Extended Entity Relationship (ER) Features

- As the complexity of data increased in the late 1980’s , it became more and more difficult to use the traditional ER model for database modelling.
- Hence some improvements or enhancements were made to the existing ER model to make it able to handle the complex applications better.

Extended Entity Relationship (ER) Features

- Three concepts are added to the existing ER model

Generalization

Specialization

Aggregation

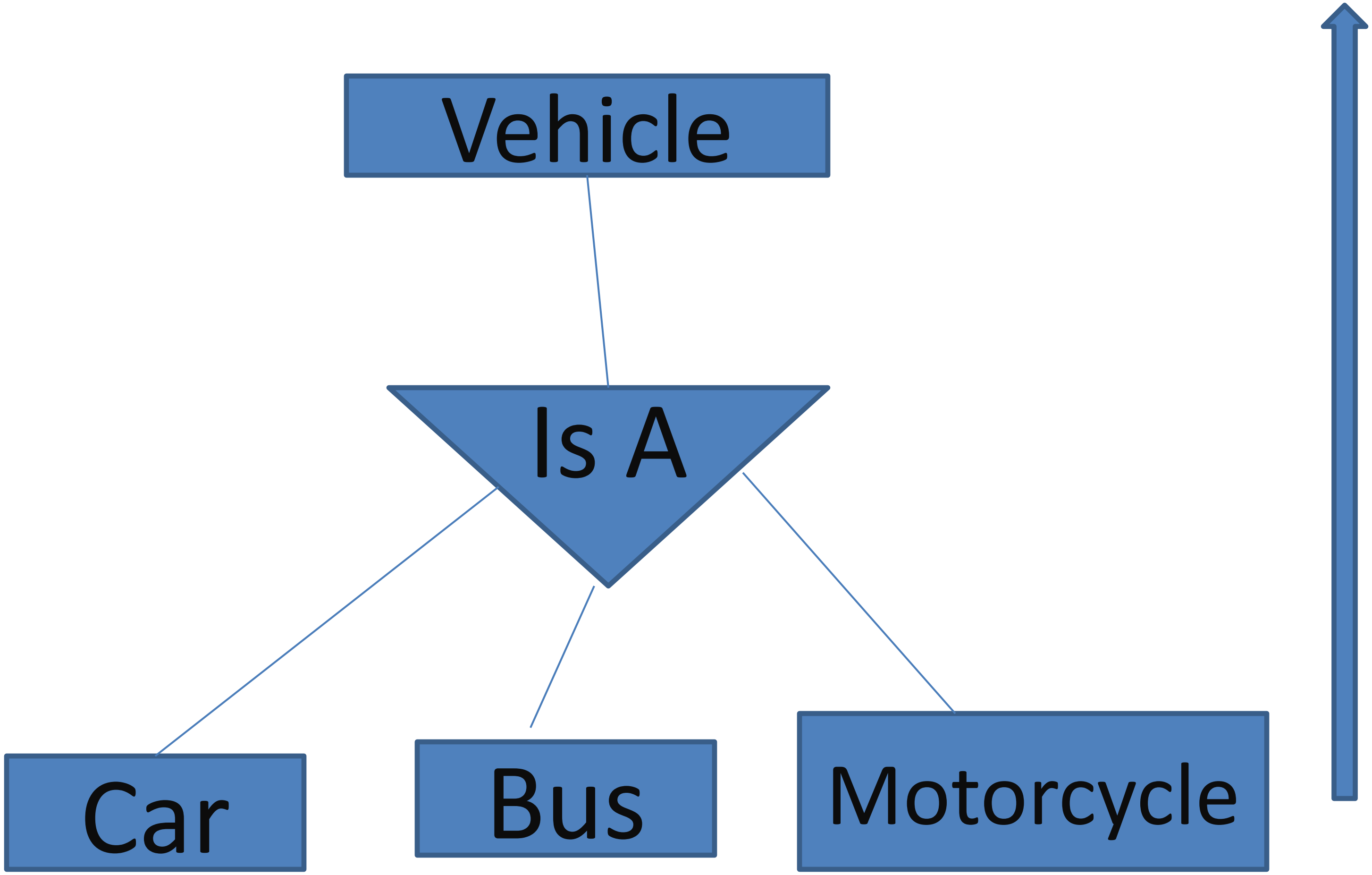
Generalization

- Generalization is the process of extracting **common properties** from a set of entites and create a generalized entity from it.
- Generalization is a " **bottom-up approach**" in which two or more entites can be combined to form a higher level entity if they have some attributes in common

subclasses are combined to make **superclass**

Example : Generalization

- Consider we have 3 sub entites Car, Bus and Motorcycle , now these three entities can be generalized into one higher- level entity (or super class)



