

DATABASE CONCEPTS & ER MODEL

Instructor:



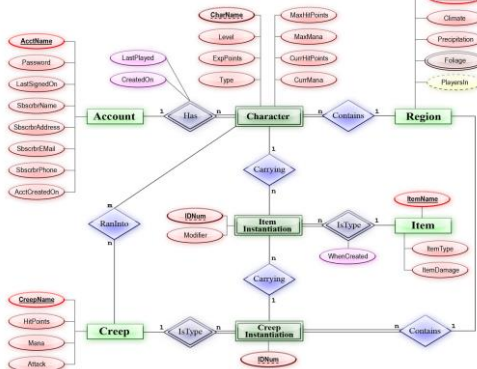
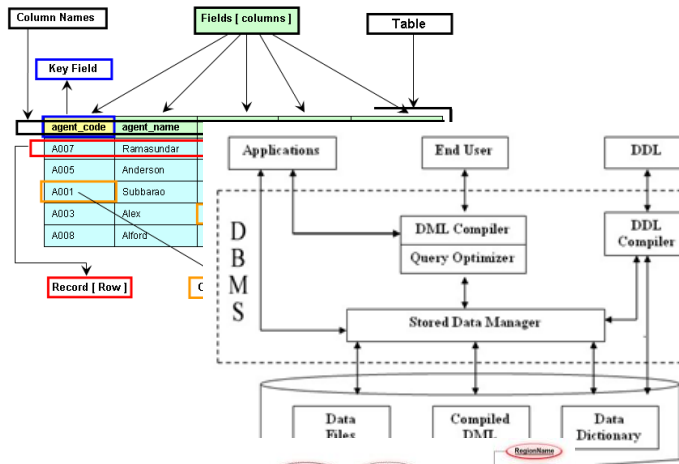
By the end of this lecture students should be able to:

✓ Understand an overview of the basic RDBMS Concepts

✓ Understand an insight into the architecture and components of a Database System.

✓ Describe how entities, attributes and relationships are used to model data;

✓ Converting ER Model to relational schema



Column Name	Kind of Data				
Table LINEITEMS_RELTAB					
LINEITEMNO	PONO	STOCKNO	QUANTITY	DISCOUNT	
Number	Number	Number	Number	Number	
NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	
PK	FK, FK	FK			
KEY	References	References			

Table PURCHASEORDER_RELTAB							
PONO	CUSTNO	ORDERDATE	SHIPDATE	TOSTREET	TOCITY	TOSTATE	TOZIP
Number NUMBER	Number NUMBER	Date DATE	Date DATE	Text VARCHAR(200)	Text VARCHAR(200)	Text CHAR(2)	Number VARCHAR(20)
FK	FK						

Table CUSTOMER_RELTAB						
CUSTNO	CUSTNAME	STREET	CITY	STATE	ZIP	PHONE1
Number	Text	Text	Text	Text	Number	Number
NUMBER	CUSTOMER	CHAR(200)	CHAR(200)	CHAR(2)	VARCHAR(200)	VARCHAR(200)
FK						

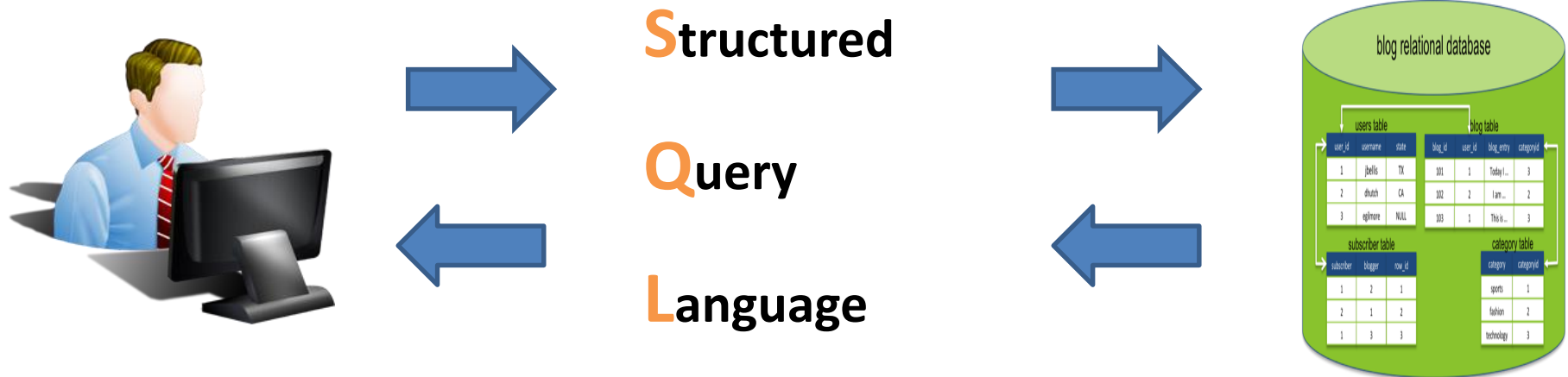
Table STOCK_RELTAB		
STOCKNO	PRICE	TAXRATE
Number	Money	Number
NUMBER	NUMBER	NUMBER
PK		

- ◇ **SQL Overview SQL Overview**
- ◇ **The Relational Database**
- ◇ **RDBMS Concepts**
- ◇ **ER Model**

