



ER Diagrams

CMSC 461

Michael Wilson

Entity-relationship diagramming (ER Diagrams)

- ER Diagrams are diagrams that can describe relations/databases
 - Meant to be high level
 - Pure concept, no implementation
 - Can help you figure out how to design your relations, choose keys, etc.
- We're going to be using Chen diagrams
 - Keep this in mind when looking up info on the internet

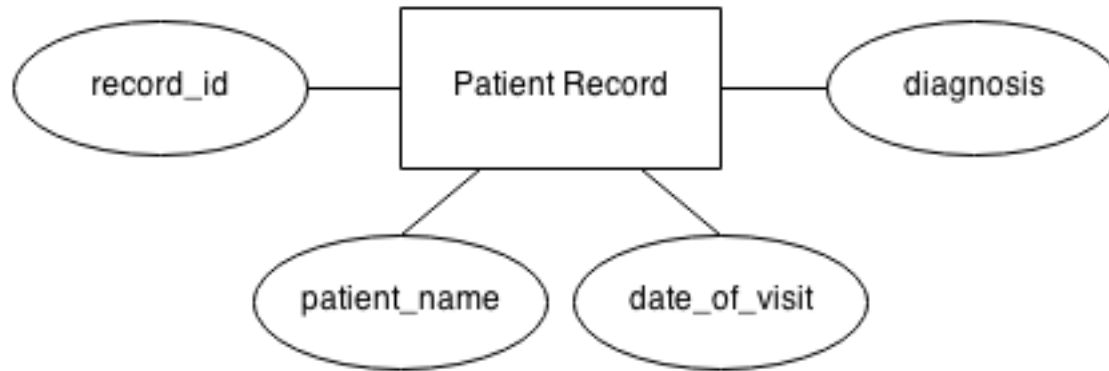
Why devote an entire lecture to a diagramming method?

- You can use ER Diagrams to help design your data
- Choose keys, figure out where to put what attributes
- Handy for trying to picture what you're really trying to model

Example

Record ID	PatientName	Date of Visit	Diagnosis
14233	Mario Mario	04/28/1991	Leg injury
174342	Snow Villiers	12/05/2012	Brain damage
189232	Lara Croft	12/05/2012	Powder burns

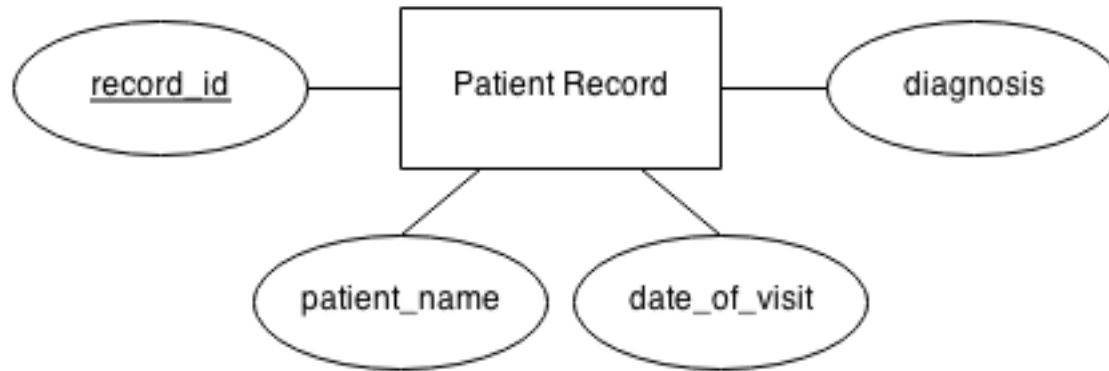
ER Diagram



ER Diagram

- Diagram of an earlier relation
 - Square box is an “entity”
 - Ovals are “attributes”
- Entities can be related to one another
 - We can use ER Diagrams to show the relationship between two entities
 - Diamonds can show a relationship type