Vehicle

Is A

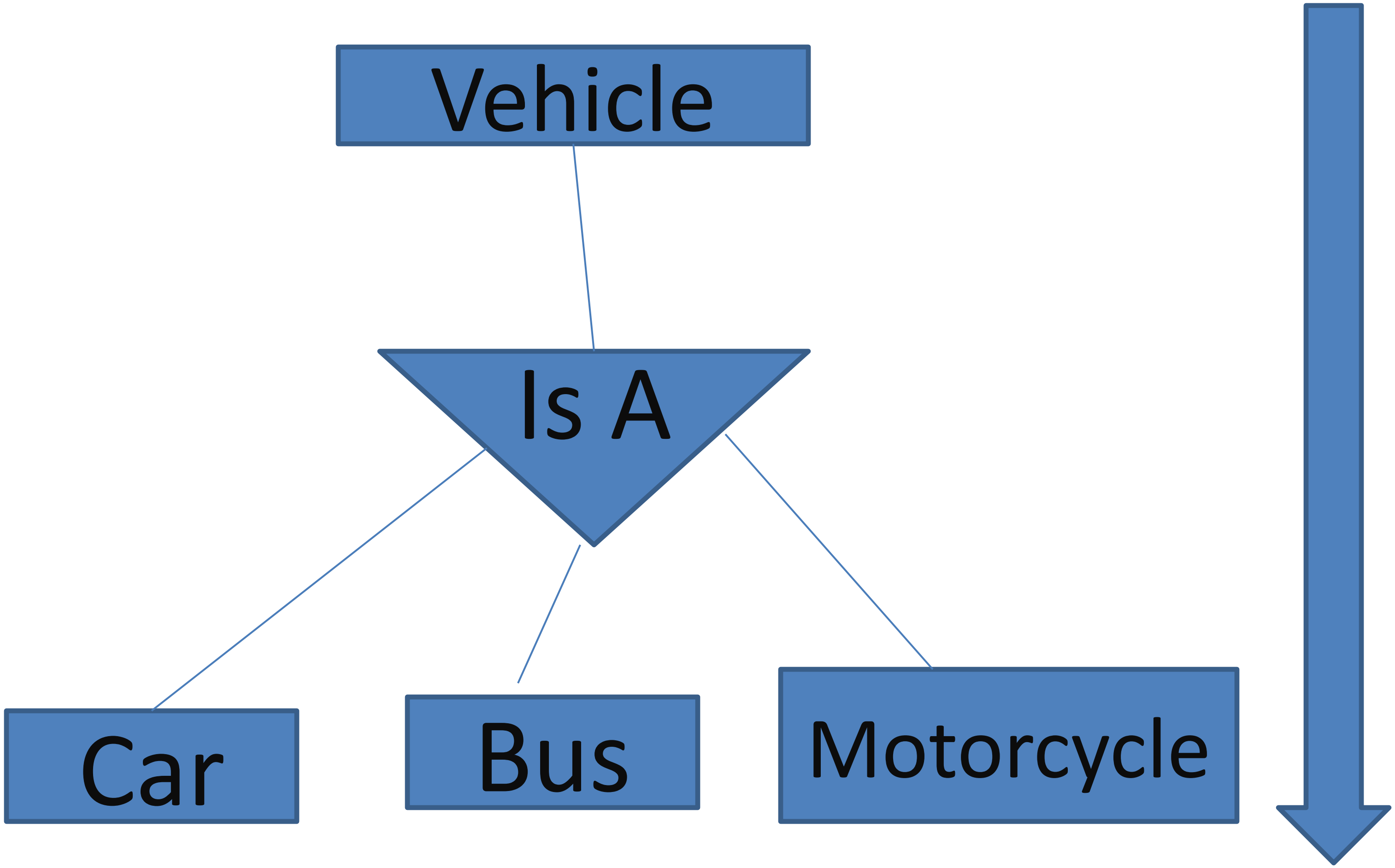
Car

Bus

Motorcycle

Specialization

- Specialization is opposite of Generalization
- In Specialization , an entity is broken down into sub entities based on their characteristics
- Specialization is a “ top- down approach” where higher level entity is specialized into two or more lower level entities
- It is used to identify the subset of an entity set that shares some distinguishing characteristics



Vehicle

Is A

Car

Bus

Motorcycle

Inheritance

Inheritance is an important feature of generalization and specialization.

