RELATIONAL DATABASES

BSc IoT

Objectives

- Define and give an example of a subtype

- Define and give an example of a supertype

- State the rules relating to entities and subtypes, and give examples of each

- Apply the rules of supertype and subtype by evaluating the accuracy of ER diagrams that represent them

- Apply the rules of supertype and subtype and include them in a diagram when appropriate

Purpose

■ Supertypes and subtypes occur frequently in the real world

– *Food order types (eat in, to go)*

– *Grocery bag types (paper, plastic)*

– *Payment types (check, cash, credit, debit)*

■ You can typically associate 'choices' of something with supertypes and subtypes.

■ For example, what will be the method of payment?

■ Understanding real world examples helps us understand how and when to model them.

Evaluating Entities

- Often some instances of an entity have attributes and and/or instances do not have.

- Imagine a business which needs to track payments from customers who can pay by cash, check, or credit/debit card.

- Customers who pay cash may not have any details of the payment stored other than date, amount etc.

- Customers who pay by card, their card number, expiry, ccv and name must be stored.

- All payments have some common attributes: payment date, payment amount etc.

Evaluating Entities

- Should we create a single PAYMENT entity or three separate entities CASH, CHECK and CREDIT CARD?

- And what happens if in the future we introduce a fourth method of payment?

Subdivide an Entity

- Sometimes it makes sense to subdivide an entity into subtypes

- This may be the case when a group of instances has special properties, such as attributes or relationships that exist only for that group

- In this case, the entity is called a "supertype" and each group is called a "subtype"

Subtype Characteristics

■ A subtype:

– *Inherits all attributes of the supertype*

– *Inherits all relationships of the supertype*

– *Usually has it own attributes or relationships*

– *Is drawn within the supertype*

– *Never exists alone*

– *May have subtypes of its own*

Supertype Subtype Example

■ A CLIENT could be either an individual person or a company. For a client you may store first name and last name but for a company you would store the company name and the industry

■ The common attributes are listed at the supertype level

CLIENT
#* id
*   address

INDIVIDUAL
*   name
*   surname

COMPANY
*   name
*   industry
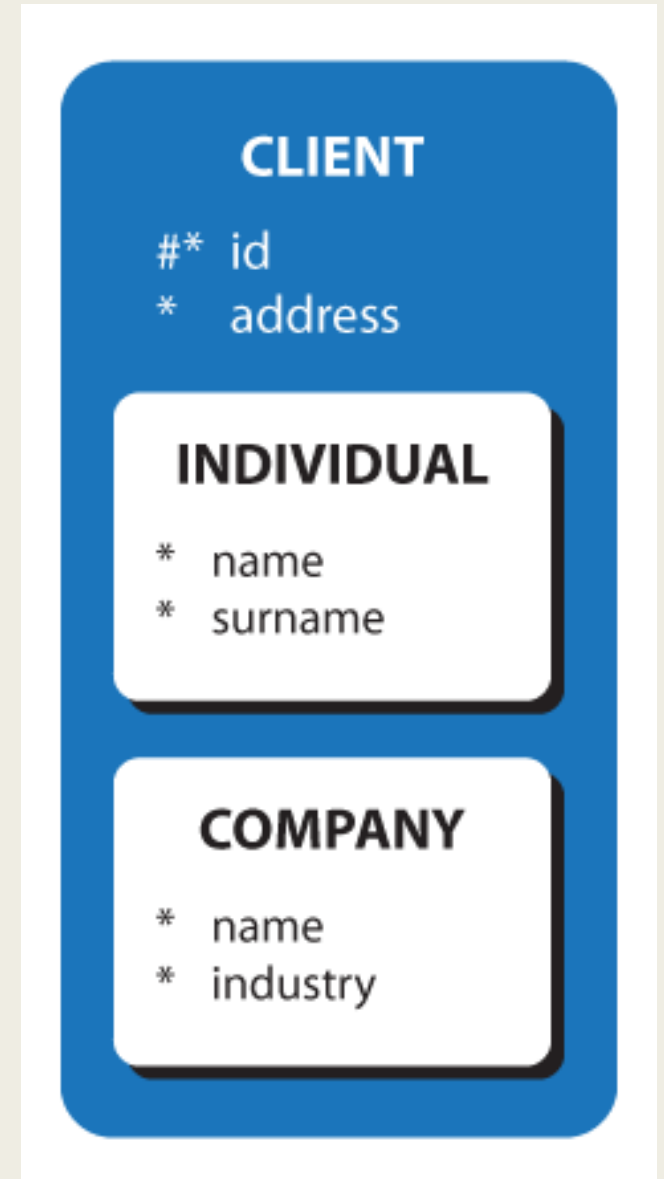
Supertype Subtype

- EMPLOYEE is the supertype of MANAGER and ENGINEER

- Subtypes inherit all attributes and relationships from the supertype.

