Introduction to Data Modelling

Business Data Management and Analytics

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Data Modelling

- E-R Diagrams
- Relational Model

Models

- A model in general is an 'abstract' of reality.
- Models can be expressed in different ways using different tools.
- Target different audiences

Models

- Getting a better "overall" view of a real life application;
- In databases, we can model an actual database and/or reality.

Entity Relationship Diagrams

- Most popular model currently used for database modeling
- Designed to be platform independent
- Primary components
  - Entities
  - Relationships
  - Attributes

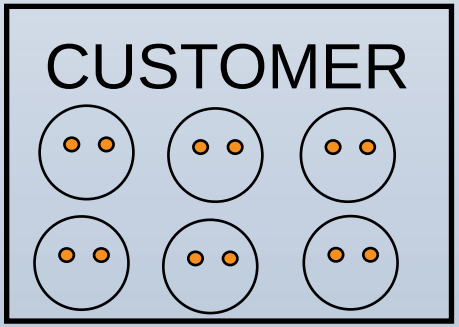
ENTITY

- Object or Event. Real or Imaginary
- Interesting enough to us that we want to record something about it
- Entity drawn as a box and a name
- Represents a collection of individual objects that we can uniquely identify from each other.
- Objects are called "entity instances"

ENTITY

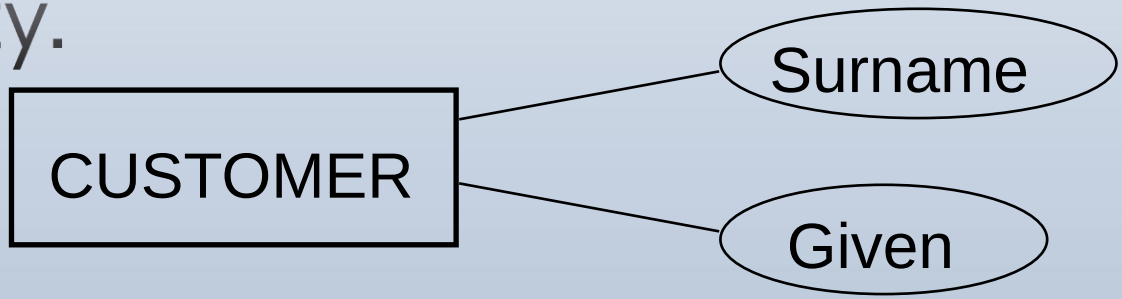
- This box is the Entity CUSTOMER

- The entity actually represents the collection of individual customers



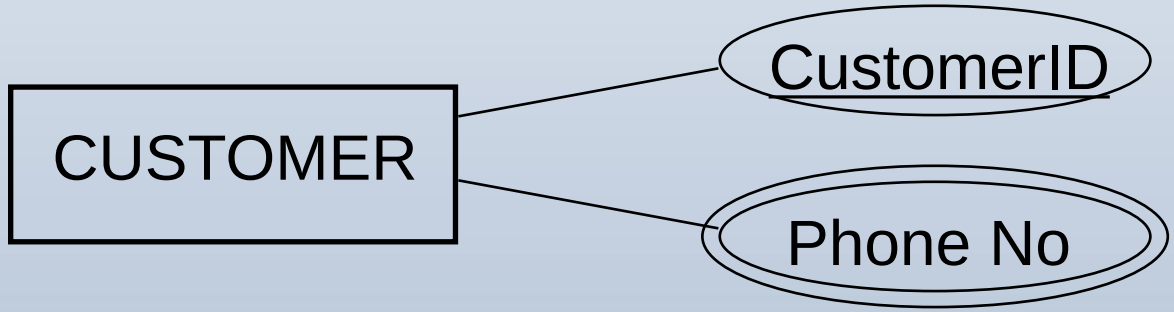
ATTRIBUTE

- A property or characteristic of an entity
- A piece of data that we want to keep about the entity.
- Drawn as an ellipse connected to the entity.



Types of Attributes

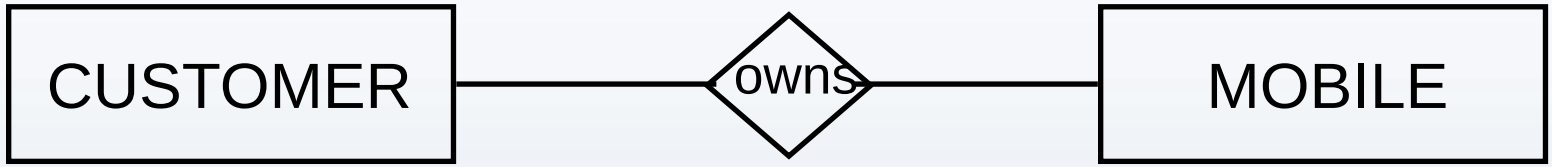
- The primary key attribute is underlined.
- A multi-valued attribute is an attribute that can have several values. It is shown in a double ellipse.