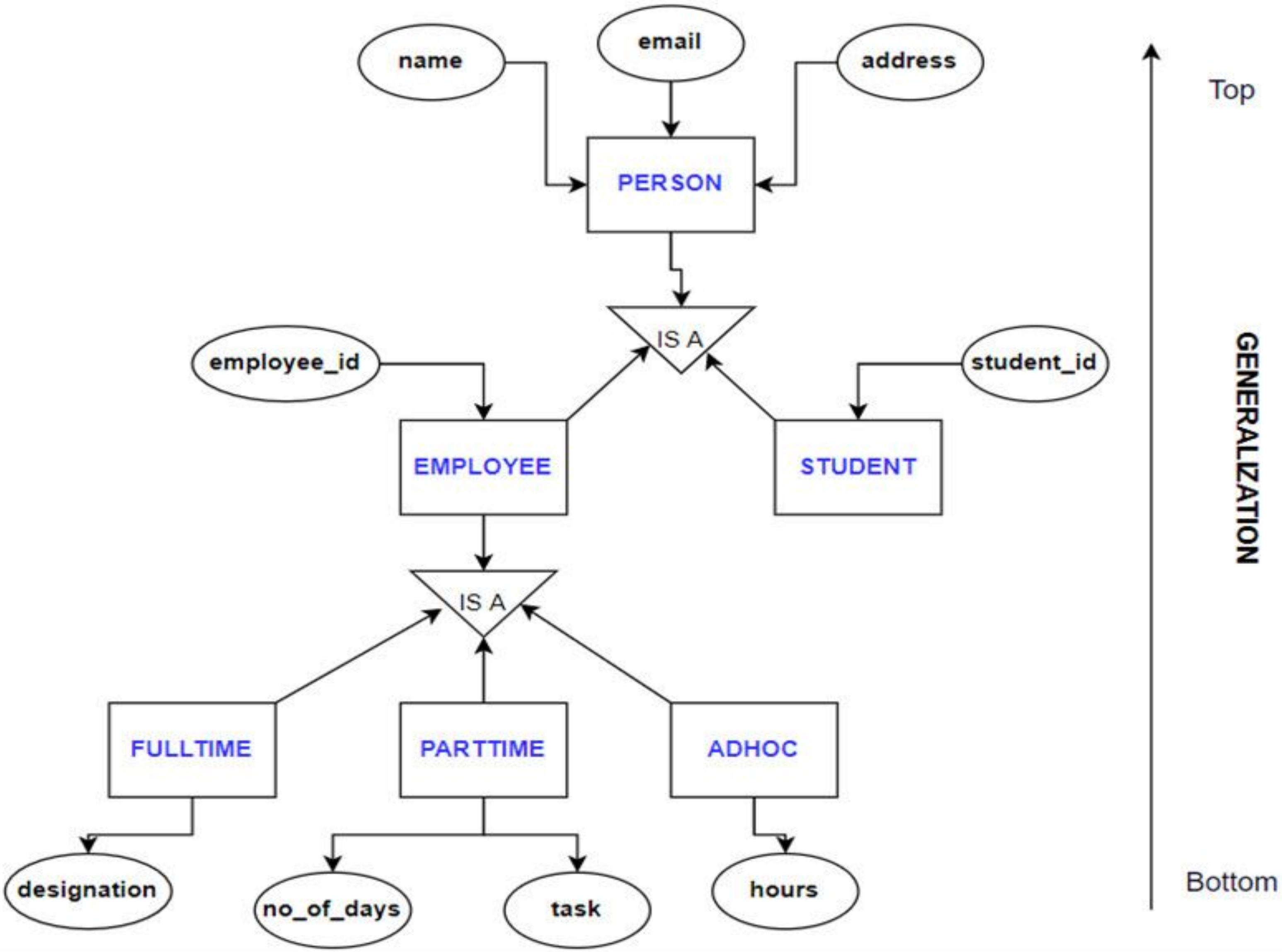
Attribute inheritance allows lower level entities to inherit the attributes of higher level entities.

example: Consider relations Car and Bus inheriting the attributes of Vehicle.Thus , Car is described by attributes of super-class Vehicle as well as its own attributes.

