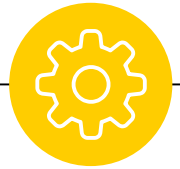
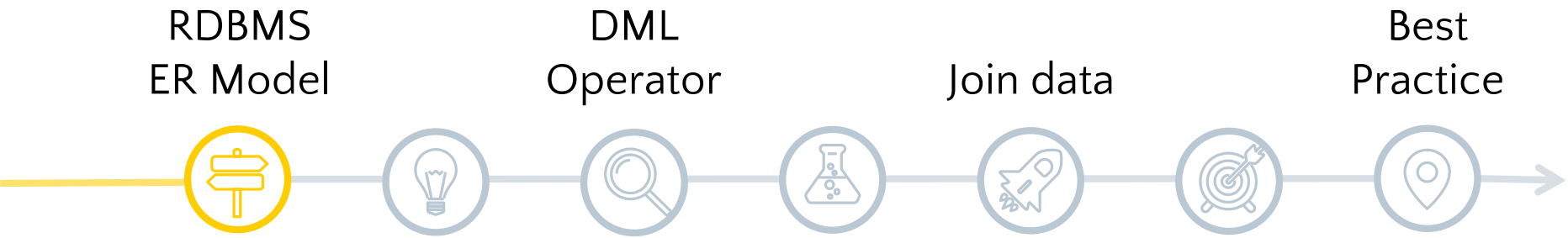
welcome



SQL Essentials

Roadmap


RDBMS
ER Model
SQL Server
DDL
DML
Operator
Function
SQL Clause
Join data
Sub Query
Best
Practice

What we will explore today?

Database

- What is RDBMS?
- What is DBMS?
- Database Schema
- Database Instance

Entity Relation Model

- What is ER Model?
- What is Entity?
- Cardinality?
- Relationships
- Convert ER model to schema

What is DataBase?

- **database** is an **organized collection of data**, typically **store & accessed** electronically from a computer system or electronic device.

What kind of data is store in DB?

- UserName, Password, Email, Address, Salary ...
- Image, Videos...
- Almost everything “digital” can be storeage on database

What is DBMS?

- A **database management system** is **software** for **managing databases**
- Control access to the databases
- Create, modified, delete databases
- Manipulate data (storage, retrieve, report)

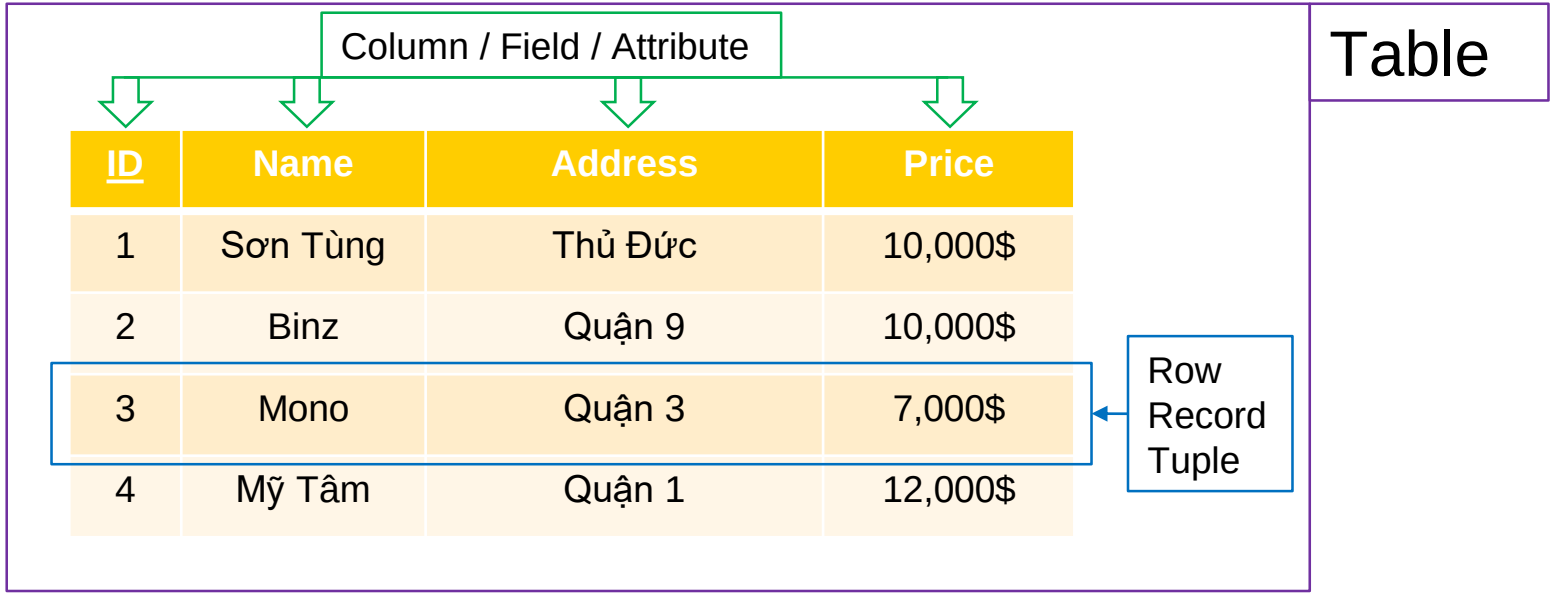
What is RDBMS?

- RDBMS store data in form of table, table contains many columns & rows.
- Use “Query” to comunicate with DBMS we can insert , delete, update data in DataBase.

Type of DBMS

- Relational database.
- Object oriented database.
- Hierarchical database.
- Network database.

It’s all about table



Relational database have many **tables.** Table containts many **columns & rows**

Database Schema

Singer(ID, Name, Address, Show)

ID	Name	Address	Price
1	Sơn Tùng	Thủ Đức	10,000$
2	Binz	Quận 9	10,000$
3	Mono	Quận 3	7,000$
4	Mỹ Tâm	Quận 1	12,000$

Schema is describe how the data should **look like**

It’s **not hold any data**

Database instance

ID	Name	Address	Price
1	Sơn Tùng	Thủ Đức	10,000$
2	Binz	Quận 9	10,000$
3	Mono	Quận 3	7,000$
4	Mỹ Tâm	Quận 1	12,000$

Relational database concept

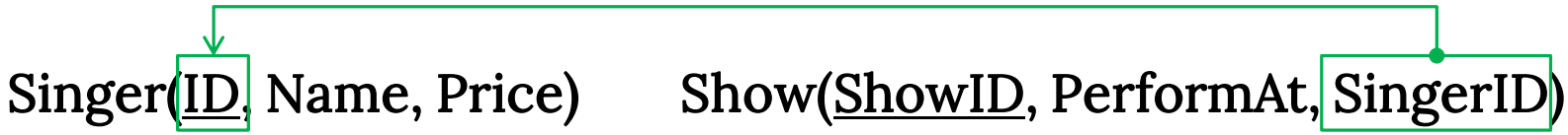
ID	Name	Price
Singer1	Sơn Tùng	10,000$
Singer2	Binz	10,000$
Singer3	Mono	7,000$
Singer4	Mỹ Tâm	12,000$

ShowID	PerformAt	SingerID
Show1	TP. HCM	Singer1
Show2	TP. HN	Singer1
Show3	TP. HCM	Singer3
Show4	TP. Nha Trang	Singer4

Database Schema

ID	Name	Price
Singer1	Sơn Tùng	10,000$
Singer2	Binz	10,000$
Singer3	Mono	7,000$
Singer4	Mỹ Tâm	12,000$

ShowID	PerformAt	SingerID
Show1	TP. HCM	Singer1
Show2	TP. HN	Singer1
Show3	TP. HCM	Singer3
Show4	TP. Nha Trang	Singer4



Why don’t we just use one table?

ID	Name	Price
Singer1	Sơn Tùng	10,000$
Singer2	Binz	10,000$
Singer3	Mono	7,000$
Singer4	Mỹ Tâm	12,000$