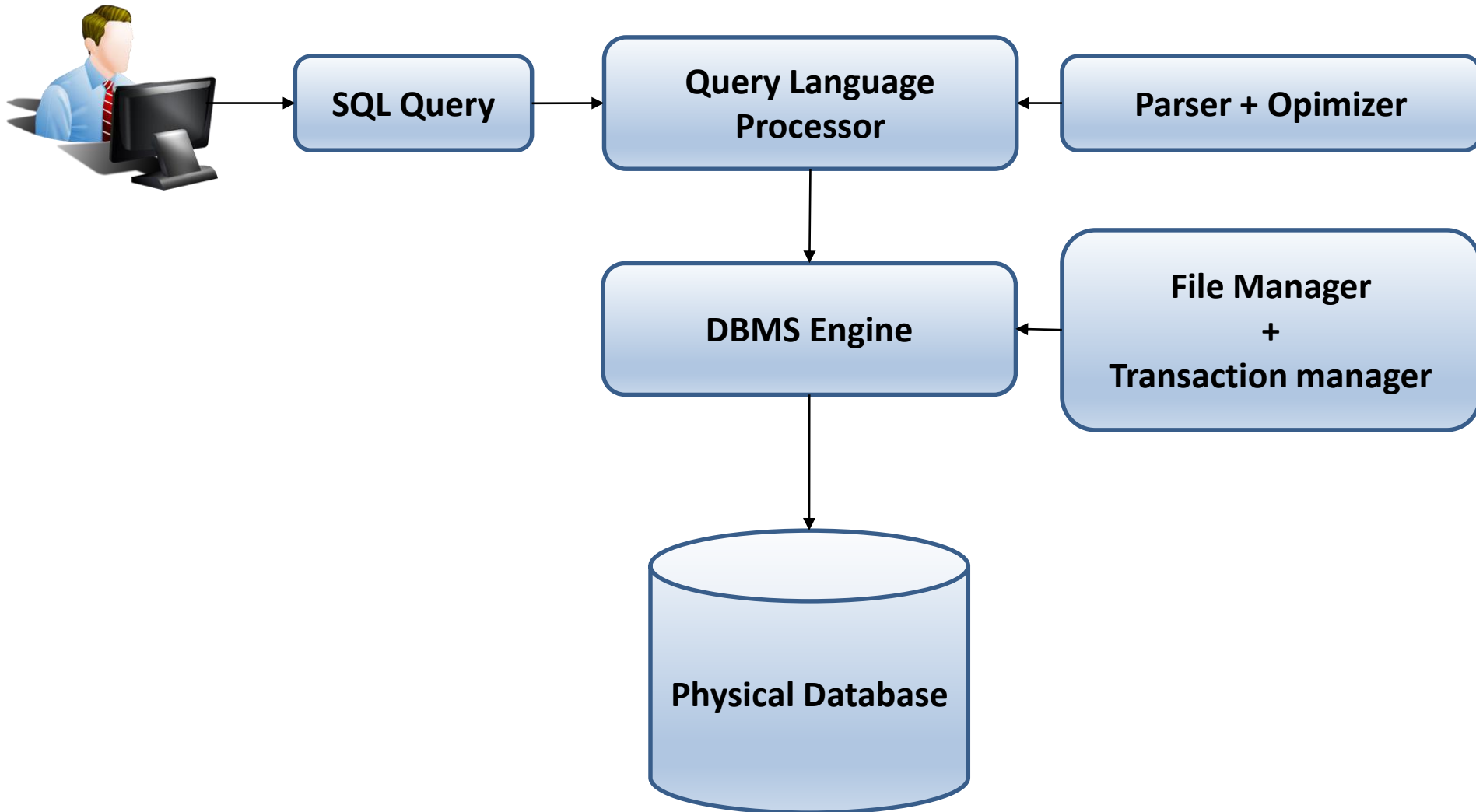
Section 1

SQL OVERVIEW

What is SQL?

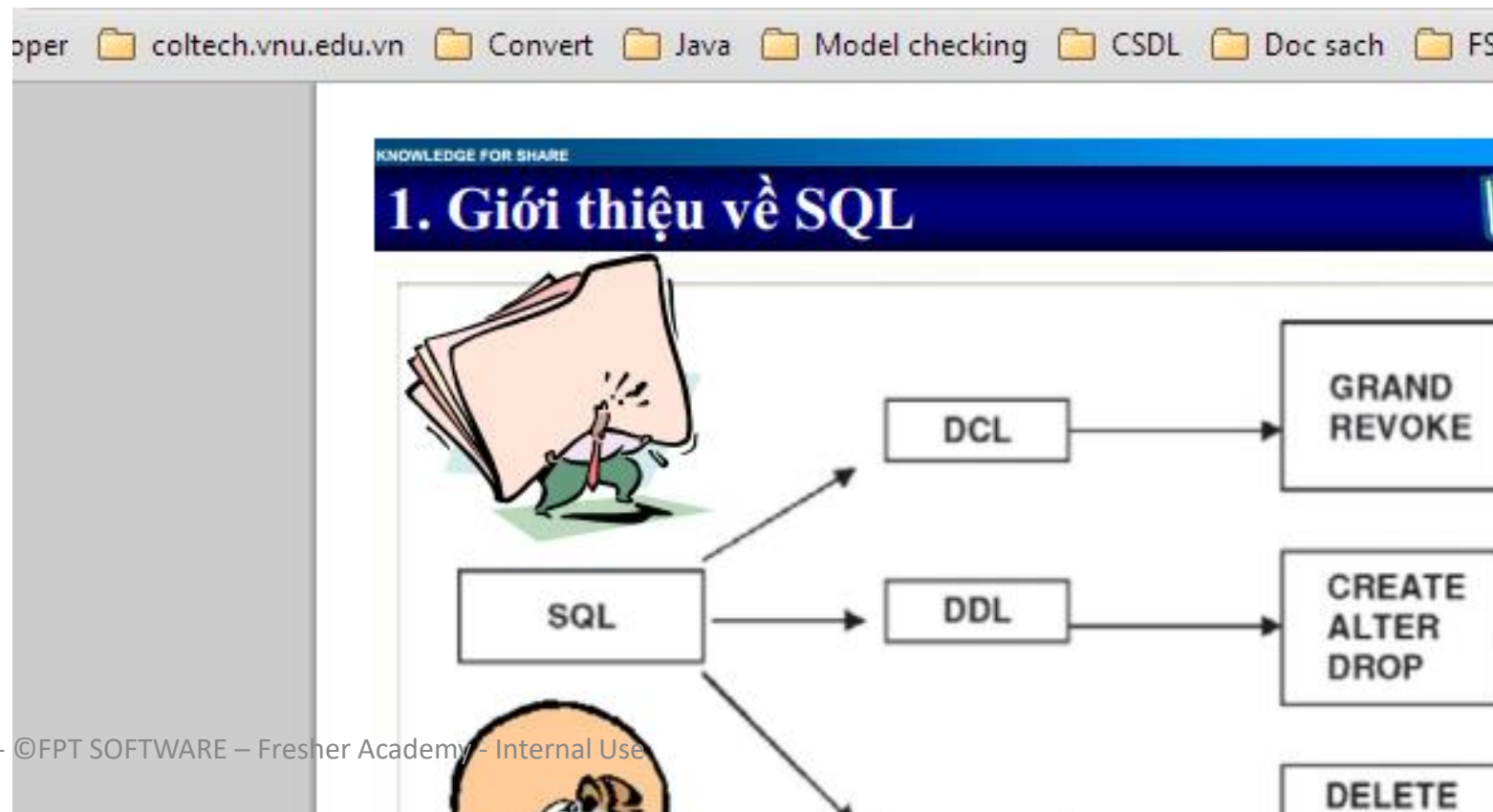


- Which is a computer language for:
 - ✓ storing,
 - ✓ manipulating and
 - ✓ retrieving data stored in relational database.
- SQL is the standard language for Relation Database System, like **MySQL**, **MS Access**, **Oracle**, **Sybase**, **Informix**, **Postgres** and **SQL Server** use SQL as standard database language.
- SQL is an ANSI (American National Standards Institute) standard.



SQL consists of **three components**:

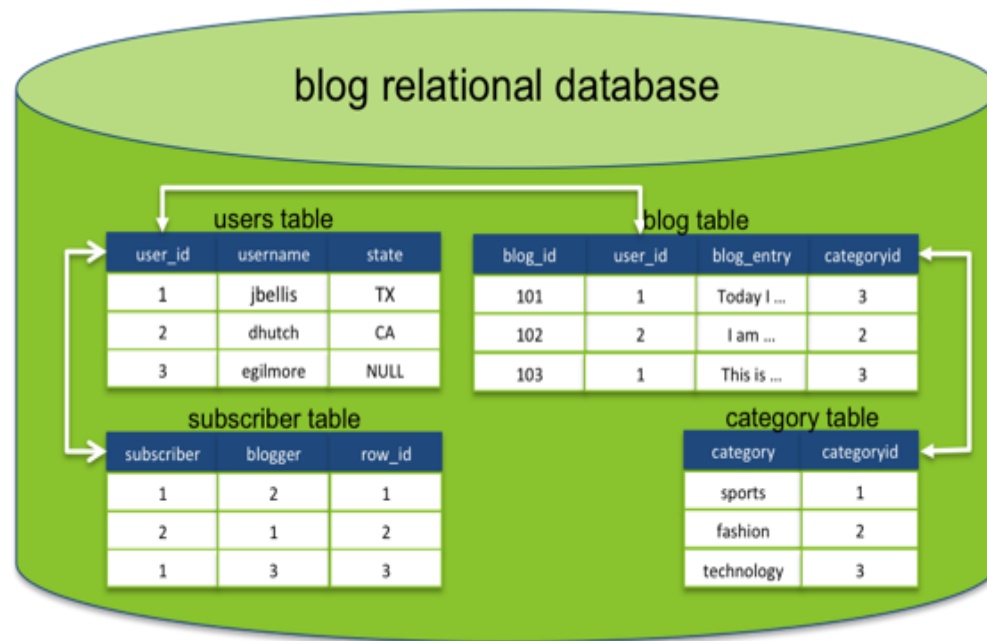
- Data Definition Language (DDL)
- Data Manipulation Language (DML) and
- Data Control Language (DCL)