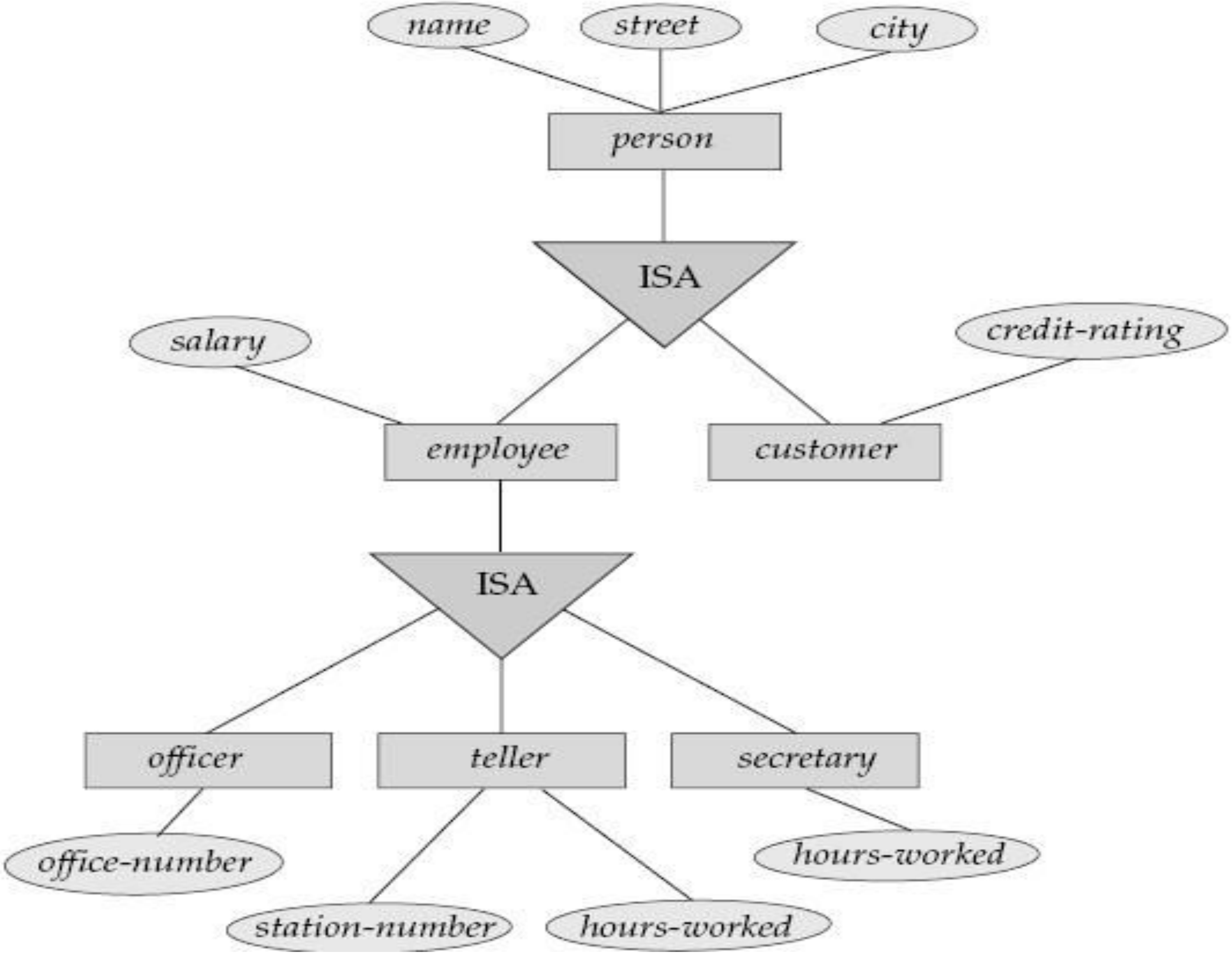
Participation Inheritance

Participation Inheritance in which relationships involving higher -level entity sets are also inherited by lower-level entity set

note: A lower level entity set can participate in its own relationship-sets too.