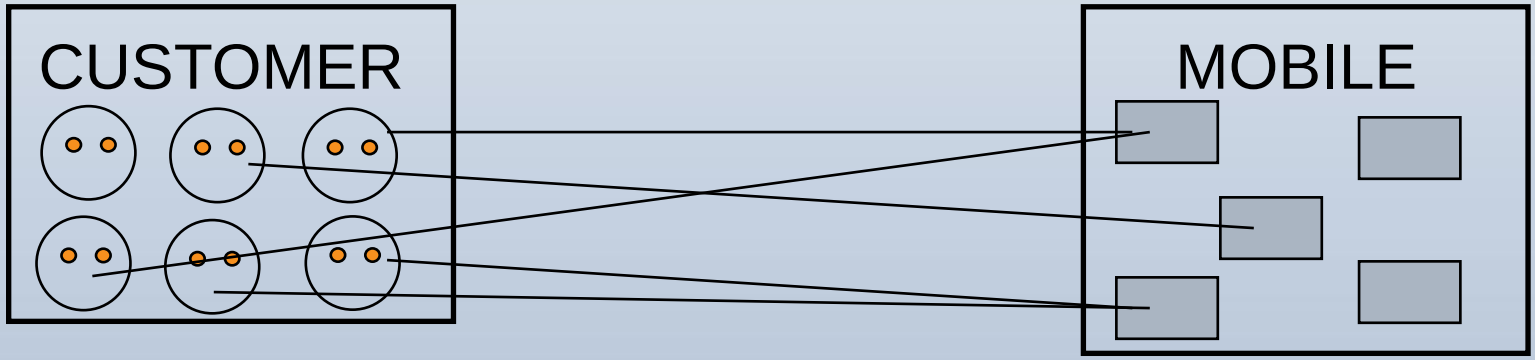
RELATIONSHIP

- Some type of association between entities
- Shown as a diamond joining entities together with a relationship name.
- The actual associations are between the individual objects in the entities.
- Therefore, the Relationship represents the collection of individual associations.

RELATIONSHIP

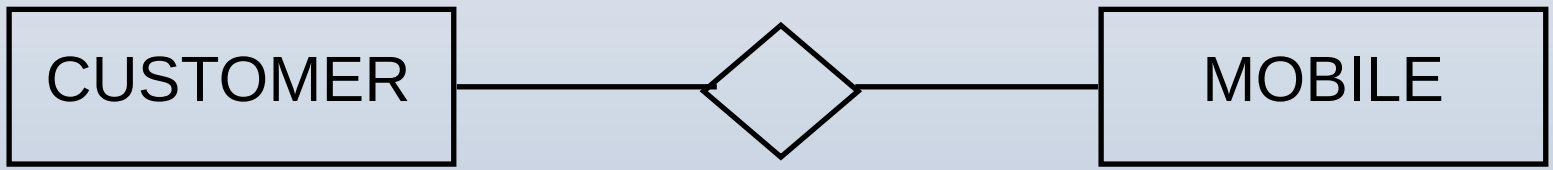


- This diamond represents the collection of individual associations between individual customers and mobiles



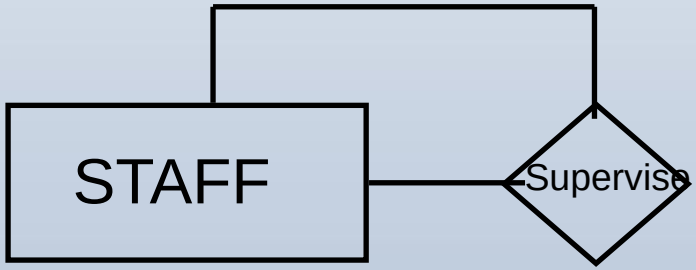
DEGREE

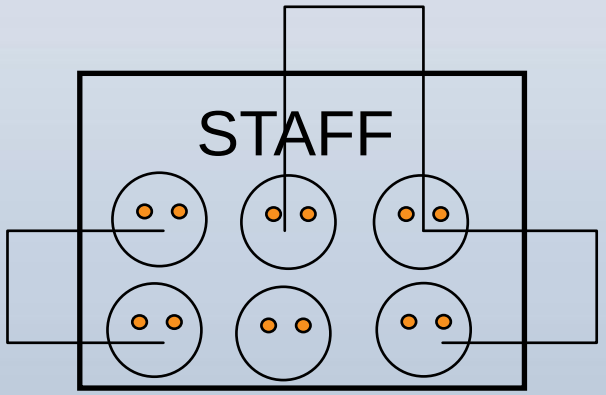
- Number of Entities a relationship is involved in
- Binary (two) - most common



DEGREE (Unary)

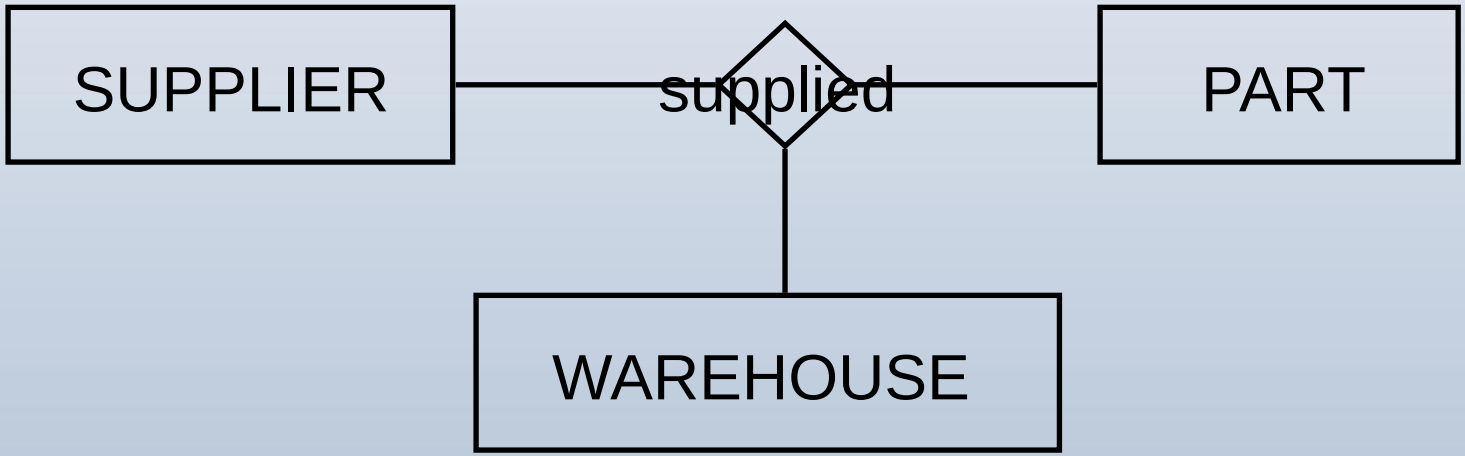
- A Unary relationship is a relationship of an entity to itself.
- The associations are between different objects of the same entity.