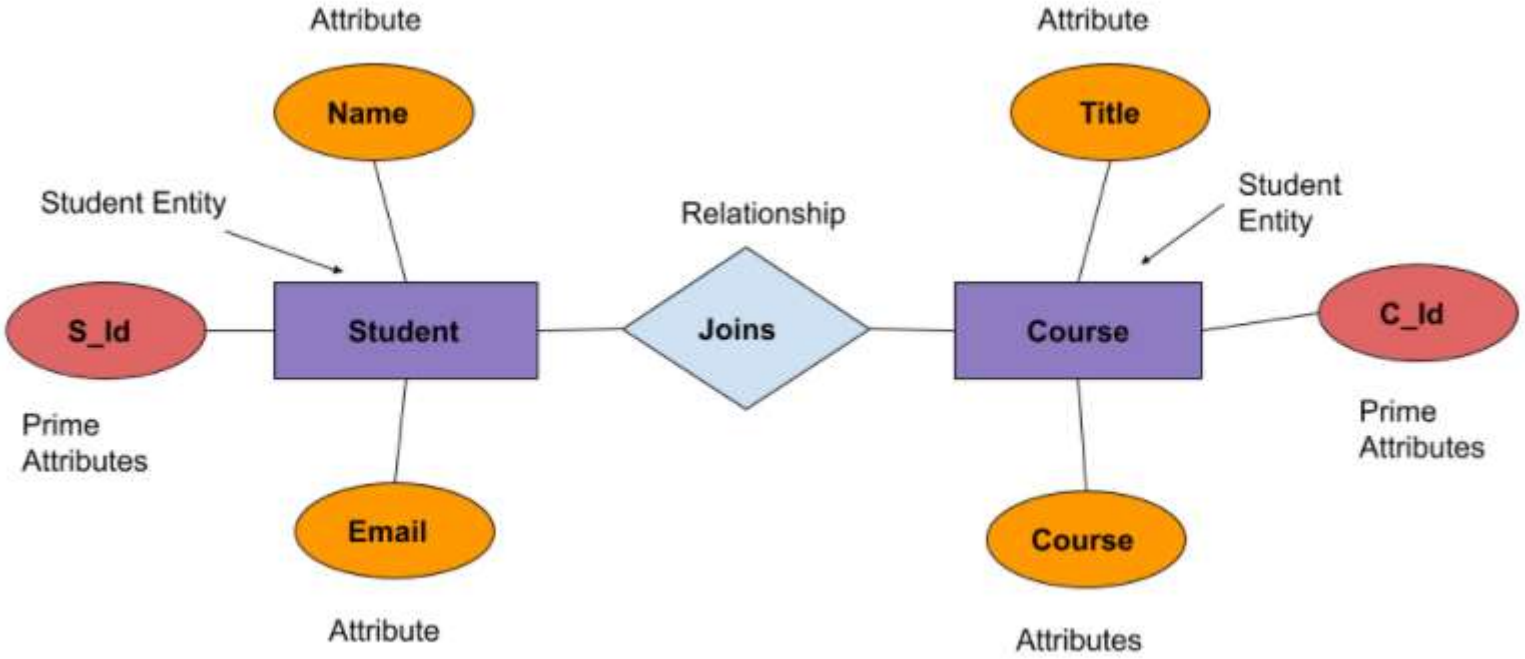
ShowID	PerformAt	SingerID
Show1	TP. HCM	Singer1
Show2	TP. HN	Singer1
Show3	TP. HCM	Singer3
Show4	TP. Nha Trang	Singer4

ShowID	PerformAt	SingerID	Name	Price
Show1	TP. HCM	Singer1	Sơn Tùng	10,000$
Show2	TP. HN	Singer1	Sơn Tùng	10,000$
Show3	TP. HCM	Singer3	Mono	7,000$
Show4	TP. Nha Trang	Singer4	Mỹ Tâm	12,000$

Some specific system use RDBMS

- MySQL
- PostgreSQL
- MariaDB
- Microsoft SQL Server
- Oracle Database
- etc...

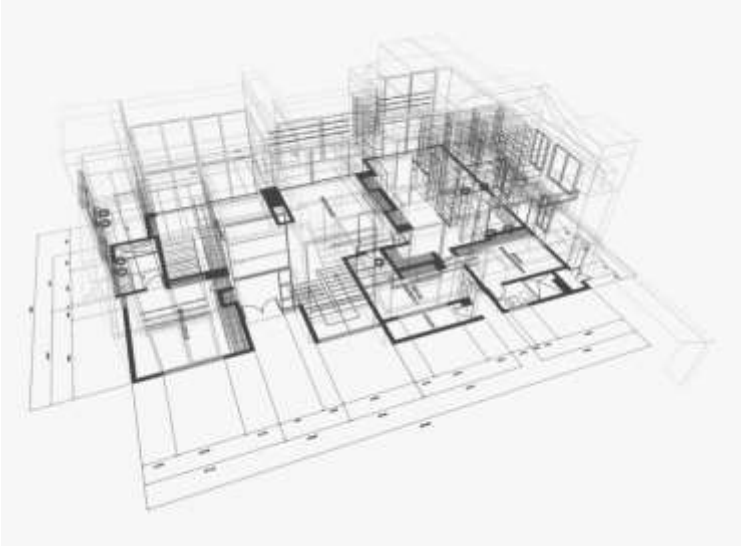
What is ER Model?



ER model is a **conceptual design** design for the database. representation of **crelationships between data.**

Why we Need it?

- ER Model visualize the design and form the overall view of the database



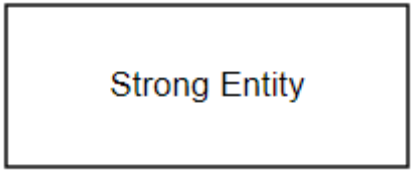
Strong entity vs week entity

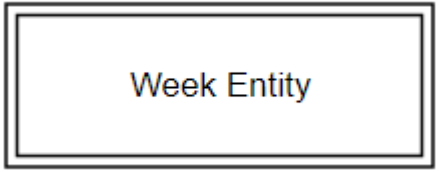
Strong Entity

- Has primary key
- **NOT depend** on other entity

Week entity

- Has partial discriminator key
- **Depend** on other entity

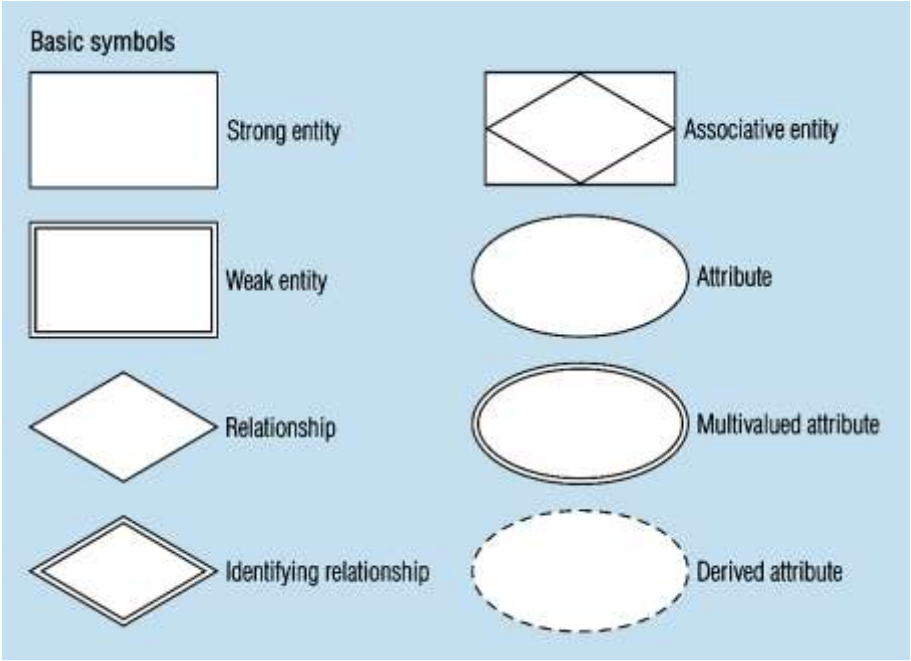




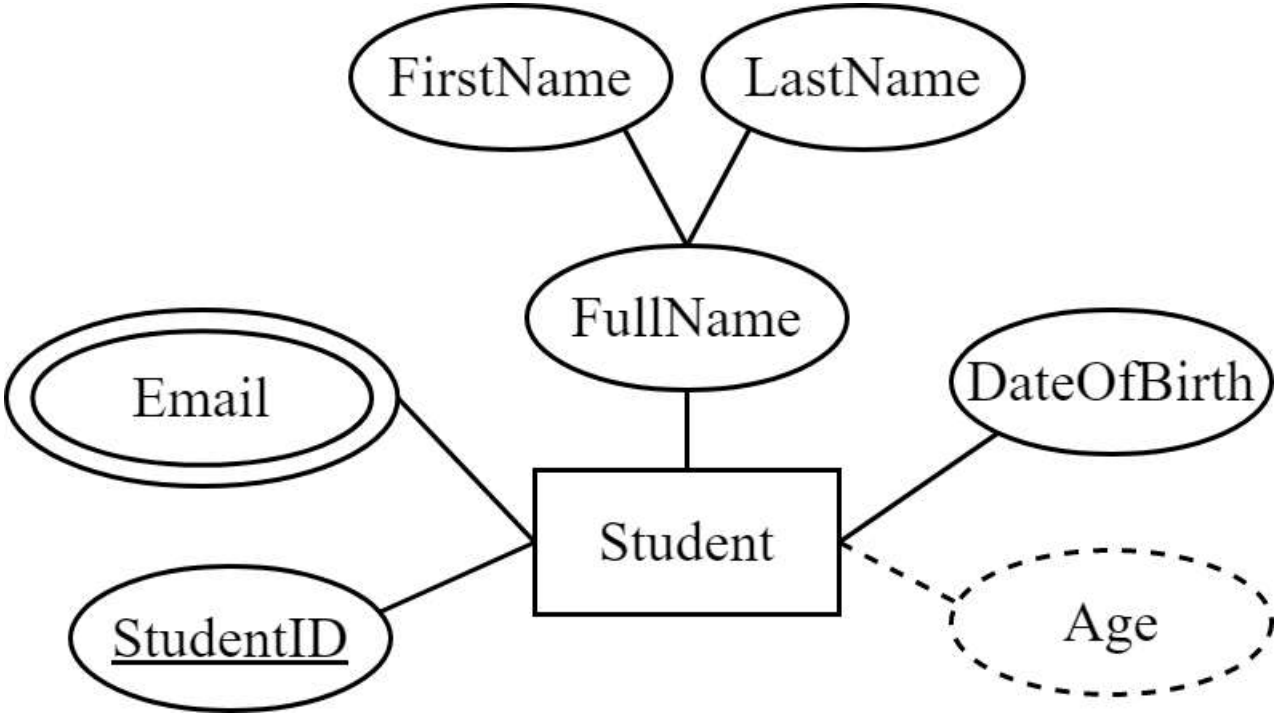
Entity Attribute

- It’s describes the characteristics of an entity
- ex: Student: Name, Phone, Grate, ...