name
email
address
PERSON
IS A
employee_id
student_id
EMPLOYEE
STUDENT
IS A
FULLTIME
PARTTIME
ADHOC
designation
no_of_days
task
hours
Top
GENERALIZATION
Bottom

Consider the example



How schemas or Tables can be formed for given example

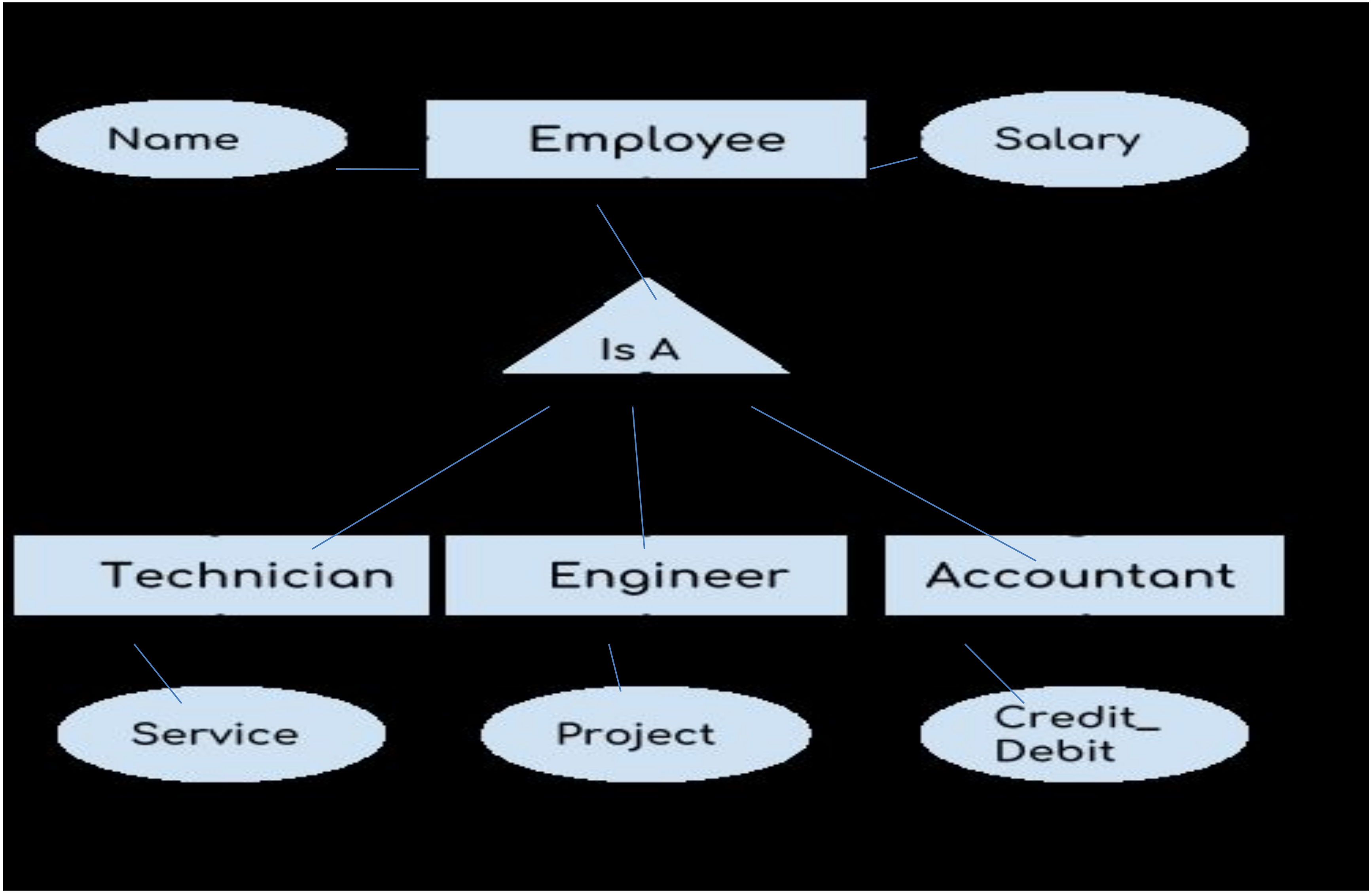
Four Tables can be formed:

customer(name,street,city,credit_rating)

officer(name,street,city,salary,office_number)

teller(name,street,city,salary,station_number,hours_worked)

secretary(name,street,city,salary,hours_worked)


Name
Employee
Salary
Is A
Technician
Engineer
Accountant
Service
Project
Credit_
Debit

Aggregation

Aggregation is used when we need to express a relationship among relationships.