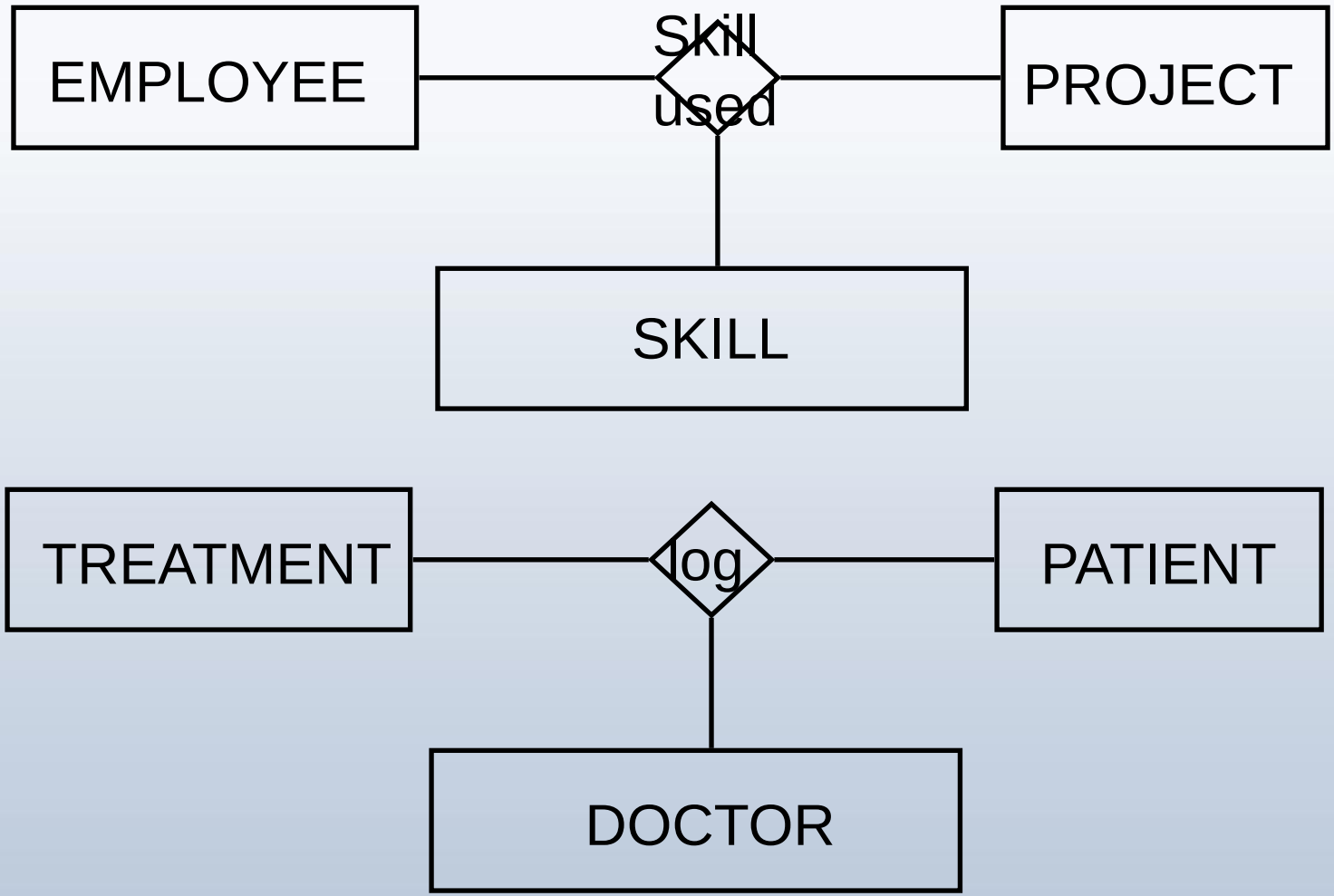


DEGREE (Ternary & n-ary)

- Ternary is between 3 entities
- We can actually have a relationship between any number of entities.