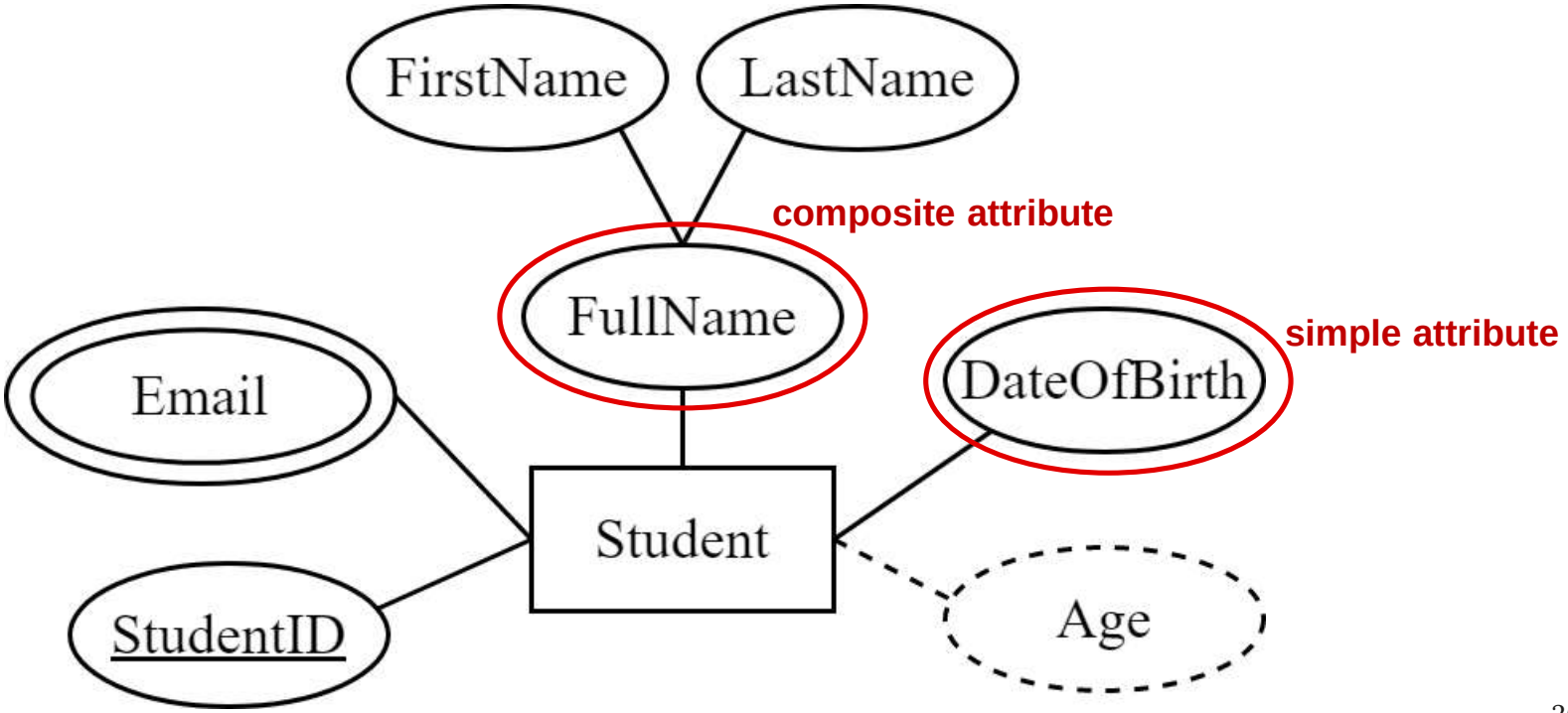
ER Notation


Basic symbols
Strong entity
Associative entity
Weak entity
Attribute
Relationship
Multivalued attribute
Identifying relationship
Derived attribute

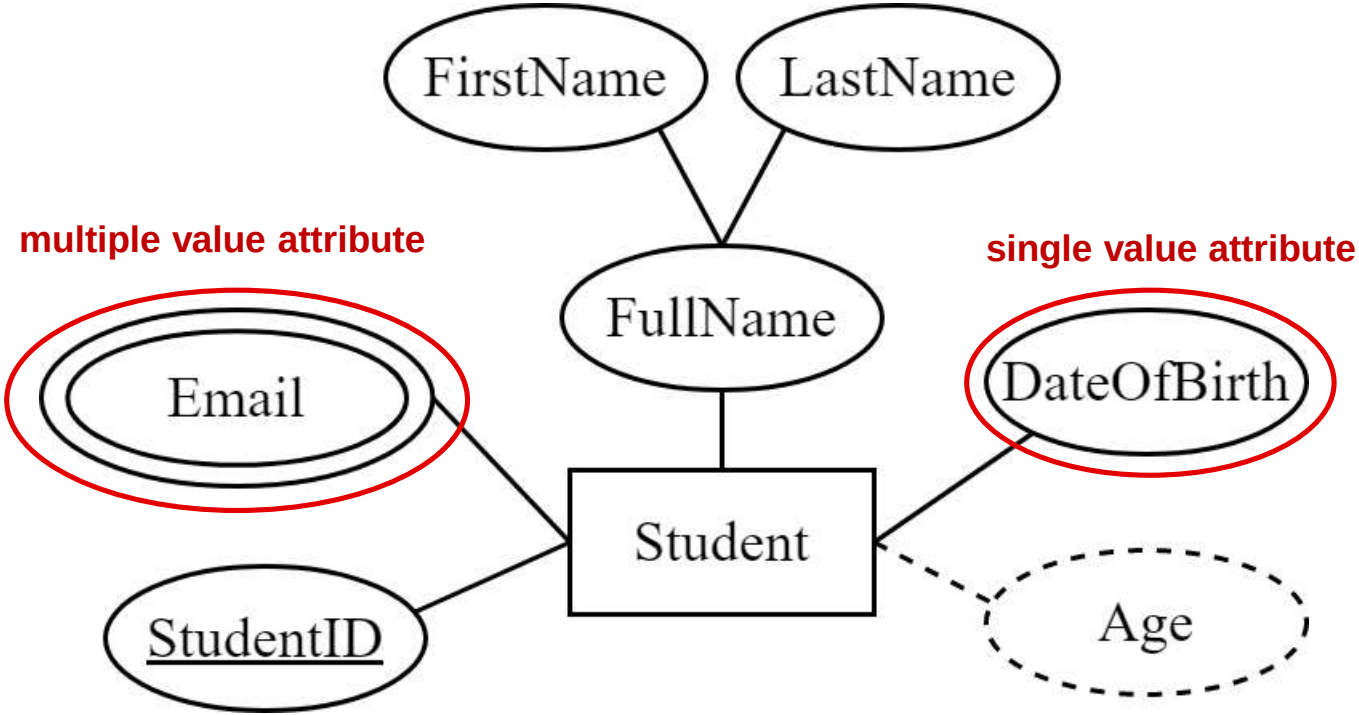
Student entity



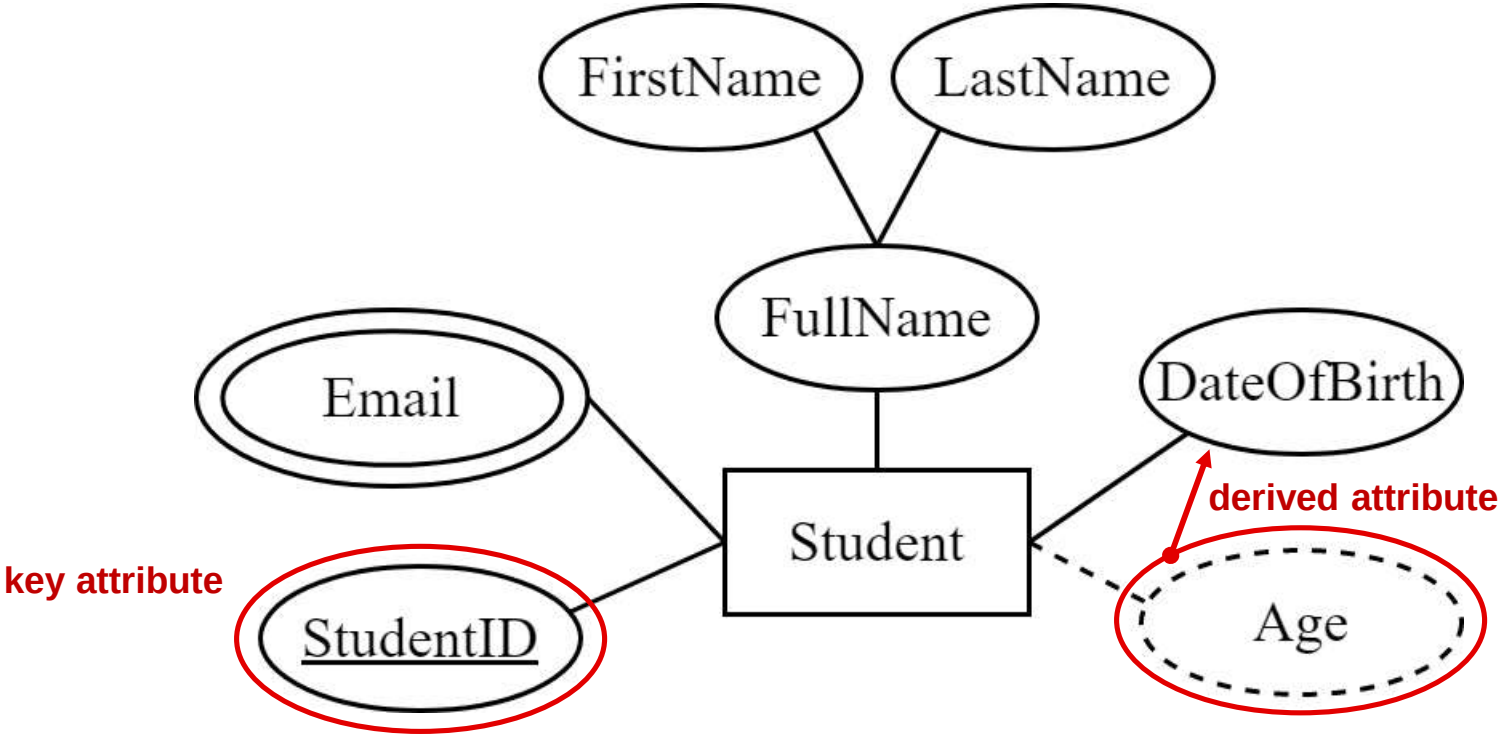
Simple & Composite attribute



Single & Multiple value attribute



Key & Derived attribute



Practice draw entity & attribute

Draw entity Customer with requirement:

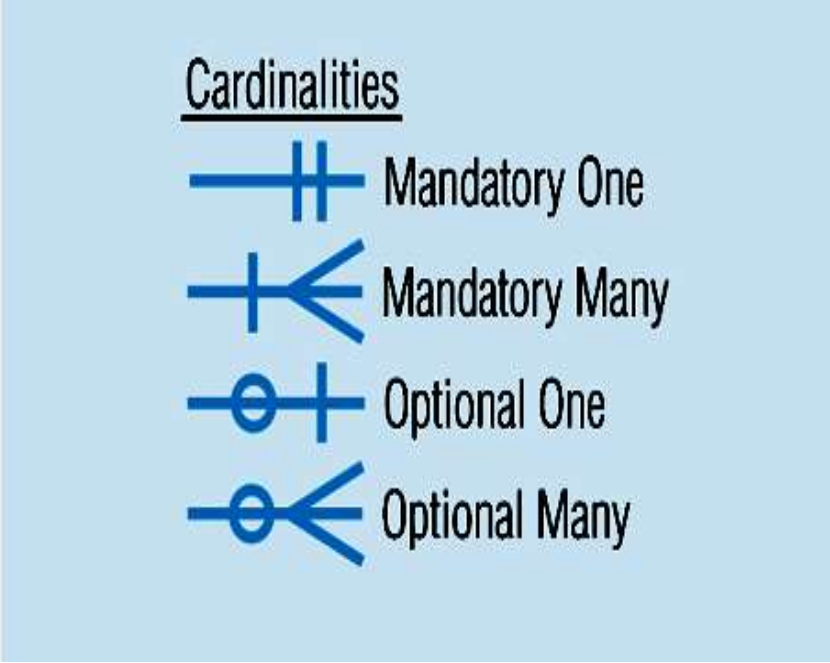
- Address(city, district, street)
- Many PhoneNumber
- FullName(FirstName, LastName)
- DateOfBirth
- Age

Cardinality

Cardinality describes a relationship between two entities

- one to one
- many to one
- one to many
- many to many

Cardinalities



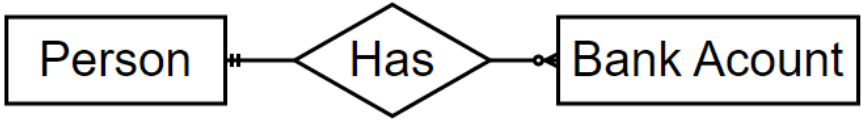
One to One

- Person have one ID Card

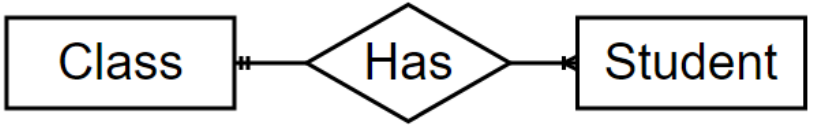
- Person have one Heart

Many-to-One or One-to-Many

- **Person** have 0 or many **BankAccount, a BankAccount** belong to one **Person**

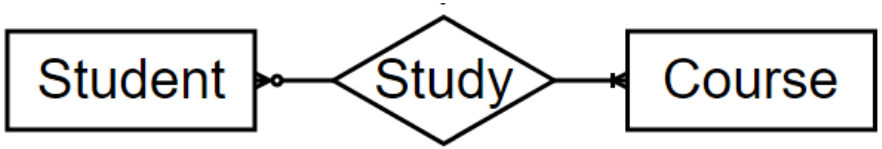


- **Class** have 1 or many **Student**, **Student** must be in one **Class**



Many-to-Many

- **Student** study many **Courese, Courses** can learn by 0 or many **Student**



Practice 1

ex1: Customer can have one or many Address, One Address can belong to zero or many customer

Practice 2

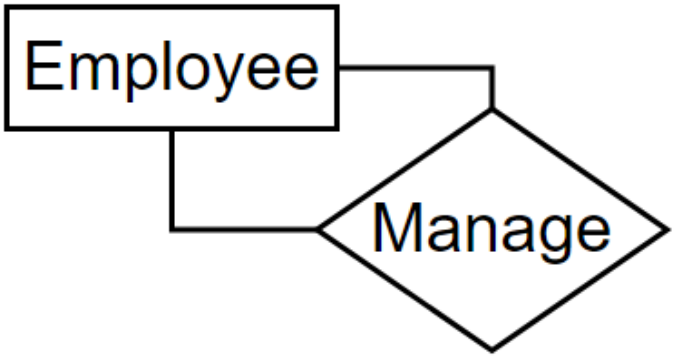
ex2: User can sent zero or many message to Other User. User received zero or many message from other User

Entity relationships

- describes how many entities are participant & how they are related

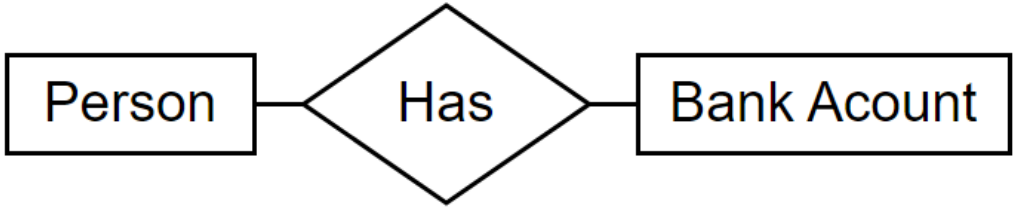
Unary relationship

- There **only one entity** participant in the relationship



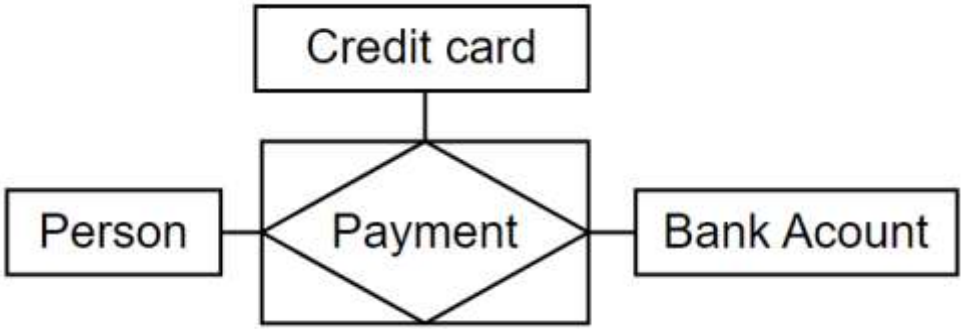
Binary relationship

- There **2 different entity** participant in the relationship



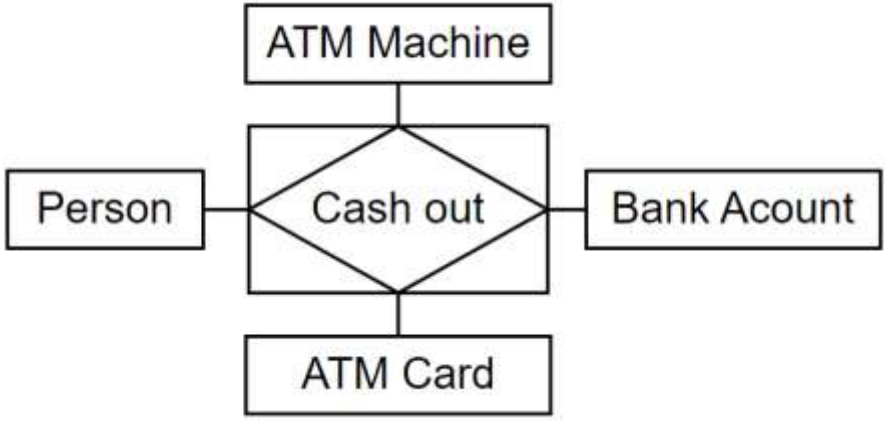
Ternary relationship

- There 3 **different entity** participant in the relationship



N-nary relationship

- There N **different entity** participant in the relationship

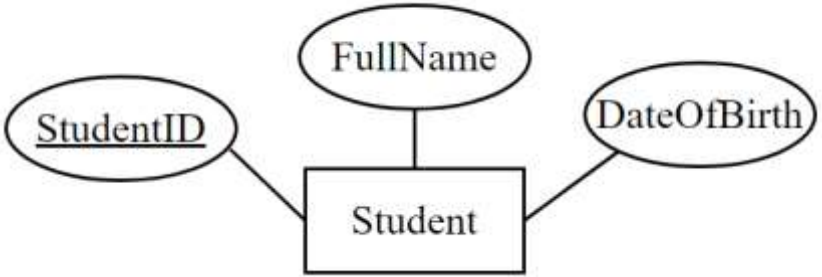


design Shopee ER Model

- **Customer** have info(name, address, phone, email, dateOfBirth...etc)
- Customer can have many Order
- **Order(**total amount, delivery address, dateDelivery**)**
- **Order** have many **Product(**ProductName**,** with quantity, price, discount**)**
- **Product** can belong to many **Order**

Convert ER Model to database chema?