Aggregation is an abstraction through which relationships are treated as higher level entities.

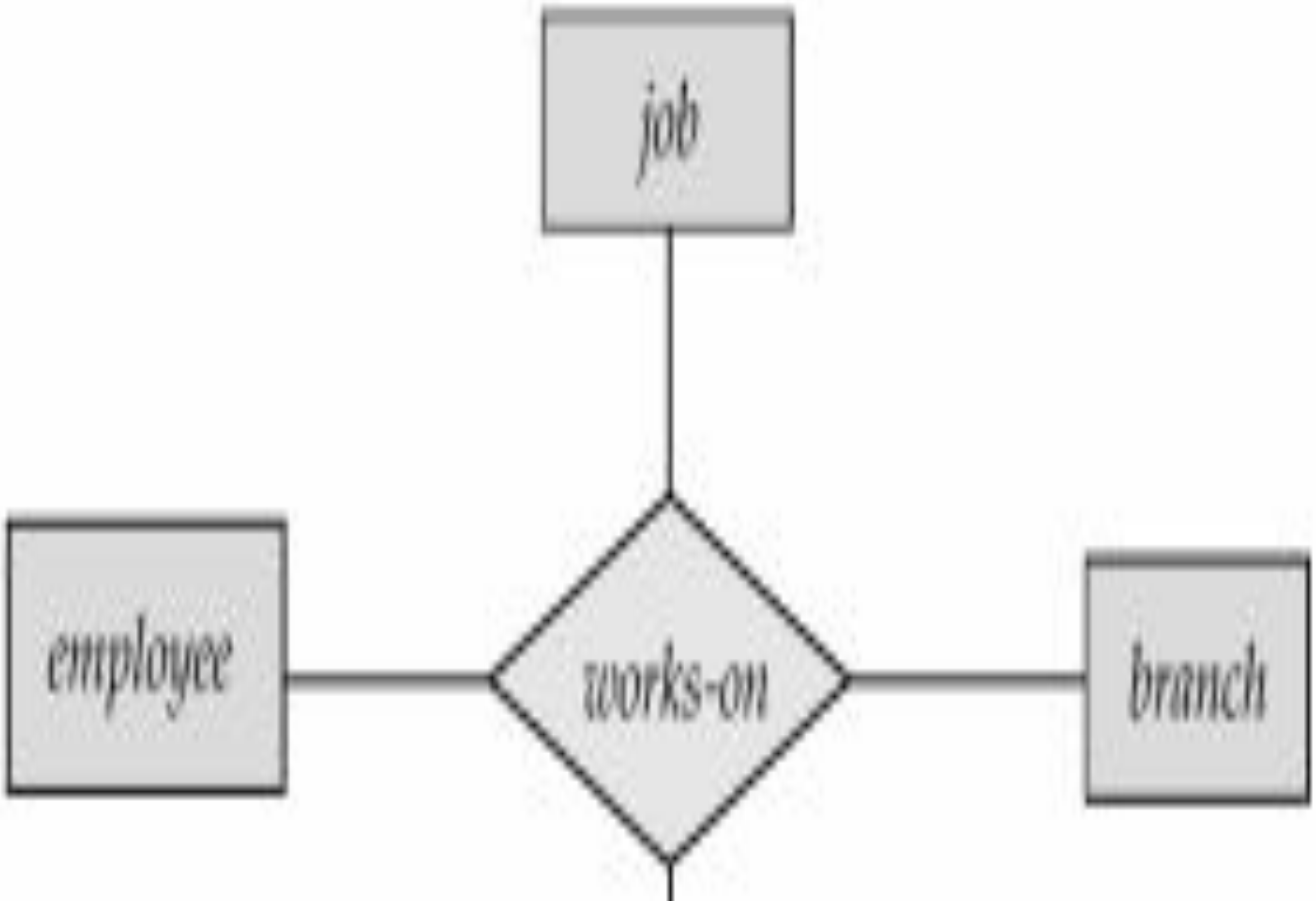
Aggregation is a process when a relationship between two entities is considered as a single entity and again this single entity has a relationship with another entity.