DEGREE (Ternary & n-ary)

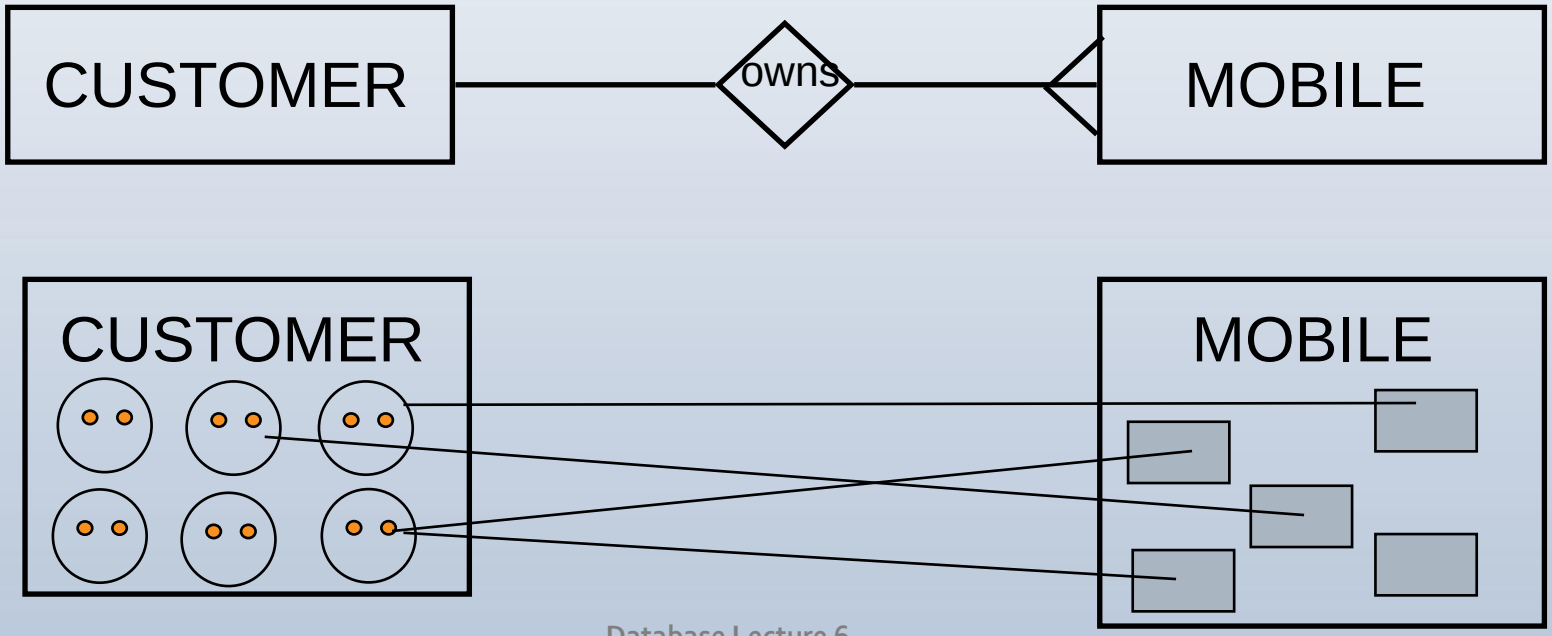


Cardinality

- Determines how many associations are allowed between individual objects involved within a relationship.
- Shown using "crow's feet" or with 1:M
- Enables us to constrain the relationships to only allow particular situations (how many mobiles can a customer have ?)

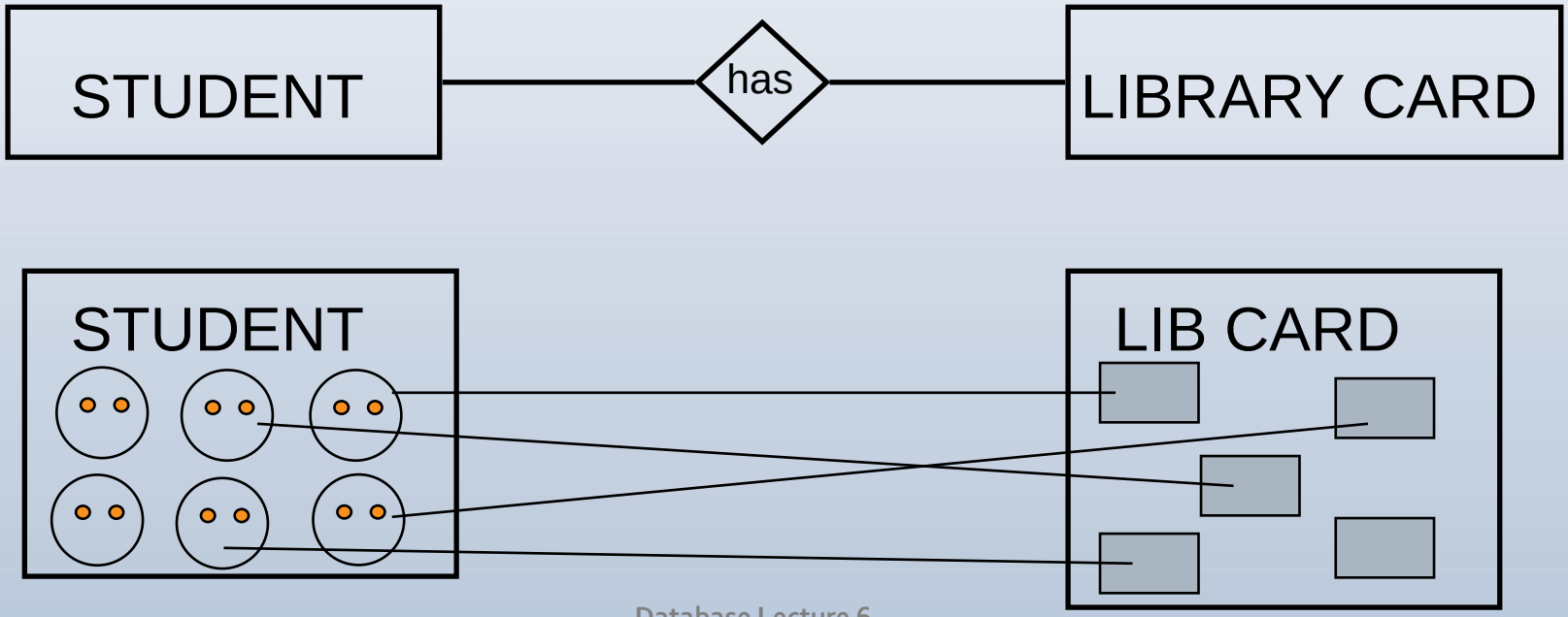
Cardinality (One to Many)

