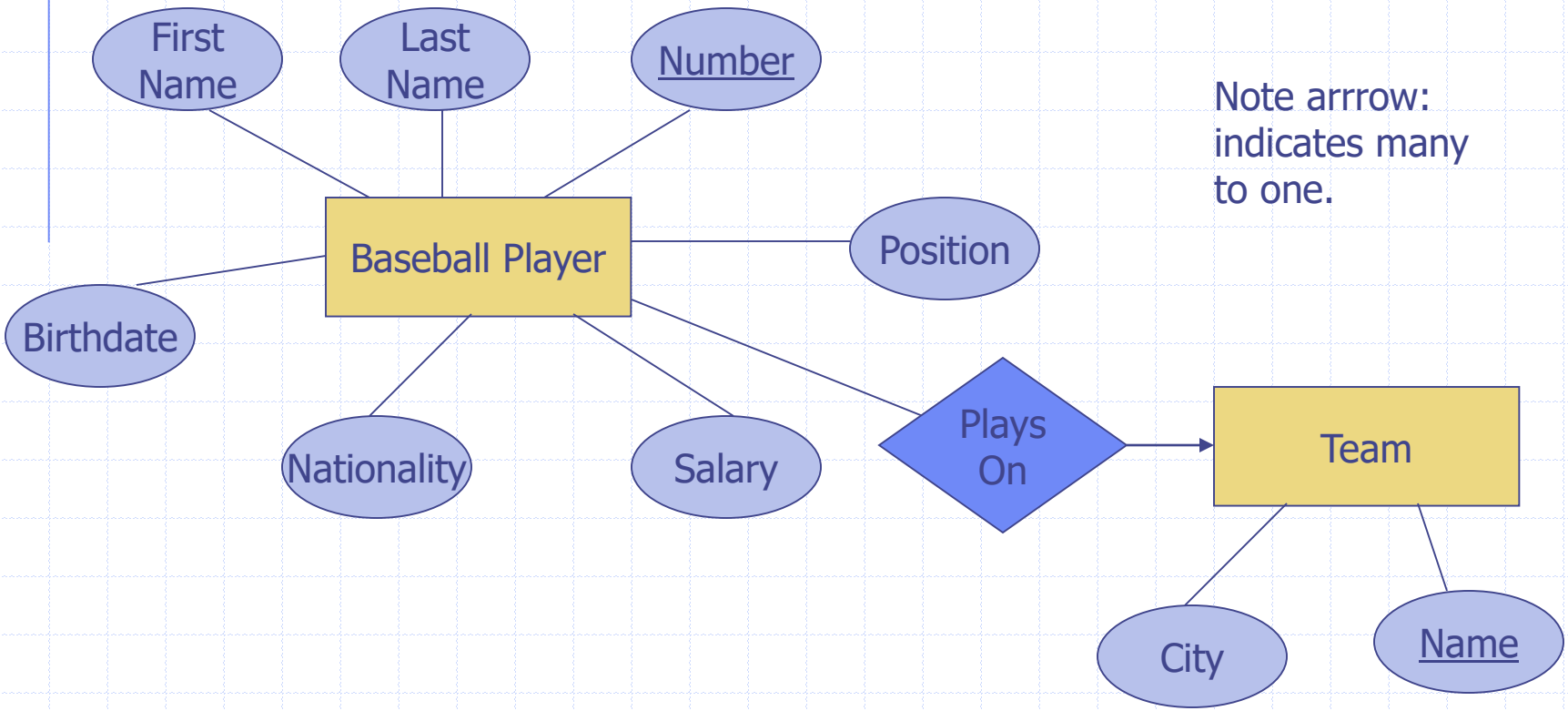
Combining Relations

- Example (many-to-one): (Good)
  - Person(Name, Birthdate, Height, Weight, Eye Color, Hair Color)
  - BornIn(Person,Town)
  - Person(Name, Birthdate, Height, Weight, Eye Color, Hair Color, Town)
  - (Only one Town per Person)
- Example(many-to-many): (Bad)
  - Senator(Name, Party, State, Years)
  - Sponsored(Senator, Bill)
  - Senator(Name, Party, State, Years, Bill)
  - (Many Bills per Senator)