Section 2

THE RELATIONAL DATABASE

- “A DBMS that manages data as collection of **tables** in which all data relationships are represented by common values in related tables.”
- “A DBMS that follows all the twelve rules of CODD is called RDBMS”



Table

Field

Record

CD_ID	Title	Artist	Genre
1	The Wall	Pink Floyd	Rock
2	Blue Train	John Coltrane	Jazz
3	Requiem	W.A. Mozart	Classical

Relational Database Concepts (3/3)

Supplier

Primary
Key

Domain

Domain

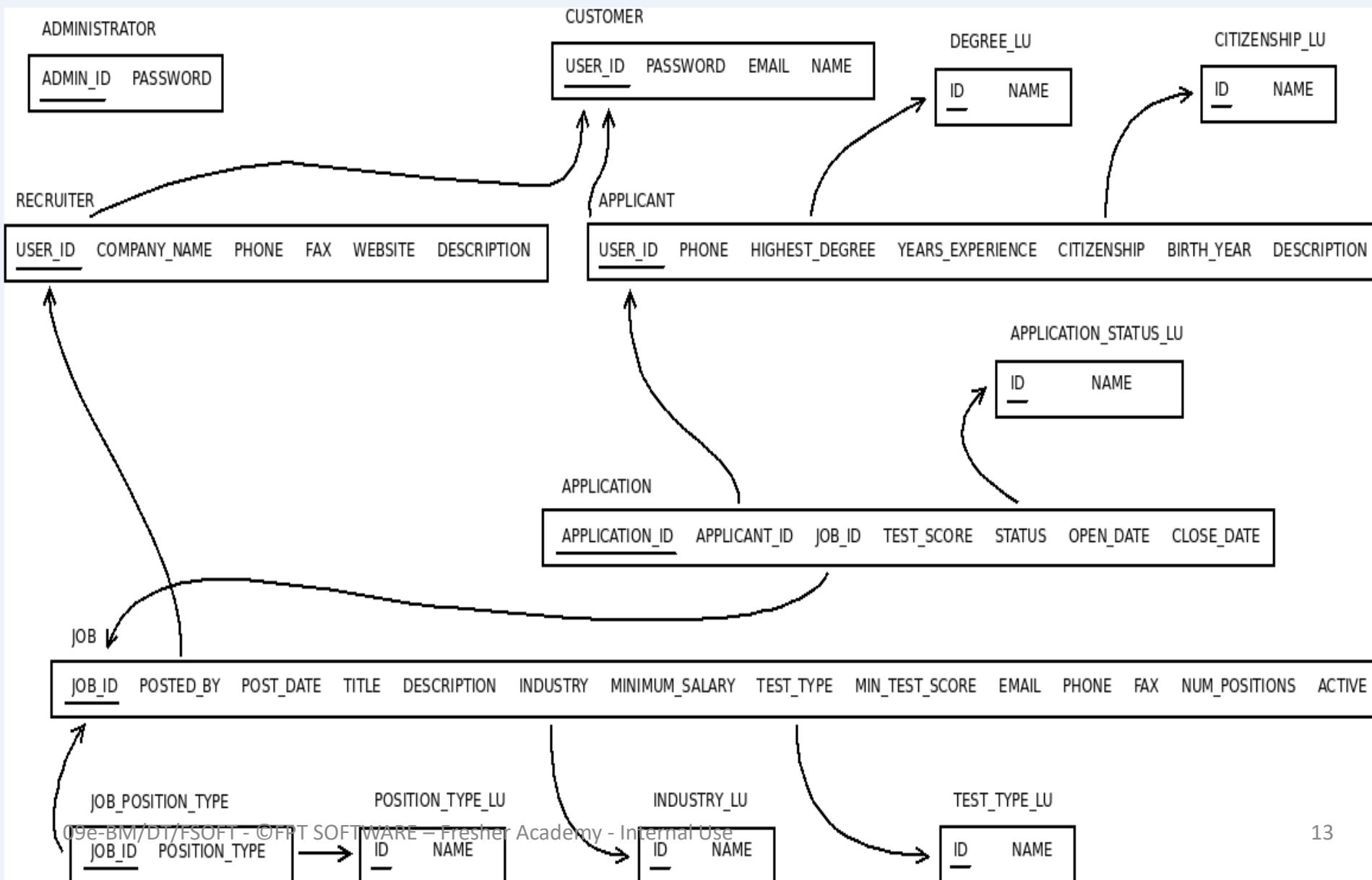
<u>SCode</u>	SName	Quantity	City
S1	Kamran	20	Lahore
S2	Zafar	10	Islamabad
S3	Azmat	40	Karachi
S4	Abdul	34	Lahore
S5	Nasir	25	Islamabad

Row/
Record

Cardinality

Field

- ✿ The name of a relation and the set of attributes for a relation is called a **schema**.
 - Example: the schema for previous slide is
Supplier (SCode, SName, Quantity, City)
- ✿ **Relation schema** = name(attributes) + other structure info., e.g., keys, other constraints.
- ✿ Order of attributes is arbitrary, but in practice we need to assume the (*standard*) order given in the relation schema.
- ✿ **Relational database schema** = collection of relation schemas.



Schema versus Instance

Student (studno, name, address)

Course (courseno, lecturer)

Schema

Student (123, Bloggs, Woolton)

(321, Jones, Owens)

Instance

sid	Name	Login	age	GPA
53666	Jones	Jones@ca	18	3.4
53444	smith	Smith@ecs	18	3.2
53777	Blake	Blake@aa	19	3.8

→ Cardinality = 3, arity = 5 , all rows distinct

→ Do all values in each column of a relation instance have to be distinct?

➤ **RDBMS** stands for:

Relational **D**atabase **M**anagement **S**ystem

➤ **RDBMS** is the basis for SQL, and for all modern database systems like:

- ✓ MS SQL Server,
- ✓ IBM DB2,
- ✓ Oracle,
- ✓ MySQL,
- ✓ and Microsoft Access.