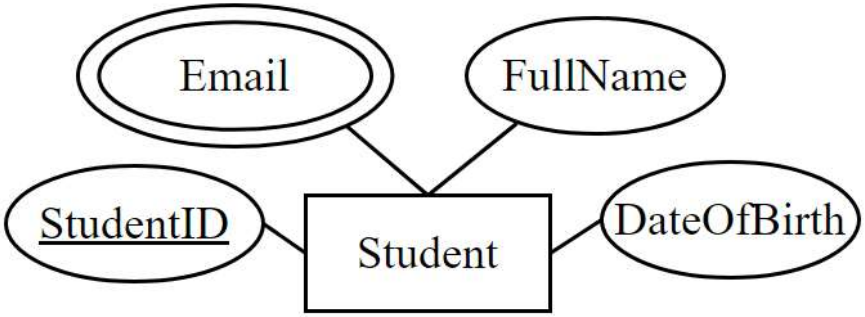
Simple attribute entity



Student(**StudentID**, FullName, DateOfBirth)

StudentID	FullName	DateOfBirth
1	Snoop Dog	2/19/2000
2	The Rock	2/16/1999

Multiple value attribute



Student(**StudentID**, FullName, DateOfBirth)

StudentEmail(**StudentID**, **Email**)

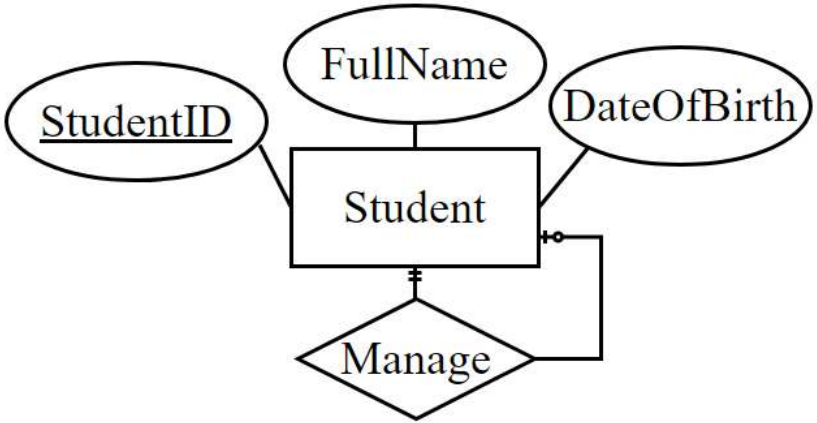
Student(StudentID, FullName, DateOfBirth)

StudentEmail(StudentID, Email)

StudentID	FullName	DateOfBirth
1	Snoop Dog	2/19/2000
2	The Rock	2/16/1999

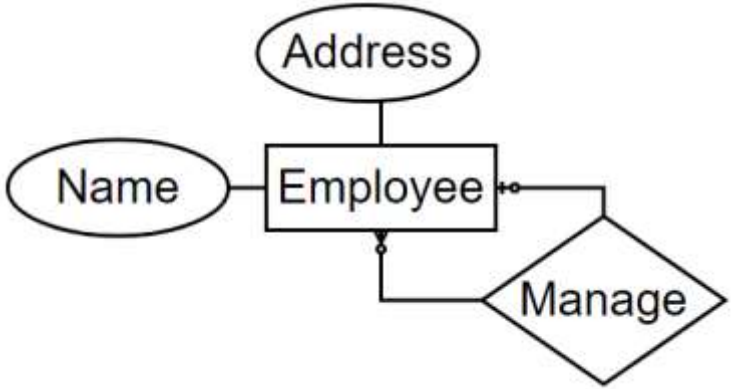
StudentID	Email
1	snoop@high.com
1	snoop@low.com
2	power@man.com
2	supper@man.com
3	test@man.com

Unary one to one(optional)



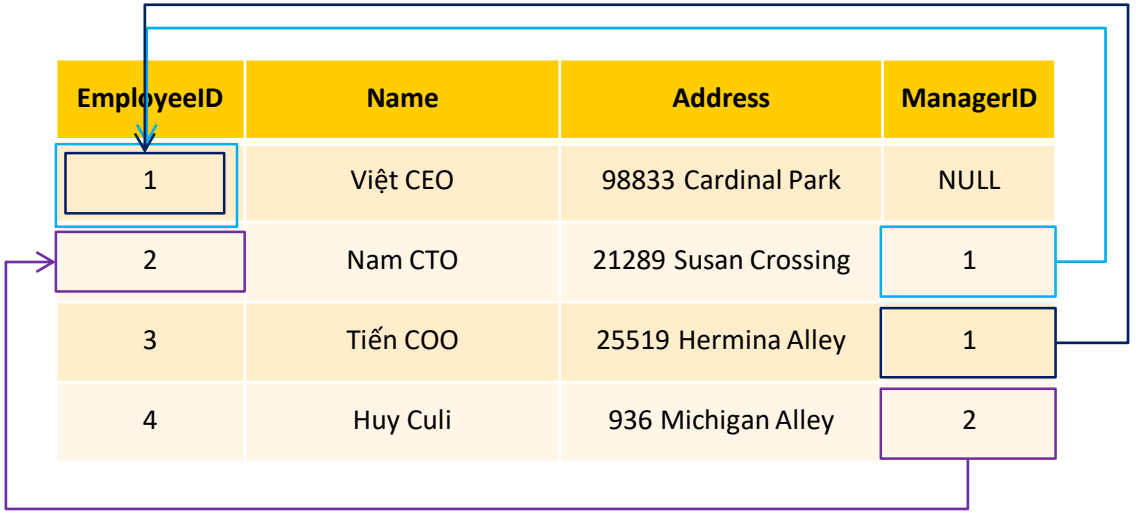
Student(**StudentID,** FullName, DateOfBirth, **ManageID**)

Unary one to many



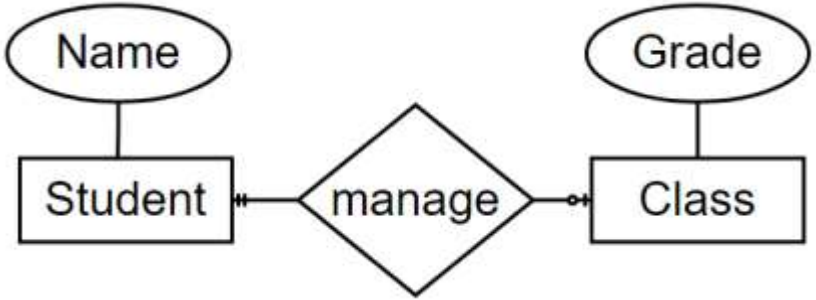
Employee(**EmployeeID,** Name, Address, **ManagerID**)

Employee(**EmployeeID,** Name, Address, **ManagerID**)



EmployeeID	Name	Address	ManagerID
1	Việt CEO	98833 Cardinal Park	NULL
2	Nam CTO	21289 Susan Crossing	1
3	Tiến COO	25519 Hermina Alley	1
4	Huy Culi	936 Michigan Alley	2

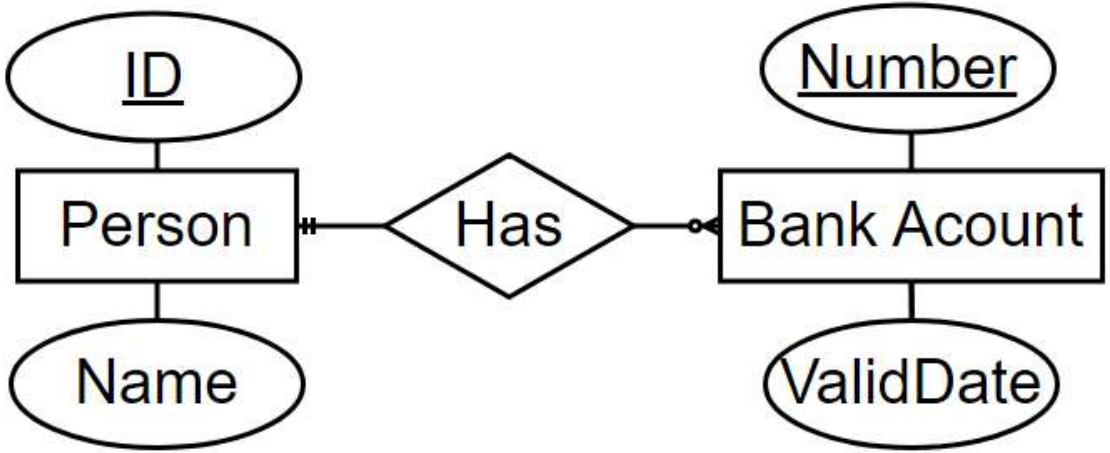
Binary one to one(optional)



Student(**StudentID,** Name)

Class(ClassID, **ManagerID,** Grade)