Example: Relationship of Relations

Basic E-R can’t represent relationships involving other relationships

Consider a ternary relationship works_on between Employee,Branch and Job.

An employee works on a particular job at particular branch

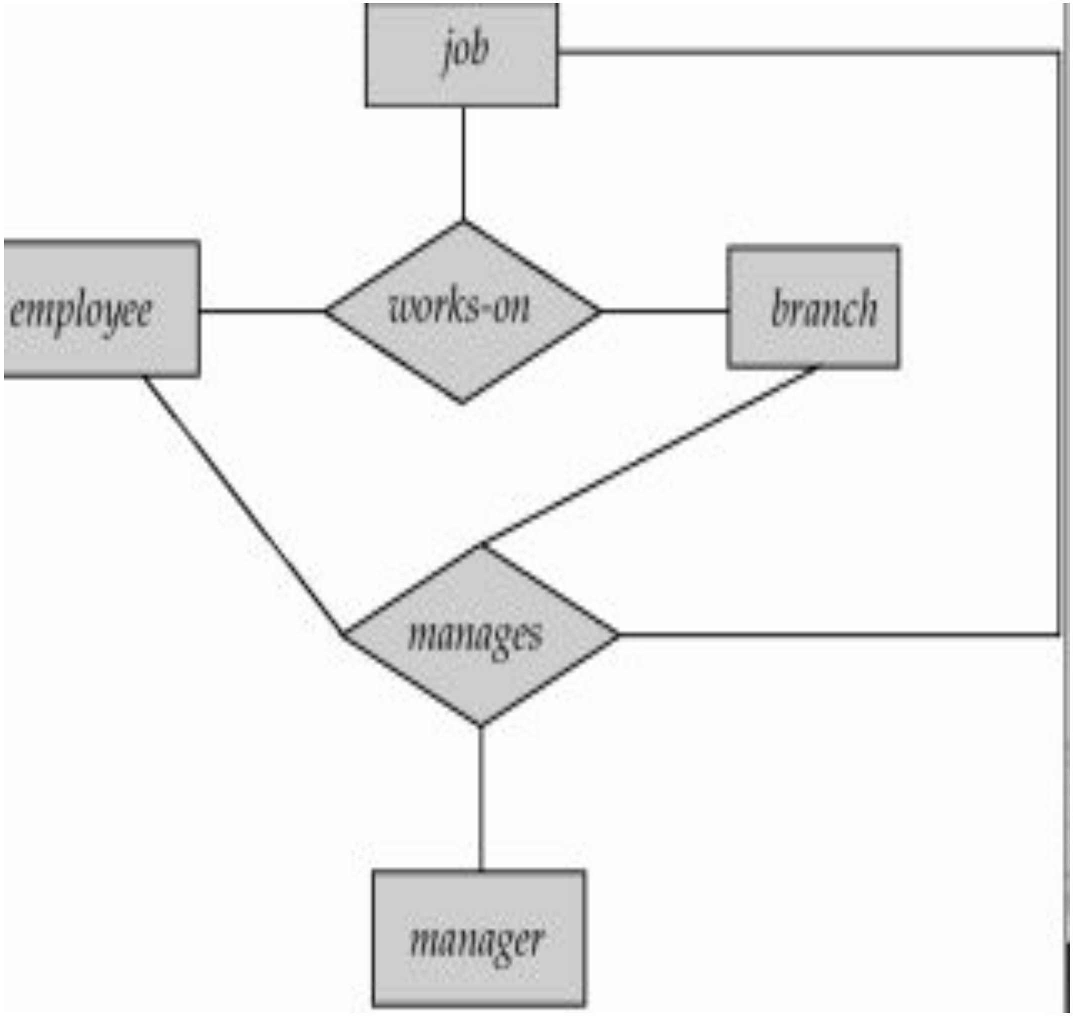

job
employee
works-on
branch

Suppose we want to assign a manager for jobs performed by an employee at a branch(ie, want to assign managers to each employee , job, branch combination)

Need a separate manager entity set

relation between each manager,employee,branch and job entity.