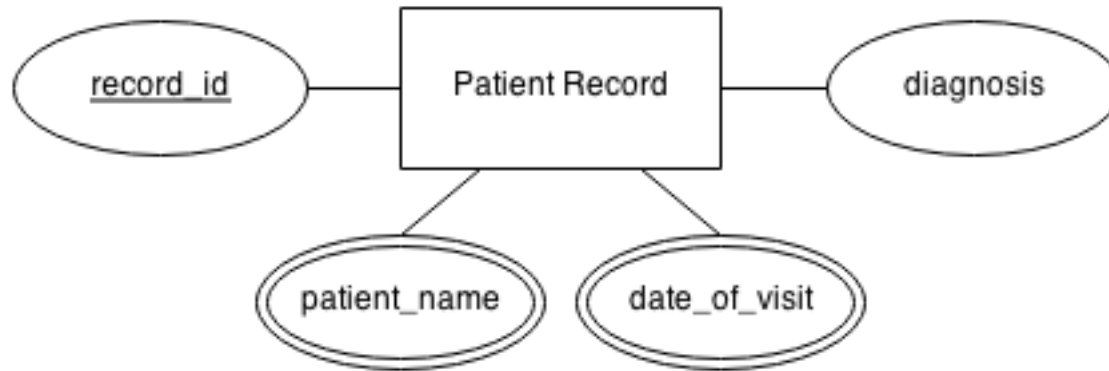
Primary keys



Primary keys

- Primary keys can be shown by underlining a particular attribute

Multivalued attributes



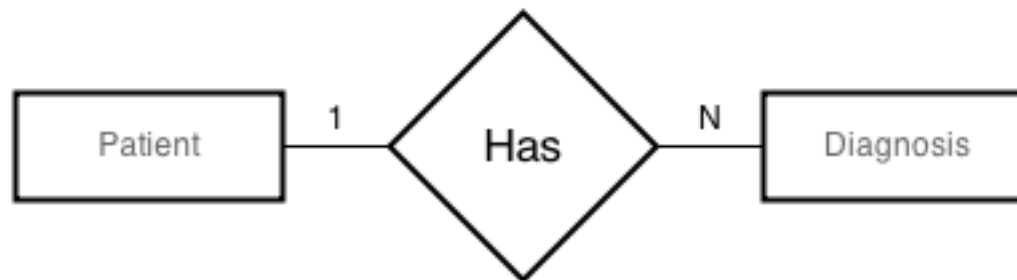
Multivalued attributes

- Attributes with multiple values are shown using concentric ovals
 - A multivalued attribute is an attribute that consists of multiple other attributes or values
 - For example patient name:
 - First name
 - Last name

Relationships between entities

- These relationships are high level as well
 - They simply describe, at a conceptual level, how the two entities relate to one another
- Relationships are generally plaintext words or sentences
 - Customer **places** orders
 - Bands **have** members
 - Programmers **develop** video games
- Relationships are not necessarily between two entities – can be between more

Relationships and cardinality



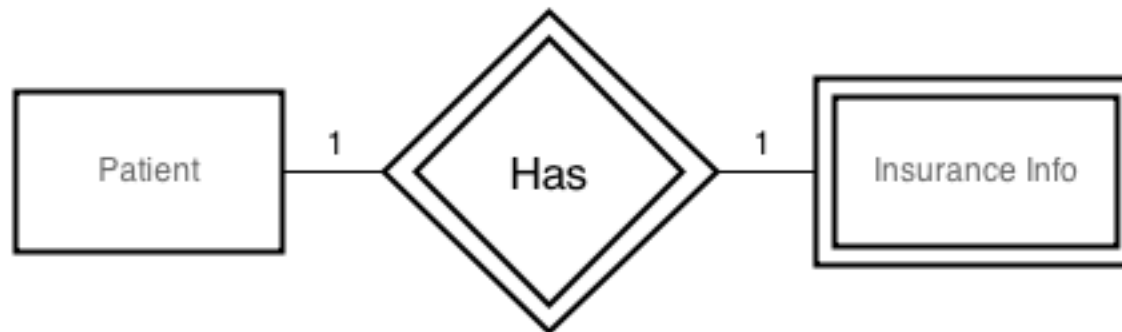
Cardinality

- Different “sides” of the relationship can have differing cardinalities
- Four different types of cardinalities here:
 - 1 to 1
 - 1 to many
 - Many to 1
 - Many to many

Cardinality

- Describing cardinality
 - One patient can have many patient diagnoses
 - We represent this by putting a “1” on the side of the relationship attached to Patient and an “N” on the side of the relationship attached to patient records

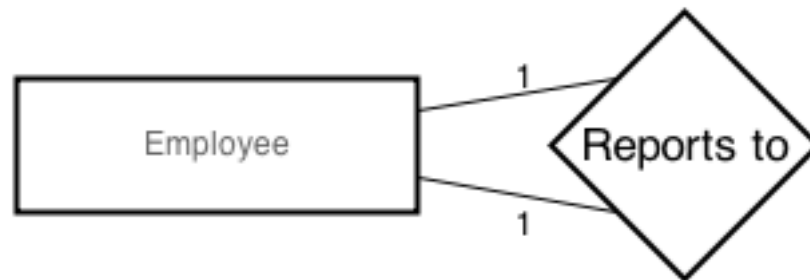
Weak entities



Weak entities

- A weak entity is an entity that depends on another entity to exist
 - In this case, a patient's insurance info must be attached to a patient
 - Therefore, it must reference a patient, and is a weak entity, represented by a double rectangle
 - This relationship is described as an **identifying relationship**, represented by a double diamond
- Tuples cannot be uniquely identified by attributes alone
 - Has to have a **foreign key**