Binary one to many

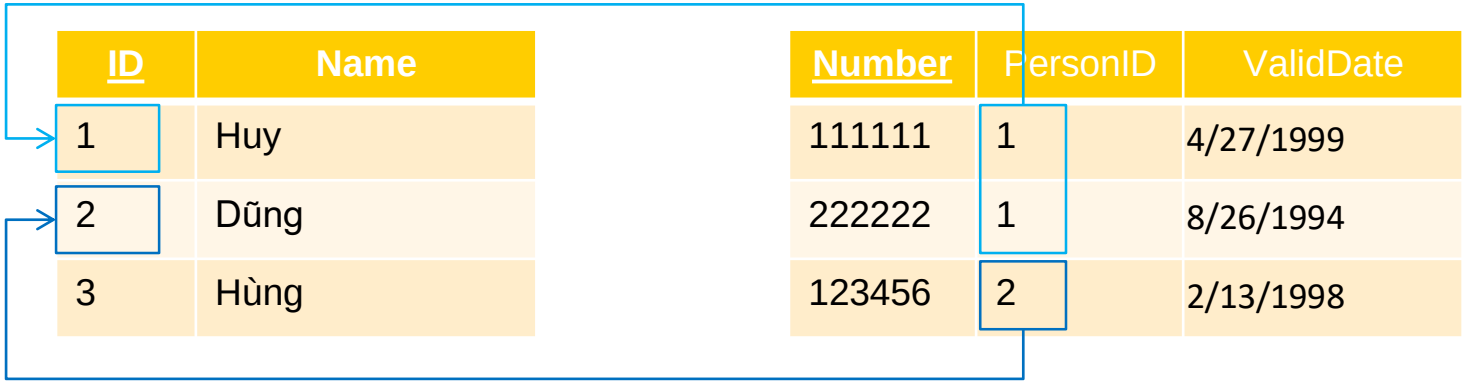


Person(**ID**, Name)

BankAccount(**Number**, PersonID, ValidDate)

Person(**ID**, Name)

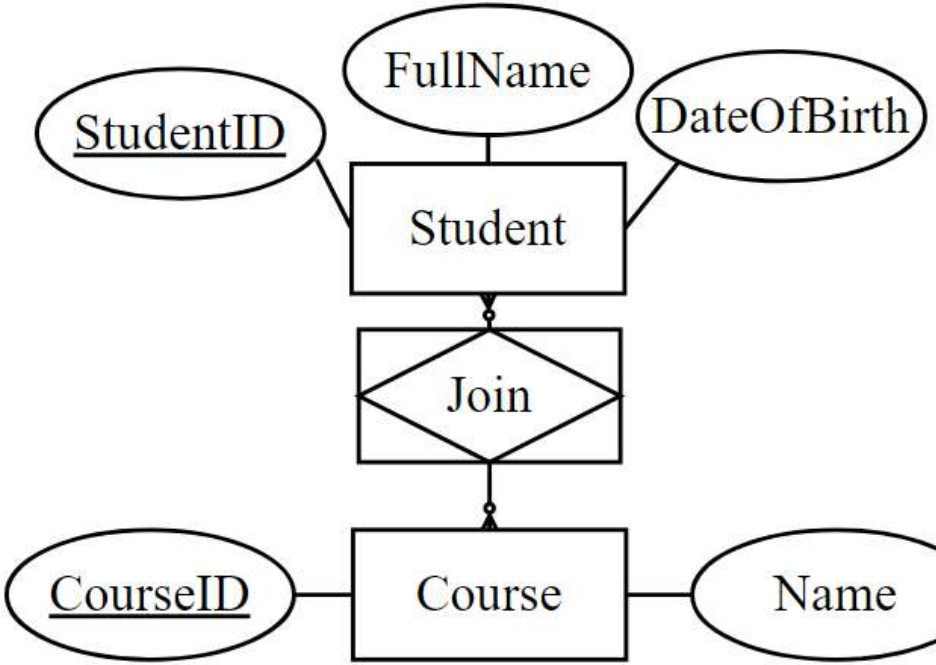
BankAccount(**Number**, PersonID, ValidDate)



ID	Name
1	Huy
2	Dũng
3	Hùng

Number	PersonID	ValidDate
111111	1	4/27/1999
222222	1	8/26/1994
123456	2	2/13/1998

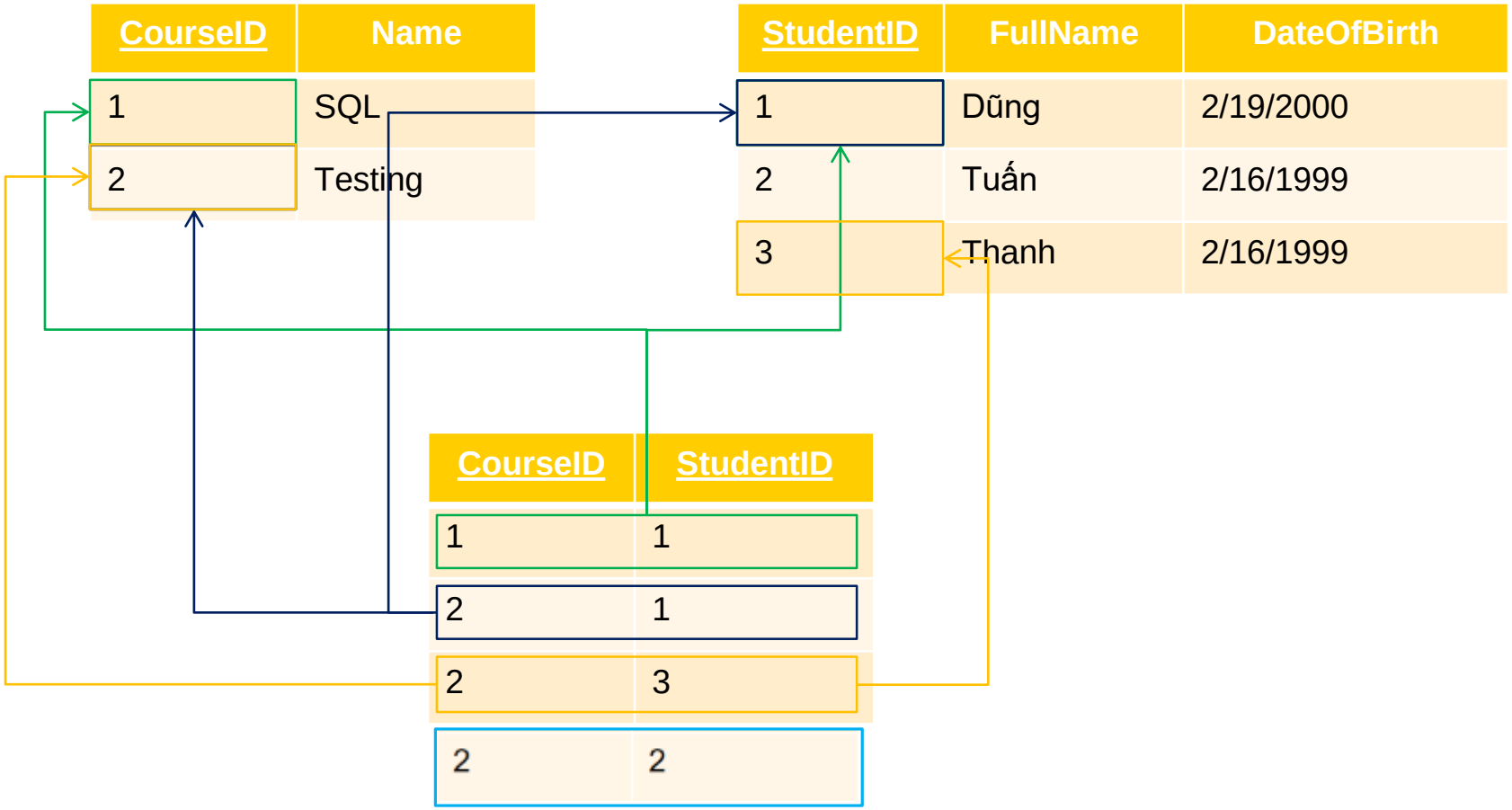
Binary many to many



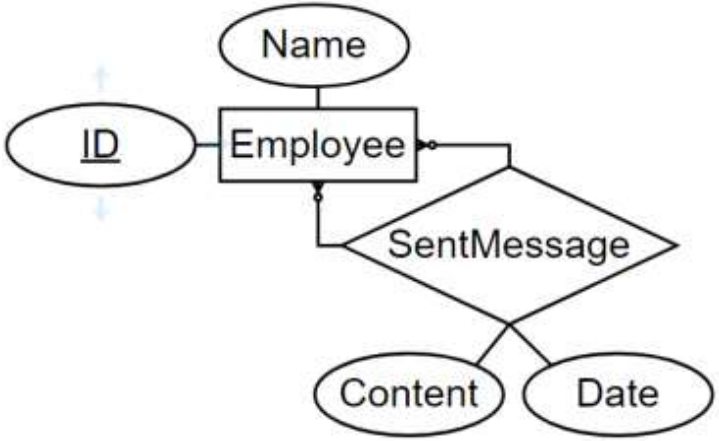
Student(**StudentID**, FullName, DateOfBirth)

StudentCourses(**StudentID**, **CourseID**)

Course(**CourseID**, Name)


CourseID
Name
1
SQL
2
Testing
StudentID
FullName
DateOfBirth
1
Dũng
2/19/2000
2
Tuấn
2/16/1999
3
Thanh
2/16/1999
CourseID
StudentID
1
1
2
1
2
3
2
2