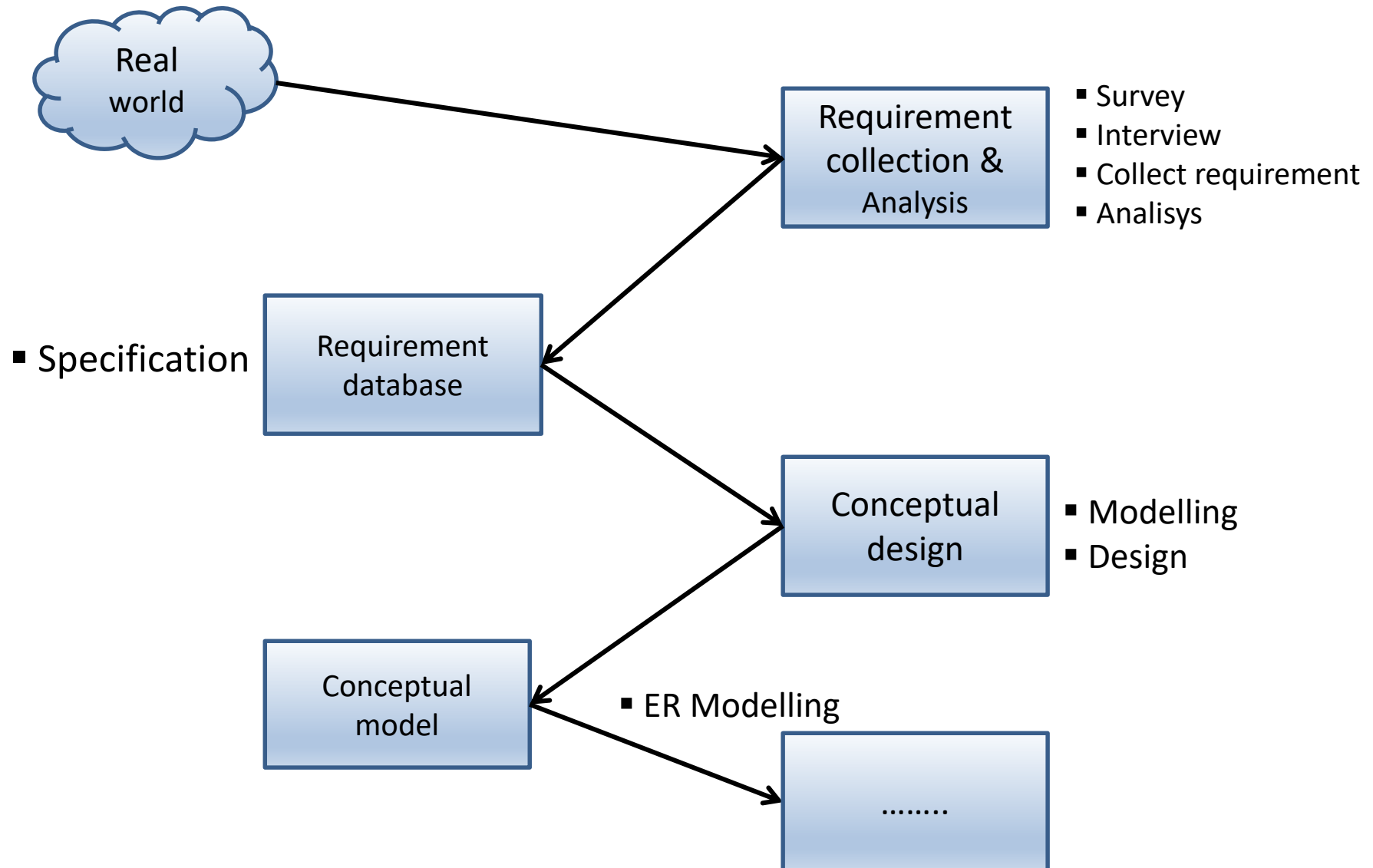
➤ A Relational database management system (RDBMS) is a database management system (DBMS) that is based on the relational model as introduced by E. F. Codd.

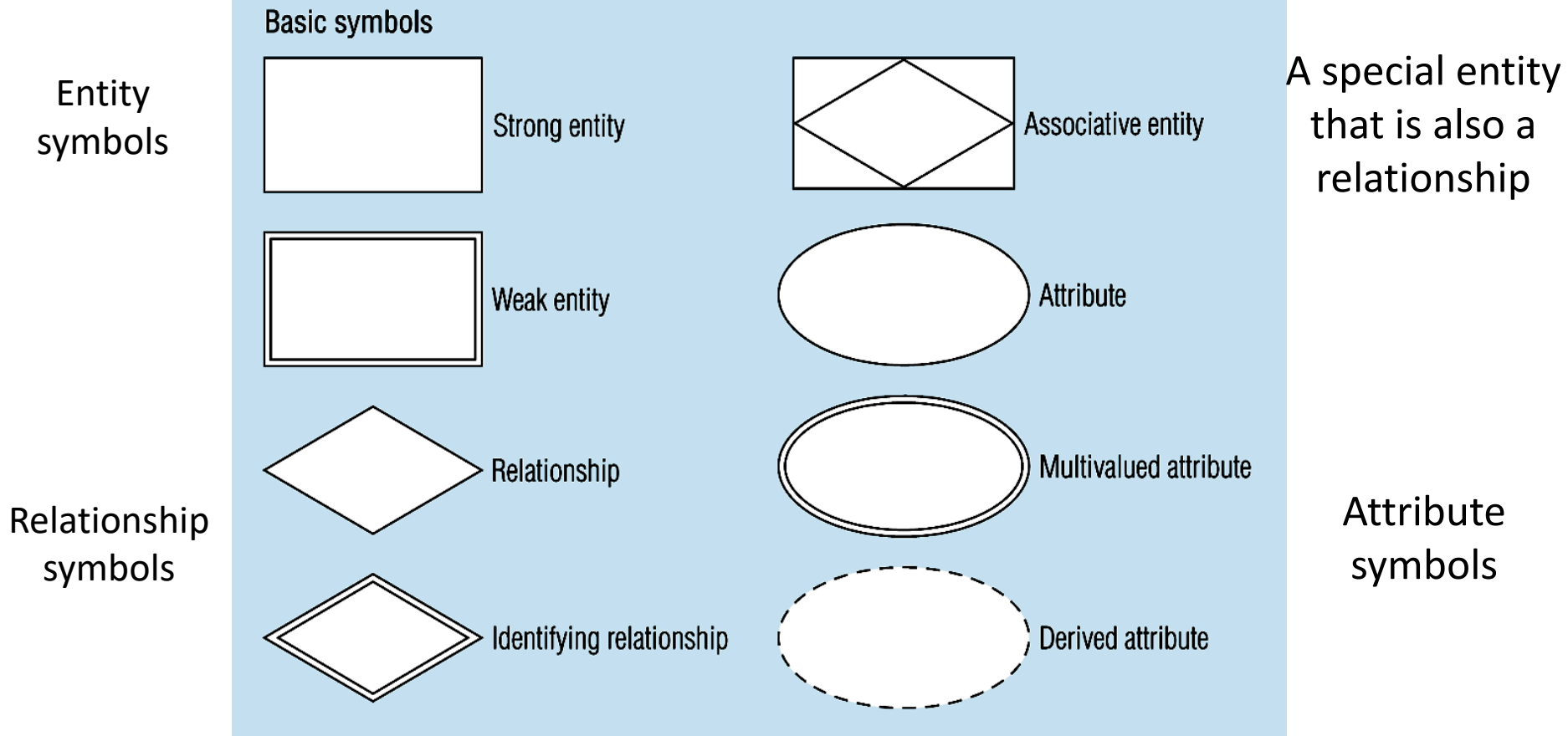
DBMS vs. RDBMS

DBMS	RDBMS
The concepts of relationships is missing in a DBMS. If it exists it is very less.	It is based on the concept Of relationships
Speed of operation is very slow	Speed of operation is very Fast
Hardware and Software requirements are minimum	Hardware and Software requirements are High
Platform used is normally DOS	Platform used can be any DOS, UNIX, VAX, VMS, etc
Uses concept of a file	Uses concept of table
DBMS normally use 3GL	RDBMS normally use a 4GL
Examples are dBase, FOXBASE, etc	Examples are ORACLE, INGRESS, SQL Server 2000 etc