- A mobile can only have one customer
- A customer can have many mobiles



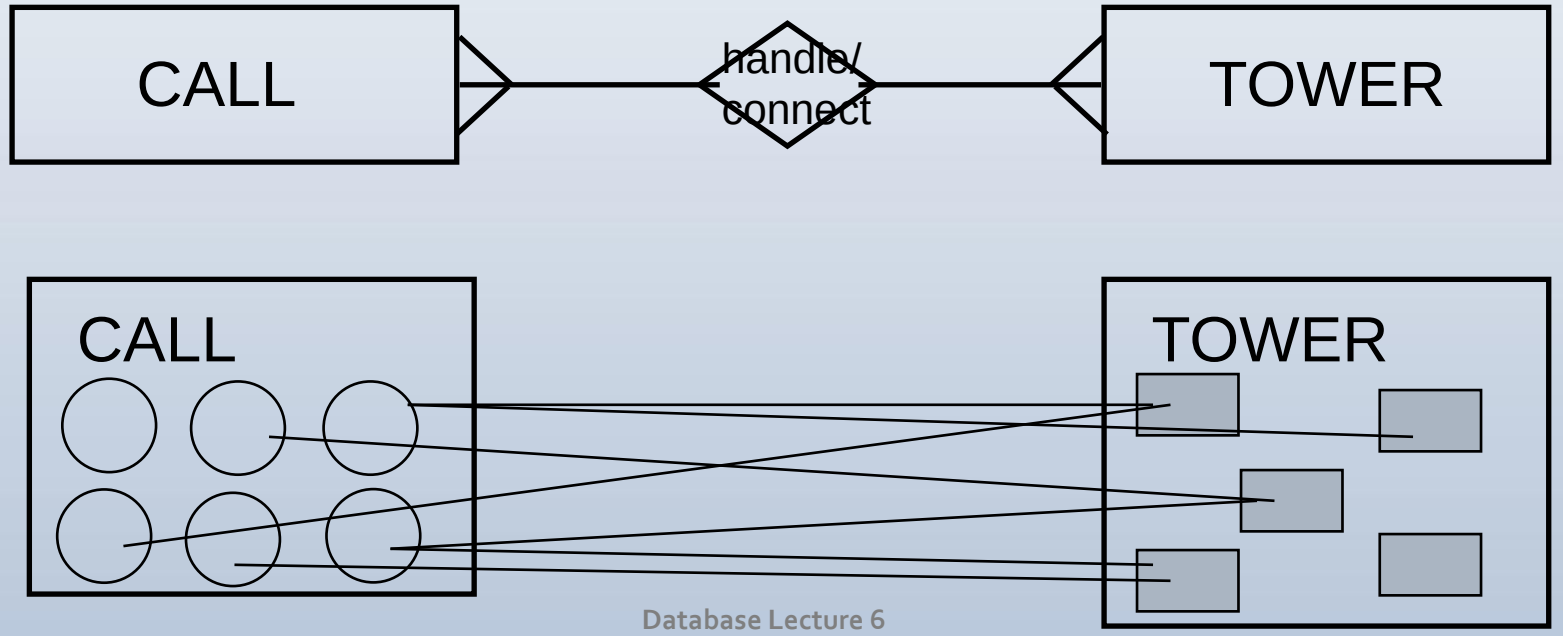
Cardinality (One to One)

- A student can only have 1 library card
- A library card can only be for 1 student



Cardinality (Many to Many)