Weak Entity Sets

- The relation for a weak entity set must contain all the elements of its key
- Supporting relationships are usually redundant (unless possibly multi-way)

Weak Entity Set Example



Weak Entity Set Example

- Team(Name, City)
- Baseball Player(Number, TeamName, First Name, Last Name, Position, Birthdate, Nationality, Salary)

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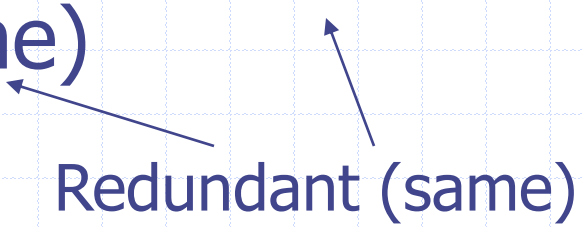

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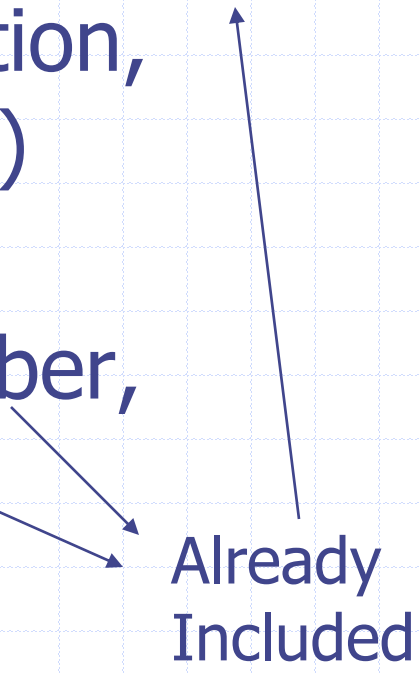
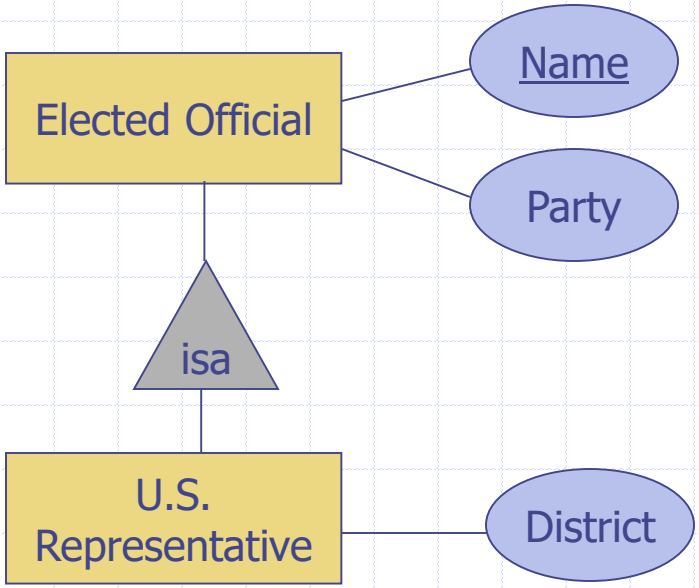


Subclasses Different Options

- Different ways to represent subclasses



Object-Oriented Style

- One relation for each subset, including all "inherited" attributes

Elected Official	
Name	**Party**
Bill Flores	Republican
Lloyd Doggett	Democrat
John Adams	Federalist
Will Hurd	Republican

U.S. Representative		
Name	**Party**	**District**
Bill Flores	Republican	17
Will Hurd	Republican	23
Lloyd Doggett	Democrat	35

Entity-Relationship Style

- One relation for each subclass (including key)

Elected Official	
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Bill Flores	Republican
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U.S. Representative	
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Bill Flores	17
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Using Nulls Style

- One relation total, with nulls for unknown information

U.S. Representative		
Name	**Party**	**District**
Bill Flores	Republican	17
Lloyd Doggett	Democrat	35
John Adams	Federalist	**NULL**
Will Hurd	Republican	23

- Can save space, but problematic if multiple subclasses or lots of NULLs

Keys

- A Key "functionally determines" all other attributes of the relation
  - Given a relation and a key, there is only one tuple that corresponds to it
- There are subtle differences from an E-R key, which we won't go into.