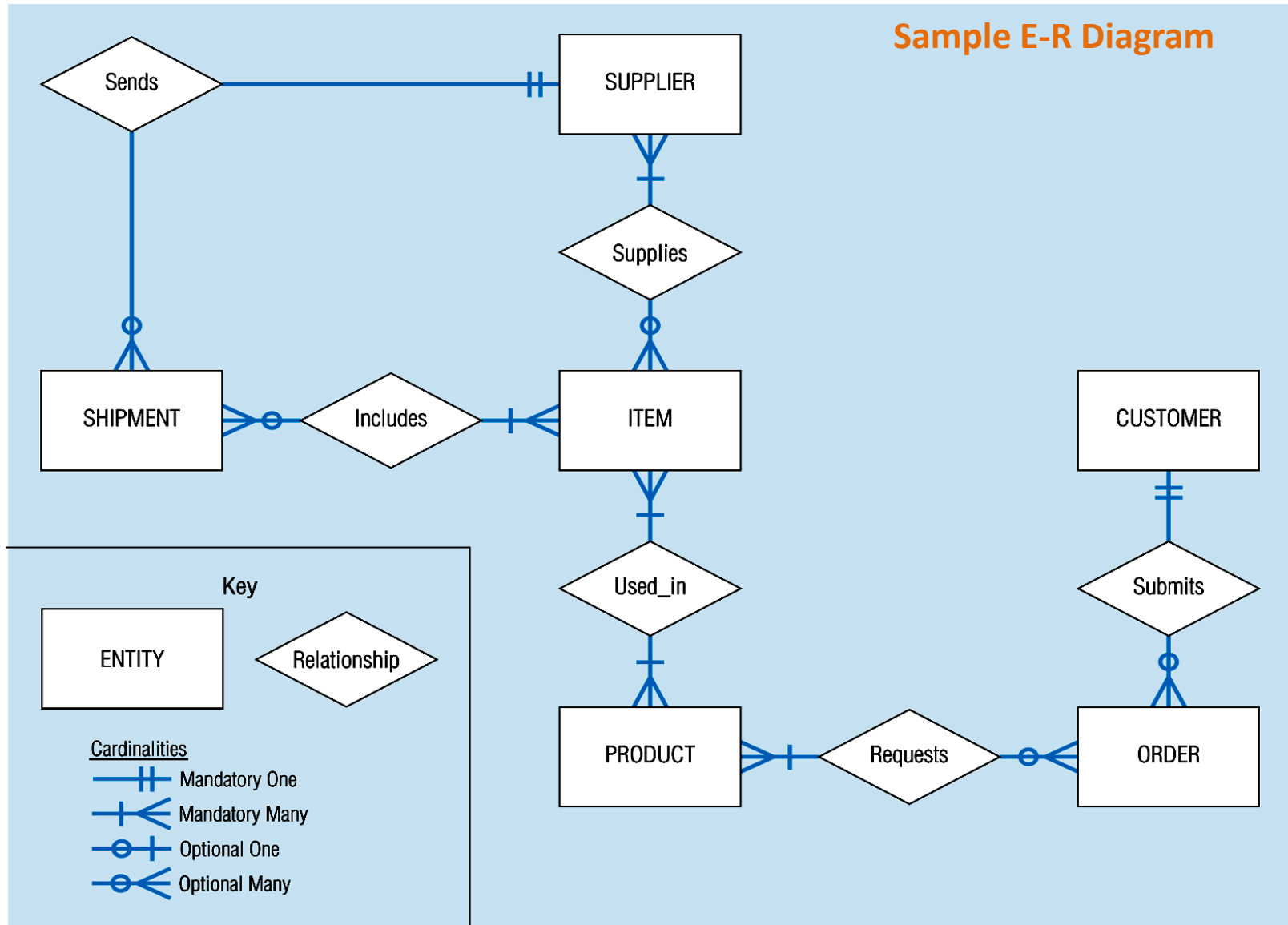
Section 3

ER MODEL

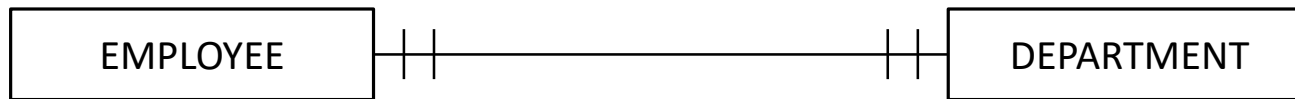
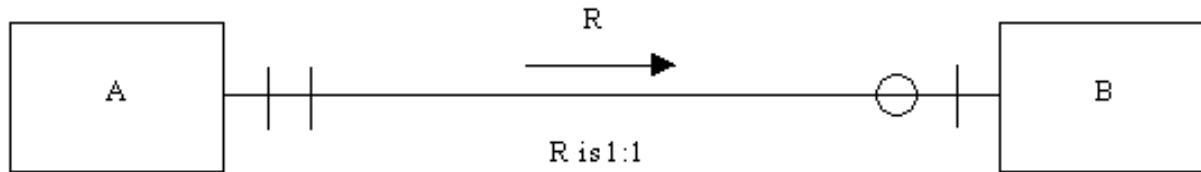




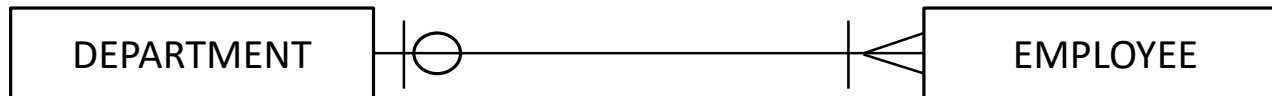
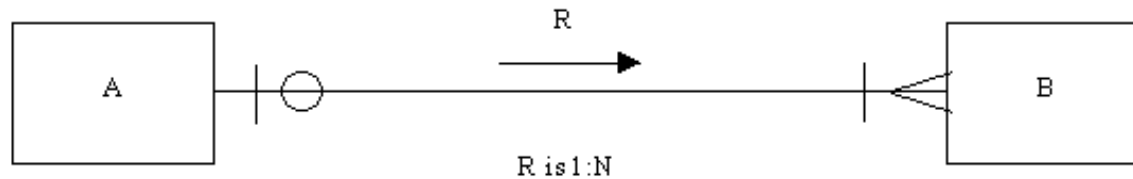
Sample E-R Diagram



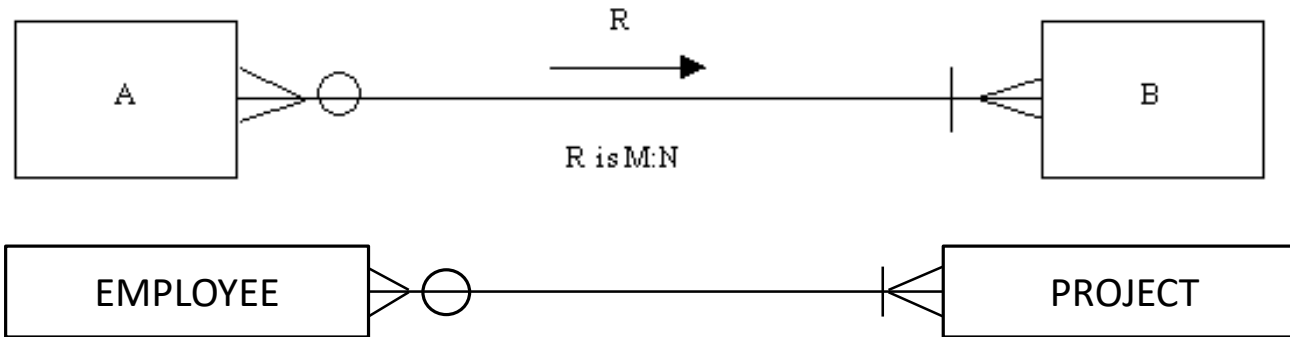
➤ One – to – one:



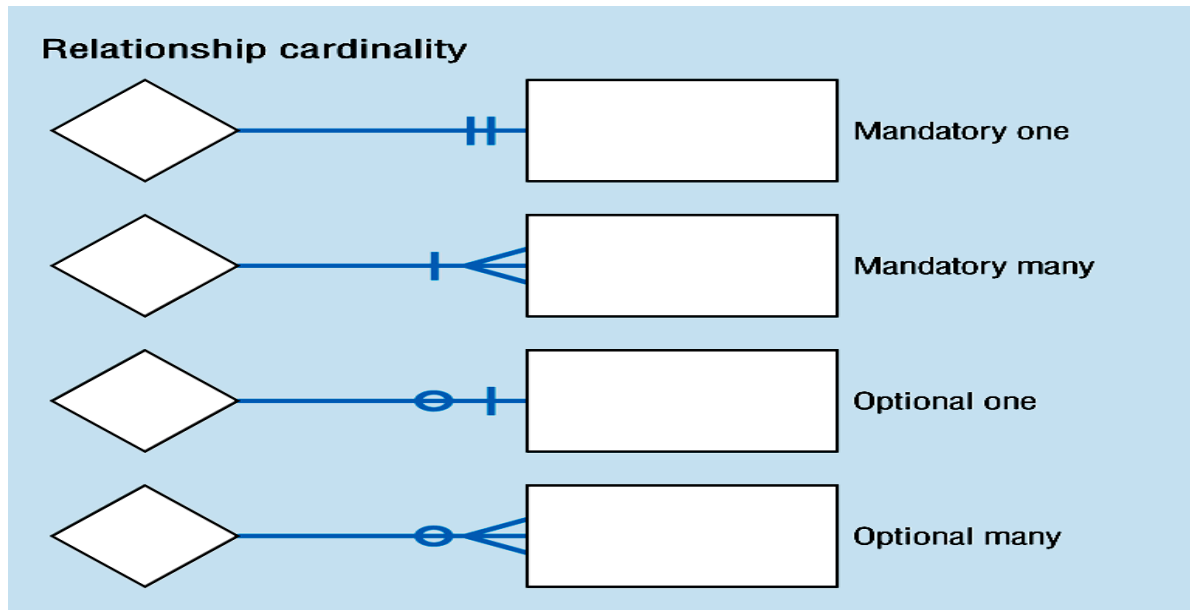
➤ One – to – many:

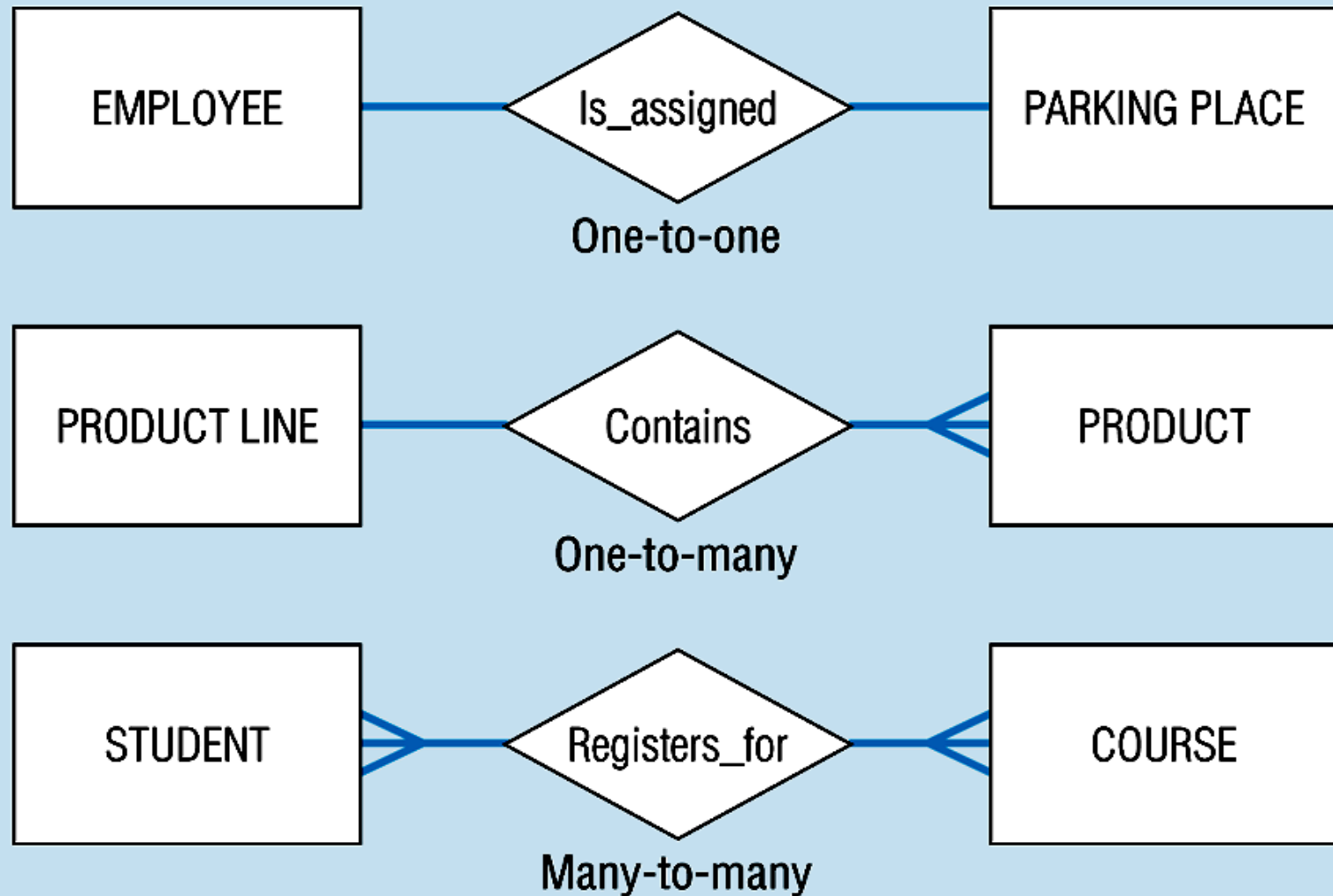


➤ Many – to – many:



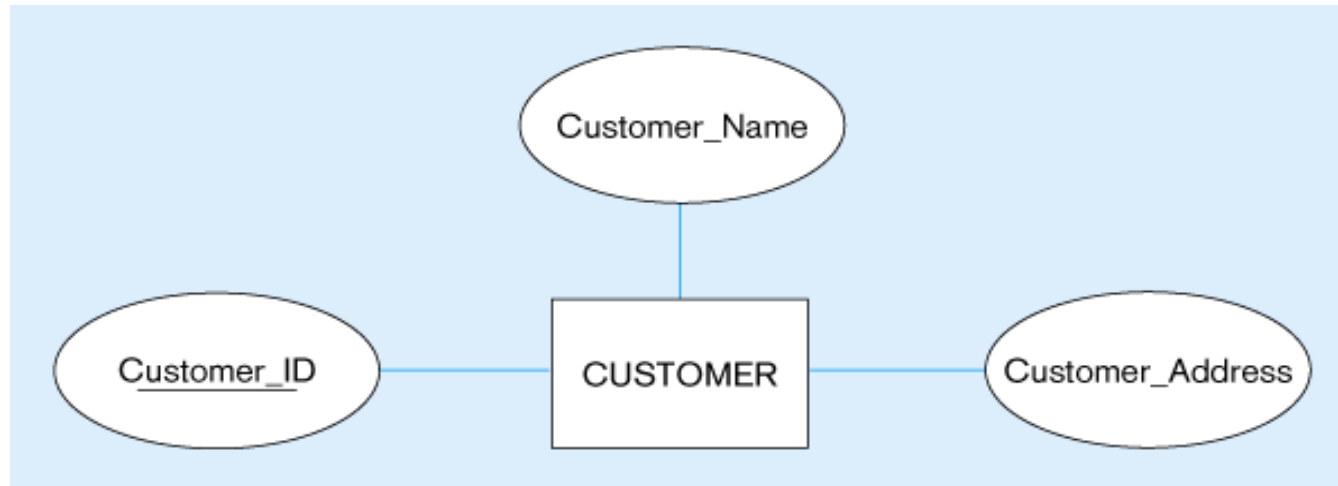
❖ In which:



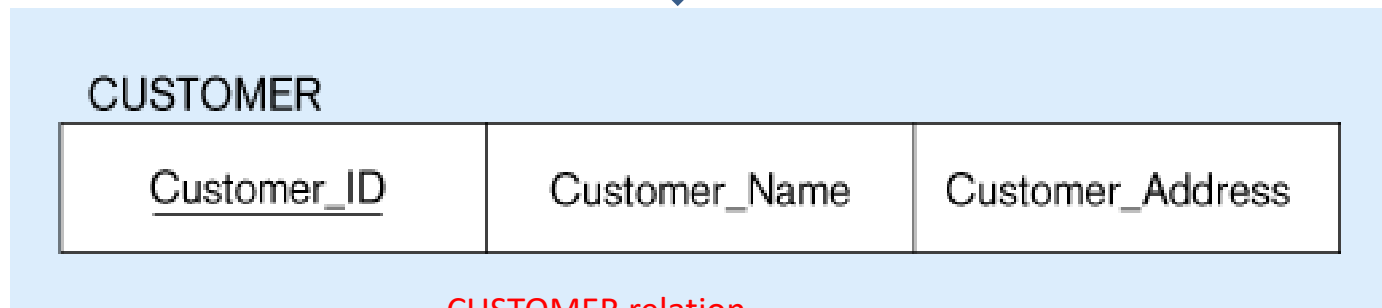


Converting ER Model to relational schema

Rule 1 - Convert entity type with simple attributes



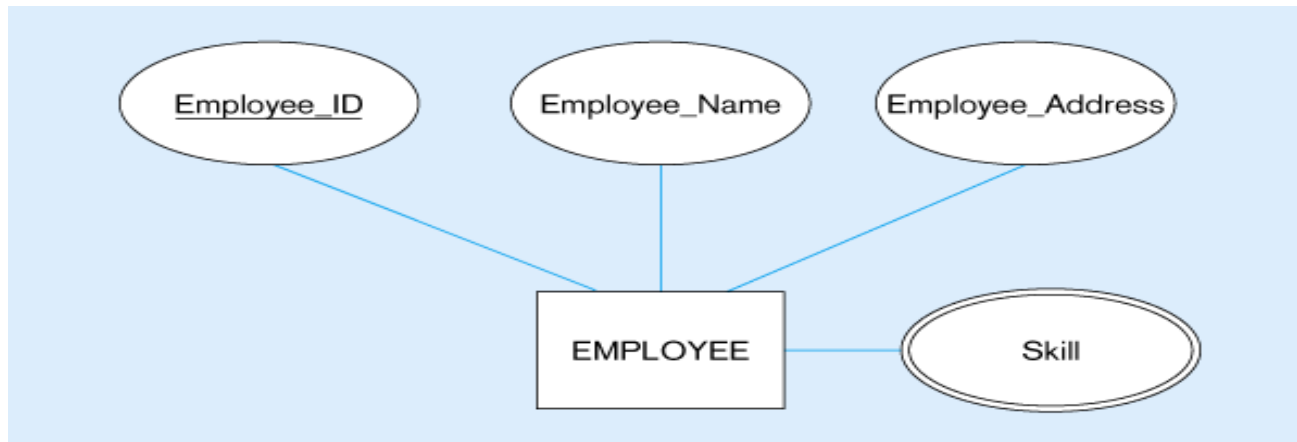
CUSTOMER entity type with simple attributes