- A call can handle/connect many towers
- A tower can handle/connect many calls



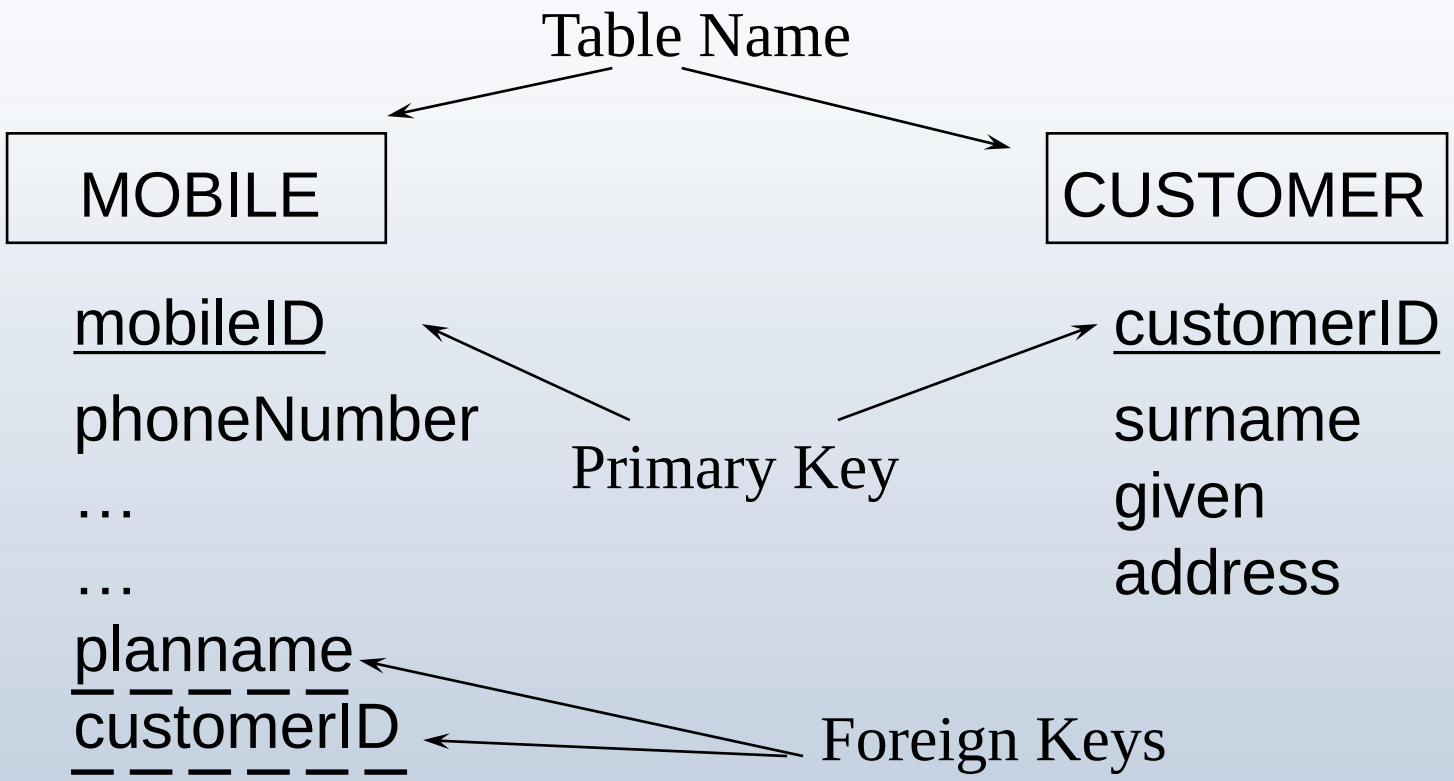
Relationships

- Relationships can also have attributes
- There is no clear rule to determine between a relationship and an entity
- Often, an entity can become a relationship and a relationship can be re-drawn as an entity.

RELATIONAL MODEL

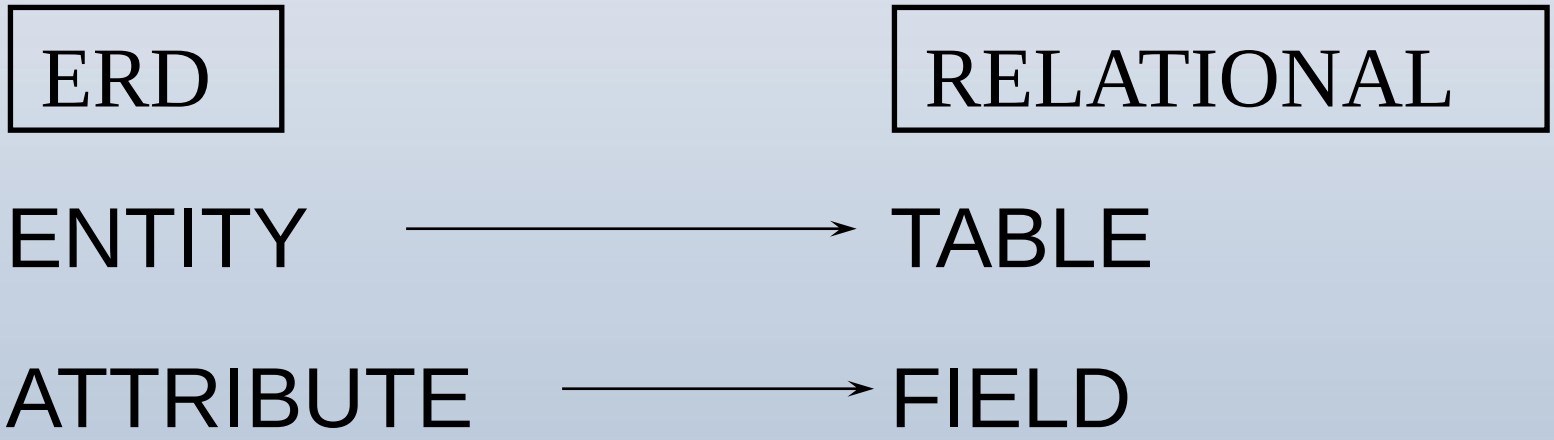
- A model of tables and fields
  - (lower level than E-R)
- A Primary key is the unique identifier of the file, and can be 1 or more fields.
- A Foreign key is a field that is a primary key in another file.

Relational Model



Mapping ERD and Relational

- Both models model the same thing, a database structure (existing or future)
- One model can be re-drawn to the other

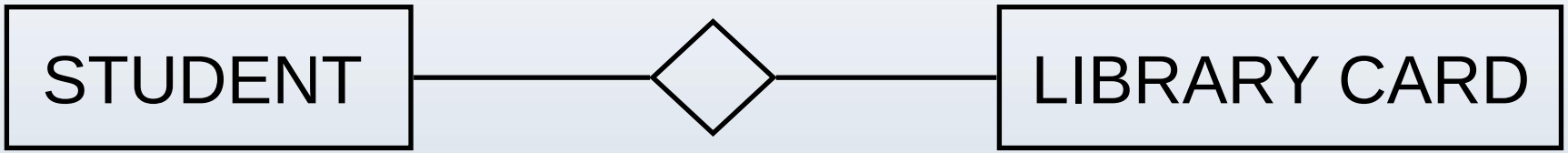


Mapping - Relationships

- Relationships in the E-R model are represented by Foreign Keys in the relational model
- Foreign keys are NOT attributes in the E-R model, they represent the relationship diamond.