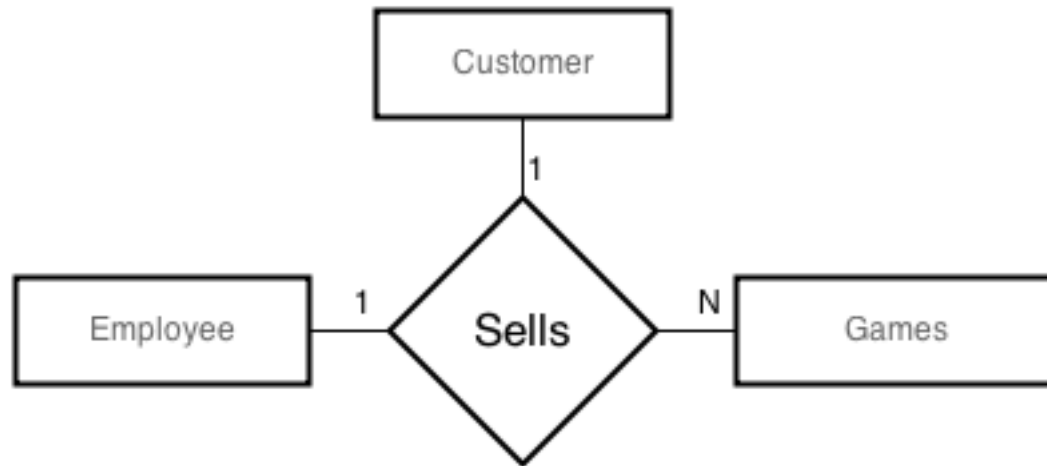
Funky relationships?!



Self referential relationships

- Employees report to a manager, who is also an employee
 - Therefore, the relationship in fact references itself
 - This is totally kosher

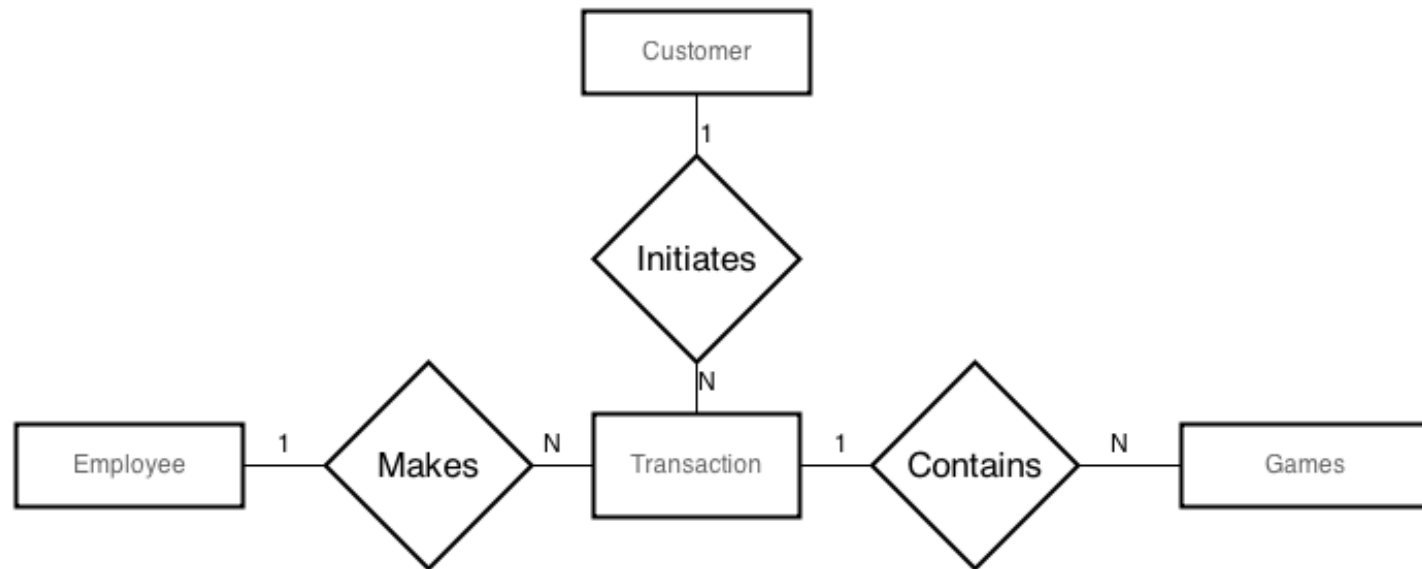
Ternary relationships



Ternary relationships

- Here, an employee can sell multiple games to a customer
 - These are also valid
- Can sometimes reduce ternary relationships into binary relationships as well
 - These are probably closer to how they would be laid out in your DBMS

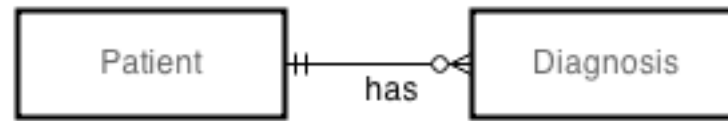
Ternary relationships



Really frustrating thing about diagramming

- This applies to more than just ER diagrams, but diagramming in general
- There isn't really one way to do it
 - If you do some research and find examples, you'll see a billion different ways
- In general, stay consistent in your meanings, define them if you're unsure
- Crow's foot notation

Crow's foot notation



ER Diagram Links

- <https://drive.draw.io/>
 - Drawing tool (more than just ER diagrams)
- <http://creately.com/blog/diagrams/er-diagrams-tutorial/>
- http://en.wikipedia.org/wiki/Entity%E2%80%93relationship_model
 - Wikipedia's page is very good