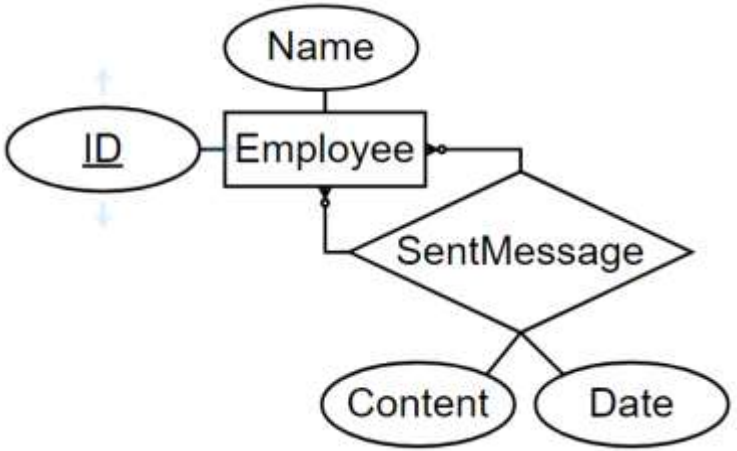
Unary many to many



Employee(ID, Name)

Messages(**FromEmployeeID**, **ToEmployeeID**, Content, Date)

Make you ease to see



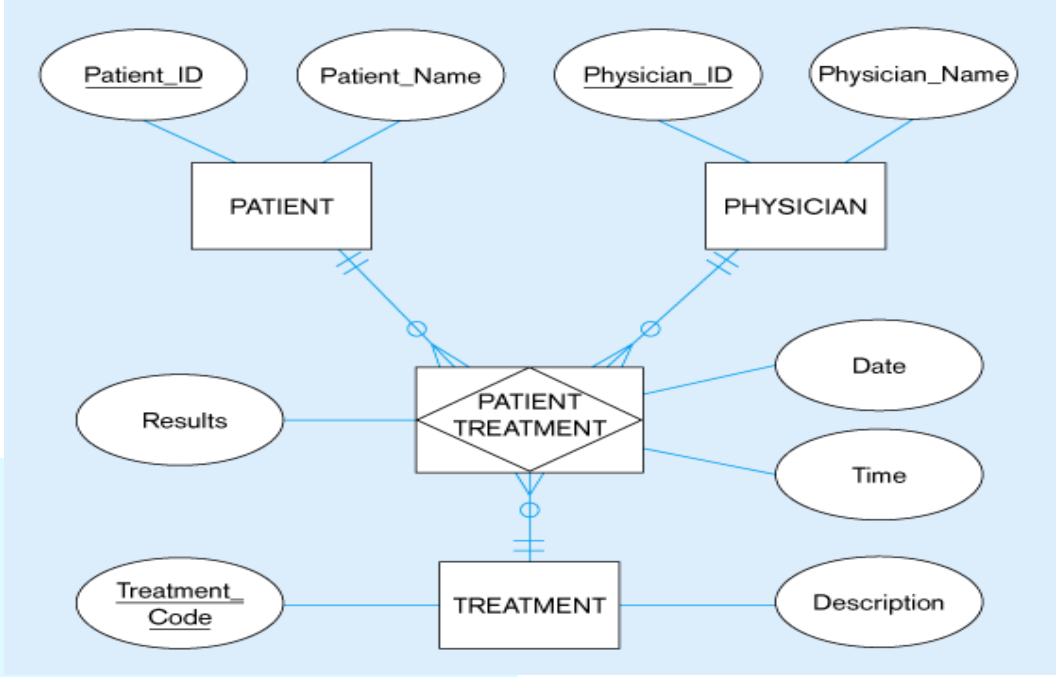
Employee(ID, Name)

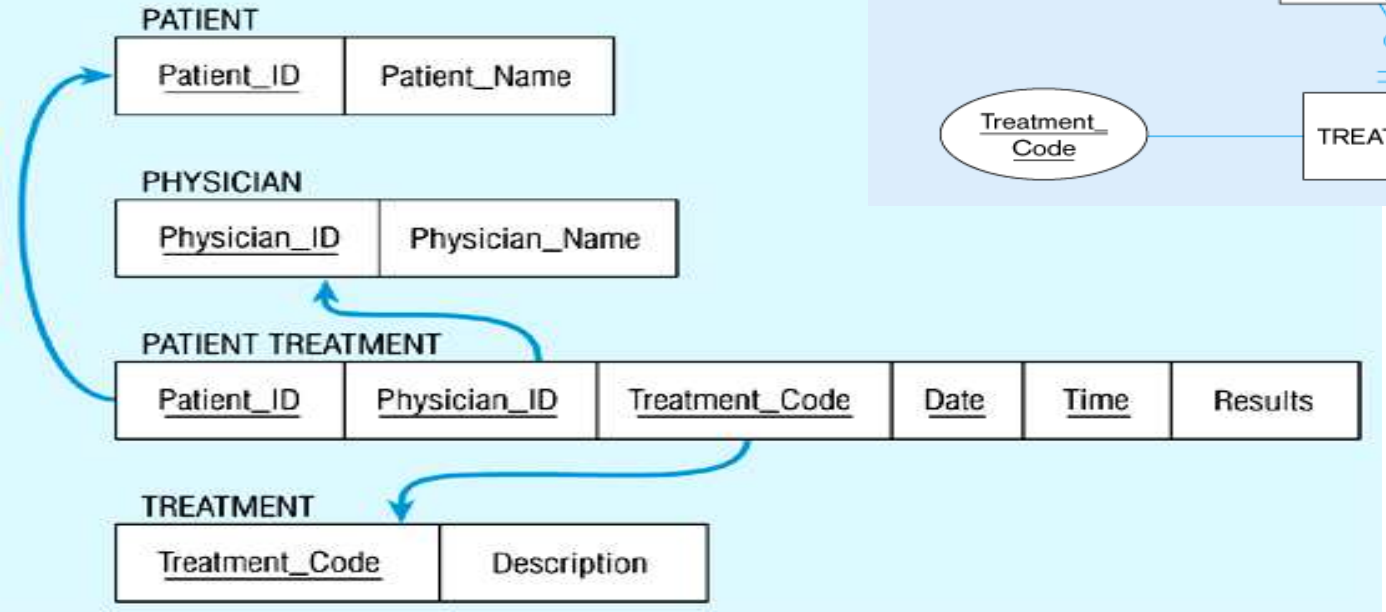
Messages(**FromEmployeeID**, **ToEmployeeID**, Content, Date)

Employee(ID, Name)

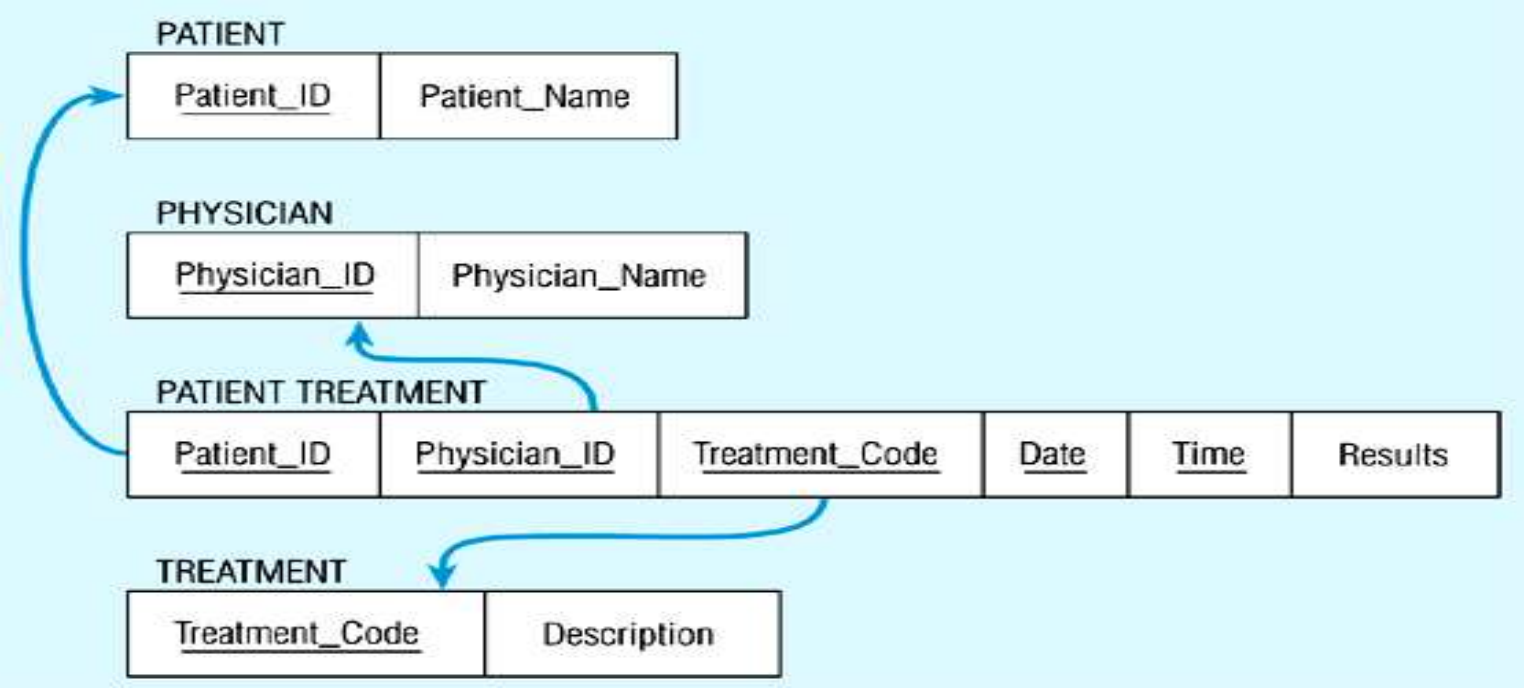
ID	Name
1	Nam
2	Dũng
3	Huy

FromEmployeeID	ToEmployeeID	Content	Date
1	2	Hello A, Khỏe ko a?	2/19/2023
2	1	Hello E, A vẫn khỏe! thế còn em?	2/19/2023
1	2	Có tiền Em vay ít?	2/19/2023
2	1	A cho chú số vợ anh nhé ;))	2/19/2023