Mapping - 1:1 Relationship

- Put the foreign key on either side



STUDENT

StudentNo

Surname

LIB CARD

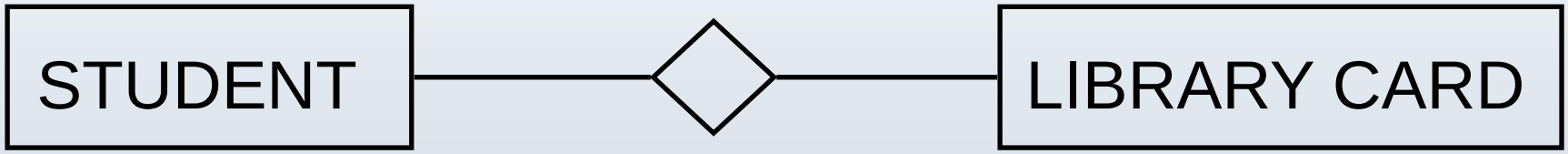
Barcode

Limit

StudentNo

Mapping - 1:1 Relationship

- OR Put the foreign key on other side NOT BOTH sides



STUDENT

StudentNo

Surname

Barcode

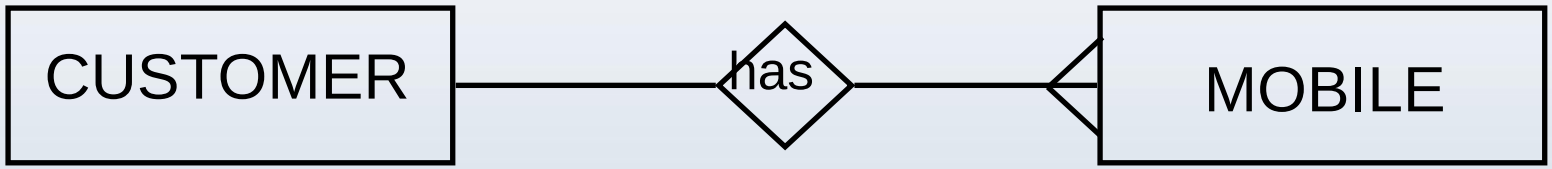
LIB CARD

Barcode

Limit

Mapping - 1:M Relationship

- Put the foreign key on the Many side



CUSTOMER

CustomerID

Surname
Given
…

MOBILE

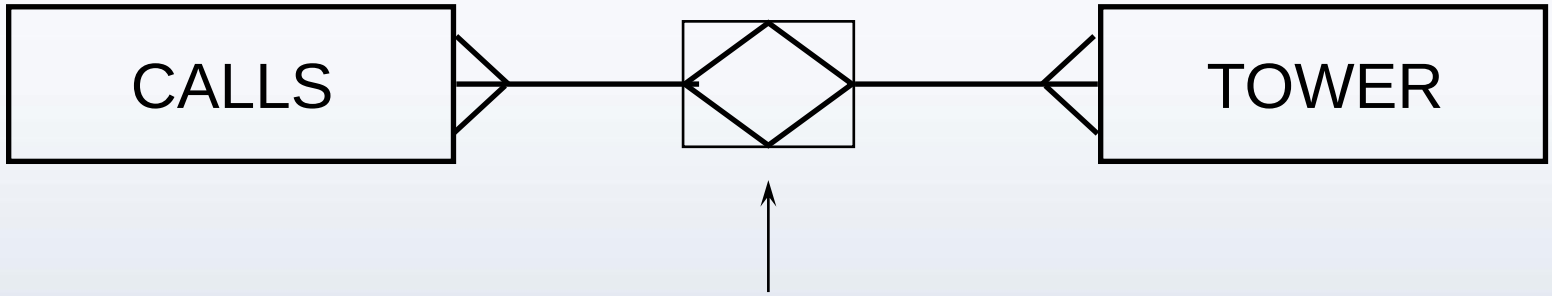
MobileID

PhoneNumber
BrandName
…
CustomerID

Mapping - M:N Relationship

- Create a new file/table to represent the relationship
- Primary keys of both sides are combined to make the primary key of the new file.

Mapping - M:N Relationship



CALLS	CONNECT	TOWER
CallsID	CallsID +	TowerID
PhoneNumber	TowerID	Location
Date		Bandwidth
Time		MaxConn
…		

NOTE: Gerund is halfway between a relationship and an entity.