- A MANAGER and ENGINEER will have a relationship with DEPARTMENT

- Only an ENGINEER will have a relationship with SKILL and ENGINEERING DISCIPLINE
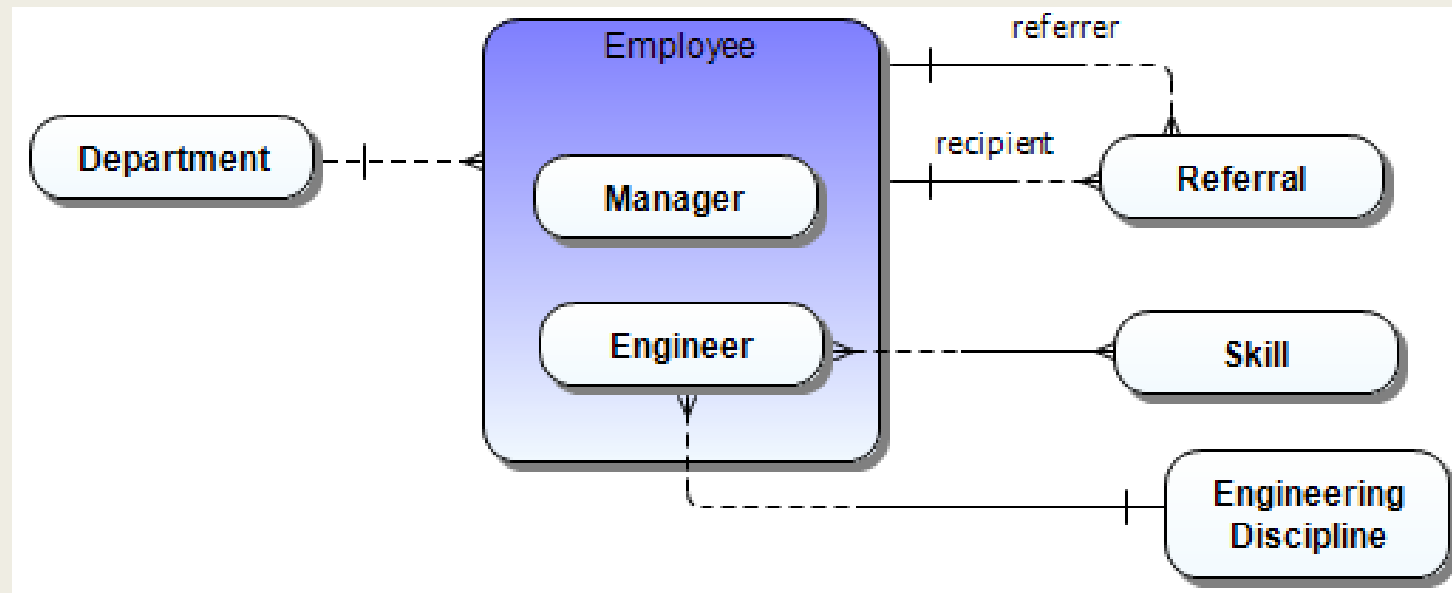
Always more than one subtype

■ When an ER model is complete, subtypes never stand alone. In other words, if an entity has a subtype, a second subtype must also exist.

■ A single subtype is the same as the supertype.

■ This concept leads to 2 subtype rules:

– *Exhaustive: every instance of the supertype is also an instance of one of the subtypes. All subtypes are listed withouth ommision.*

– *Mutually Exclusive: each instance of a supertype is an instance of only one possible subtype*

Always more than one subtype

- At the conceptual modelling stage, it is good practice to include an OTHER subtype to make sure that your subtypes are exhaustive – that you are handling every instance of the supertype.