ER Diagram with redundant Relationship



Relation sets works-on and manages represent overlapping (redundant) information

Every manages relationship corresponds to a works-on relationship

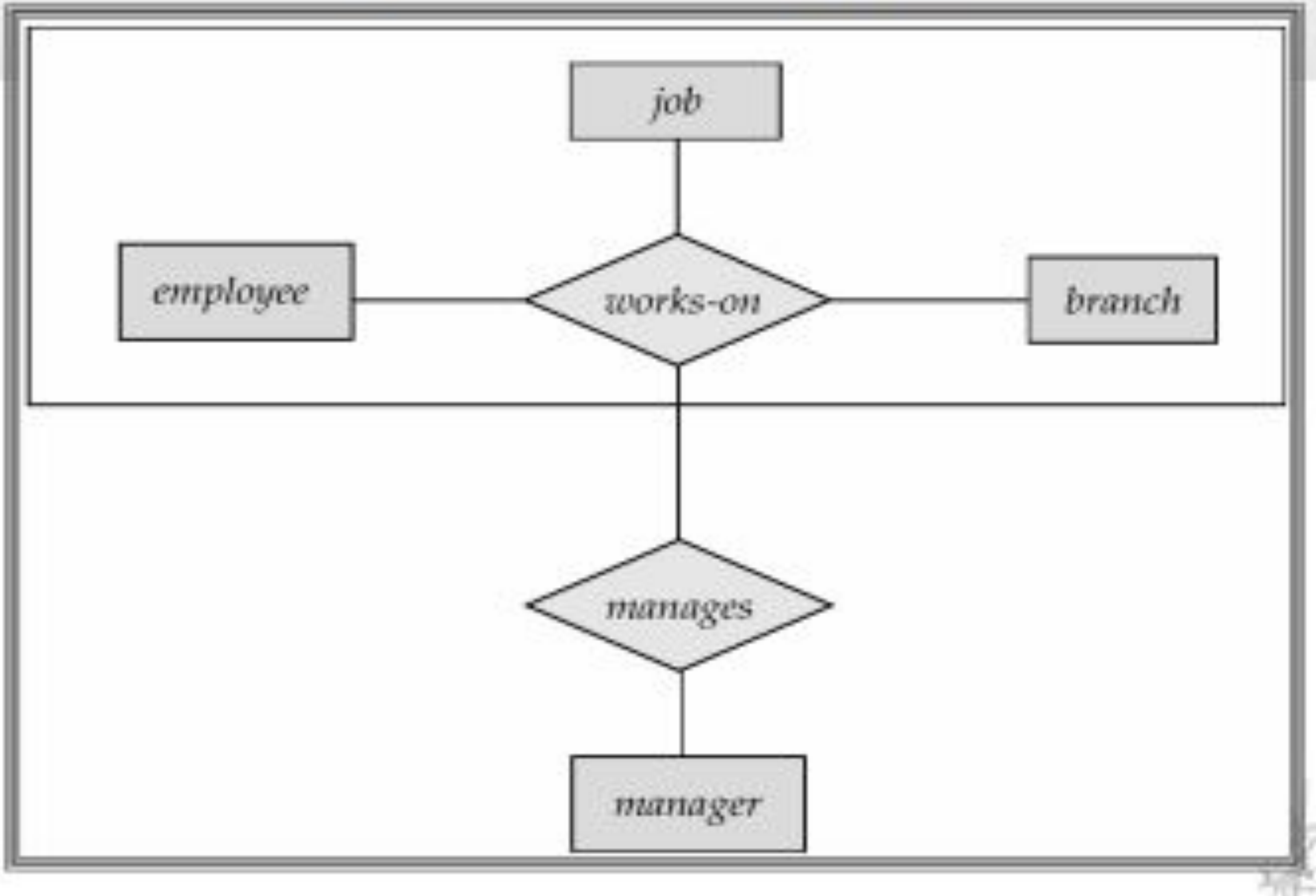
However,some works-on relationships may not correspondto any manages relationships

So we can’t discard the works-on relationship

Elimination of redundancy using aggregation

- Treat relationship as an abstract entity.
- Allow relationships between relationships
- Abstraction of relationship into new entity

E-R Diagram With Aggregation



With Aggregation :

- An employee works on a particular job at a particular branch
- An employee ,branch,job combination may have an associated manager