Mapping - M:N Relationship - 2

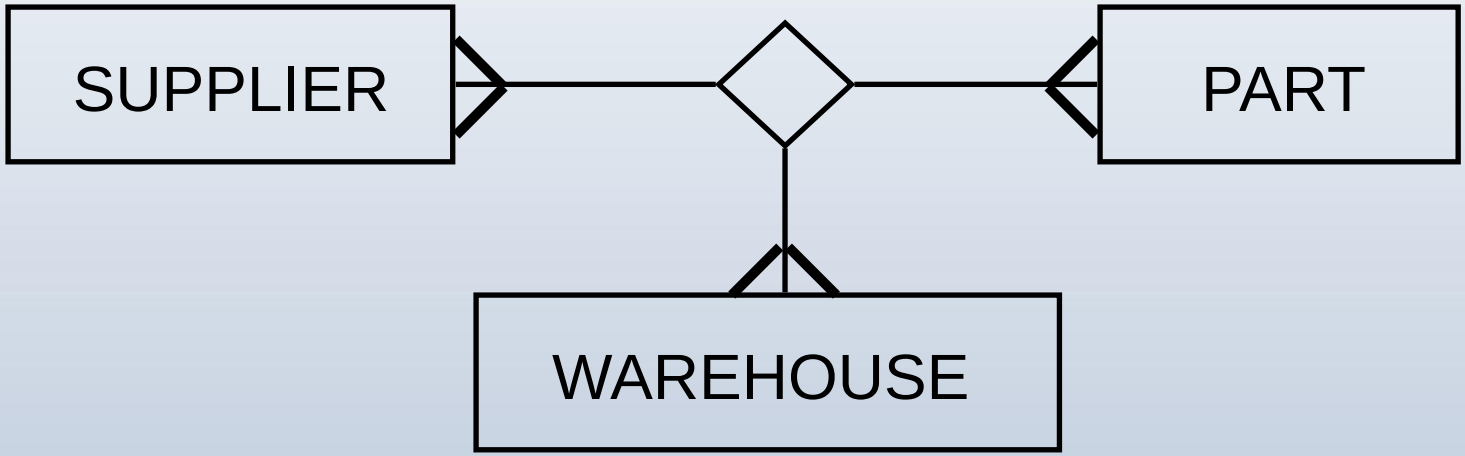
CALLS	CONNECT	TOWER
CallsID	CallsID +	TowerID
PhoneNumber	TowerID	Location
Date		Bandwidth
Time		MaxConn
…		

Mapping - M:N Relationship - 3

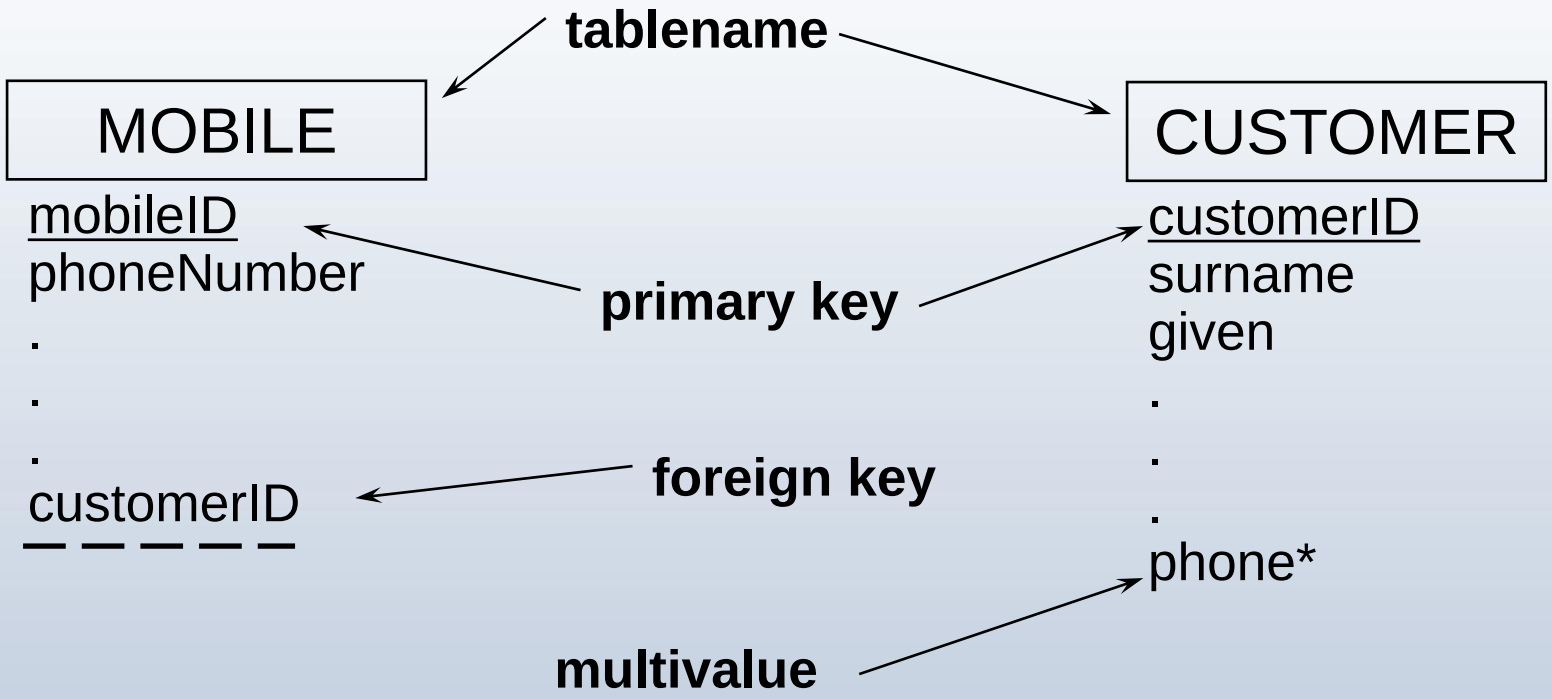
CALLS	CONNECT	TOWER
CallsID	ConnectID	TowerID
PhoneNumber	CallsID	Location
Date	TowerID	Bandwidth
Time		MaxConn
…		

Mapping – Ternary relationship

- Must create an associative entity to represent this relationship, like M:N.



Components - summary



Components - summary