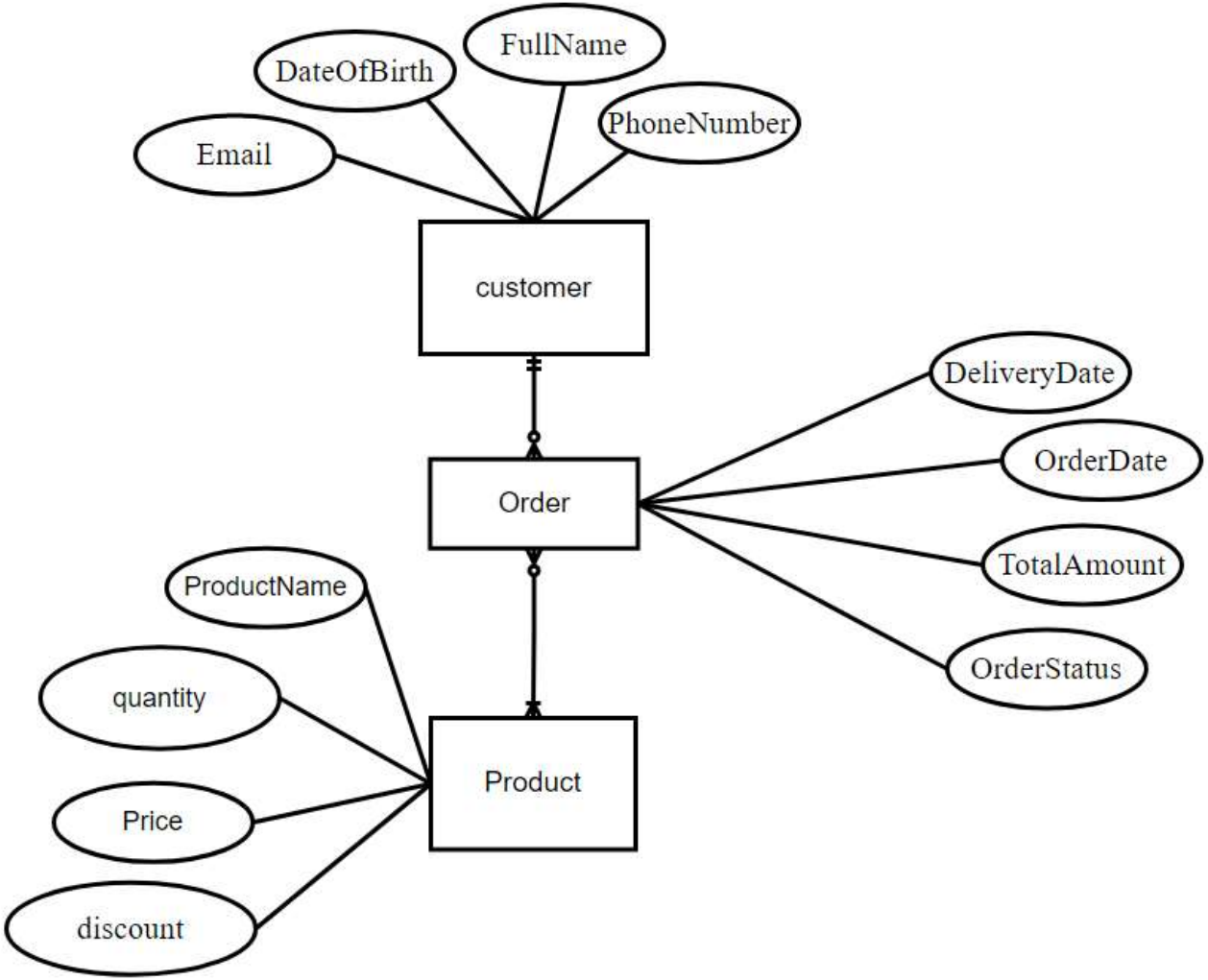

Patient_ID
Patient_Name
Physician_ID
Physician_Name
PATIENT
PHYSICIAN
Results
PATIENT TREATMENT
Date
Time
Treatment_ Code
TREATMENT
Description

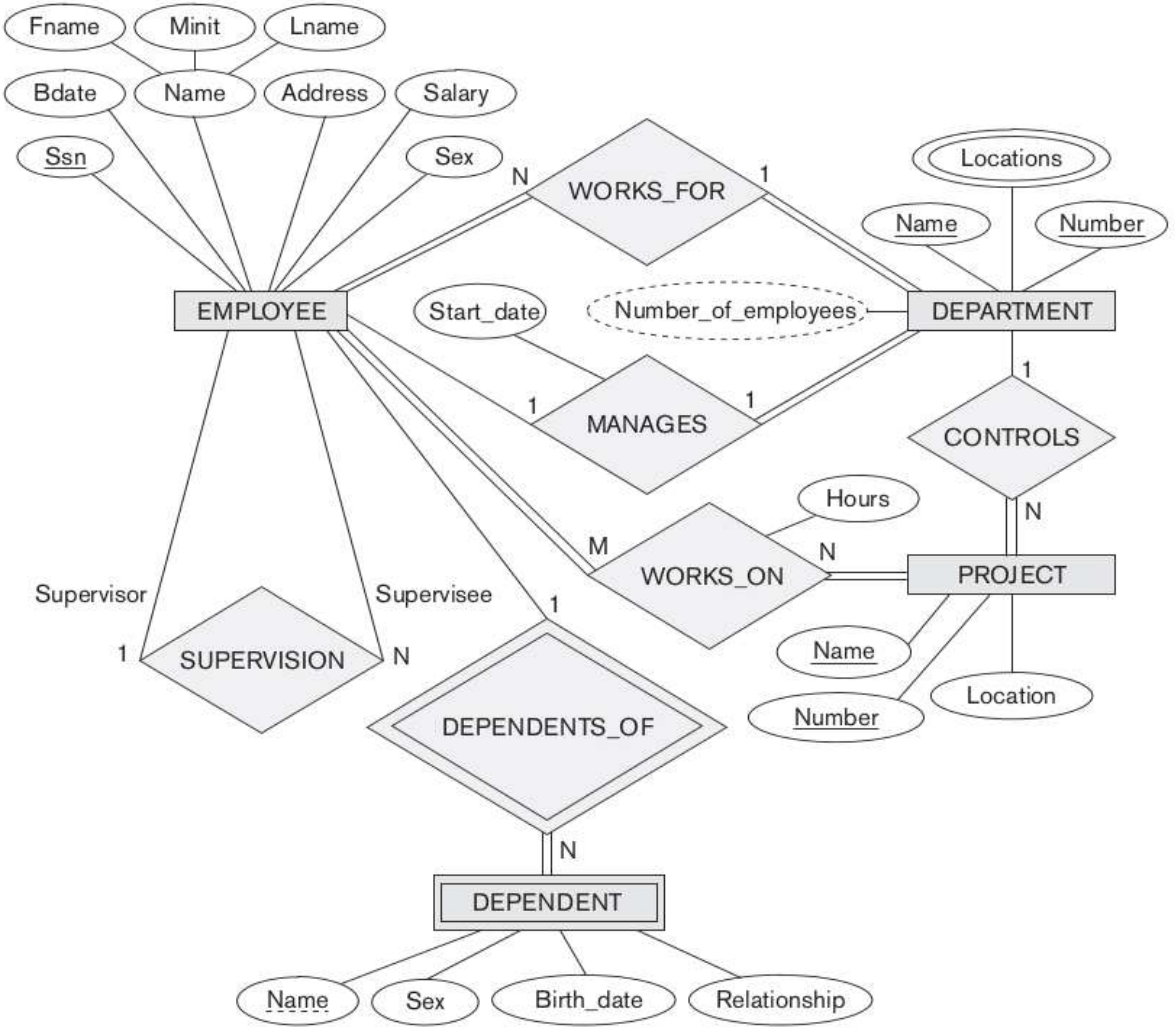

PATIENT
Patient_ID
Patient_Name
PHYSICIAN
Physician_ID
Physician_Name
PATIENT TREATMENT
Patient_ID
Physician_ID
Treatment_Code
Date
Time
Results
TREATMENT
Treatment_Code
Description

Converting ER Model to relational schema



Shopee ER Model to database chema


FullName
DateOfBirth
PhoneNumber
Email
customer
DeliveryDate
OrderDate
Order
TotalAmount
OrderStatus
ProductName
quantity
Product
Price
discount


Fname
Minit
Lname
Name
Bdate
Address
Salary
Ssn
Sex
WORKS_FOR
N
1
Locations
Name
Number
EMPLOYEE
Start_date
Number_of_employees
DEPARTMENT
1
MANAGES
1
1
CONTROLS
Hours
N
M
WORKS_ON
N
PROJECT
Supervisor
Supervisee
1
1
SUPERVISION
N
Name
Number
Location
DEPENDENTS_OF
N
DEPENDENT
Name
Sex
Birth_date
Relationship