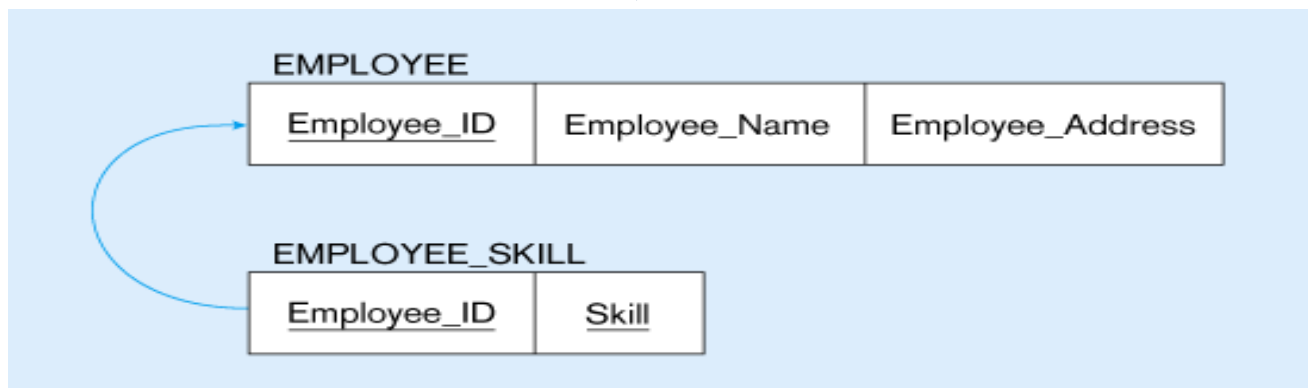
CUSTOMER relation

Converting ER Model to relational schema

Rule 2 - Convert Multivalued attribute



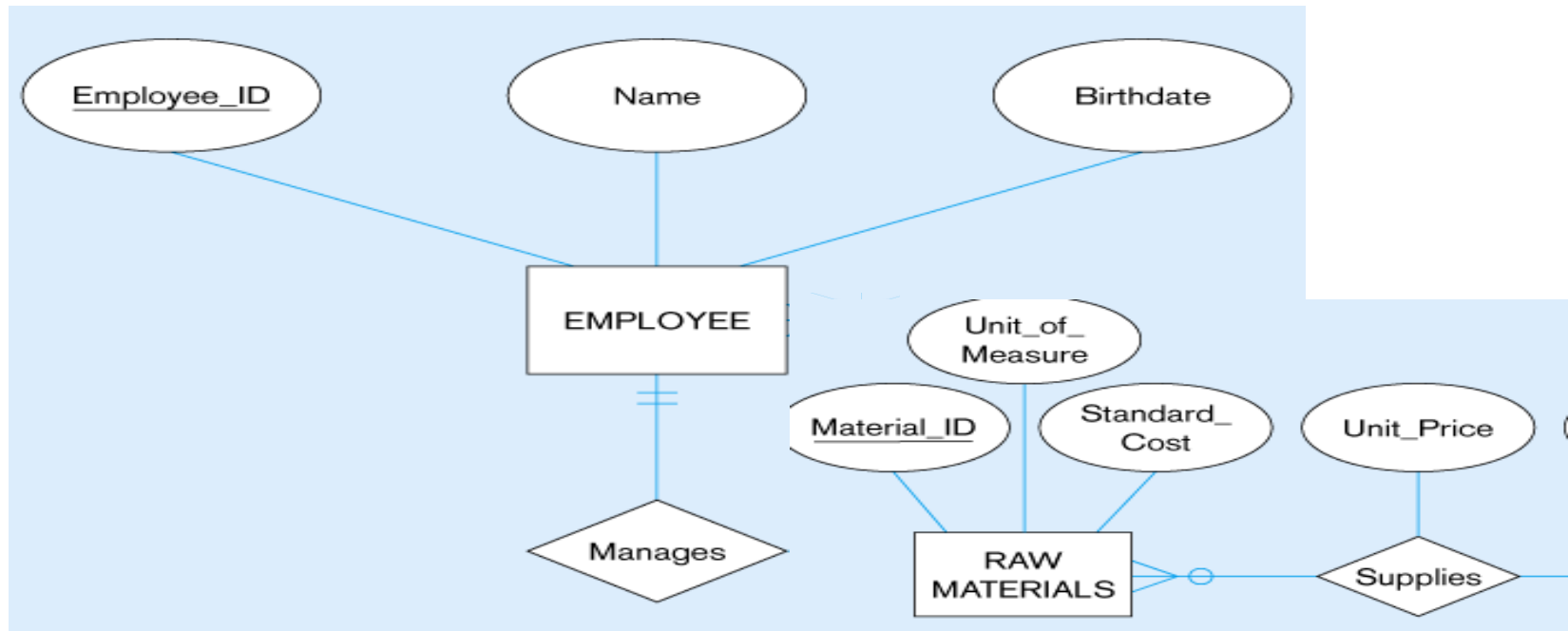
Multivalued attribute becomes a separate relation with foreign key



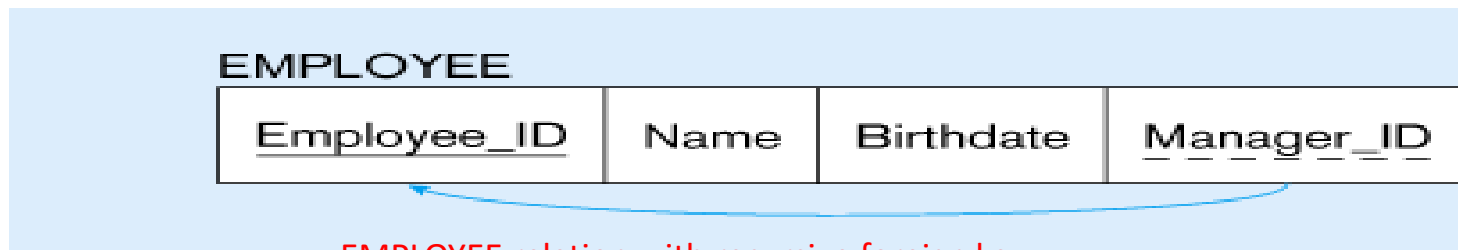
1-to-many relationship between original entity and new relation

Converting ER Model to relational schema

Rule 3 - Convert Unary relationship one to one



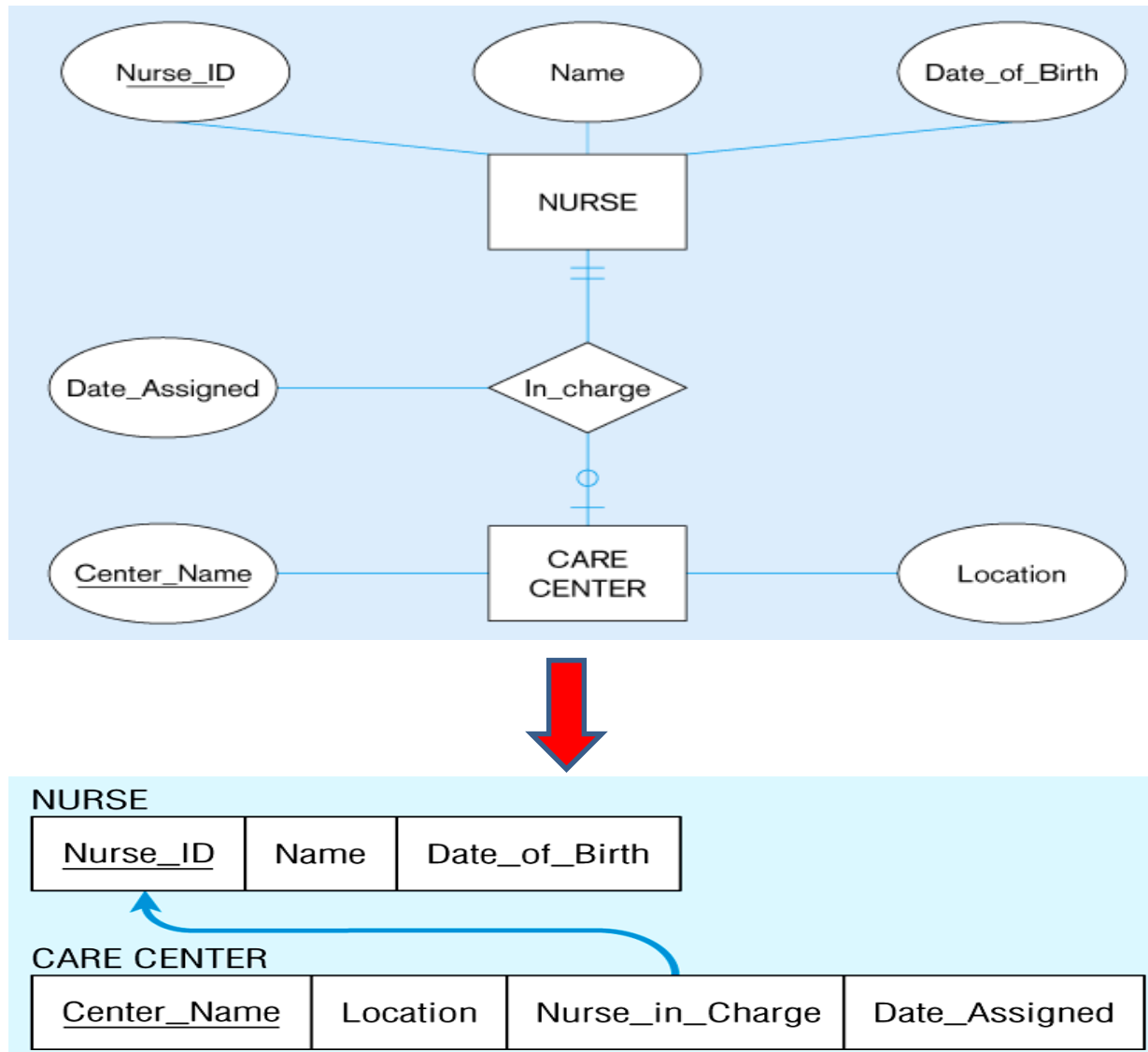
EMPLOYEE entity with Manages relationship



EMPLOYEE relation with recursive foreign key

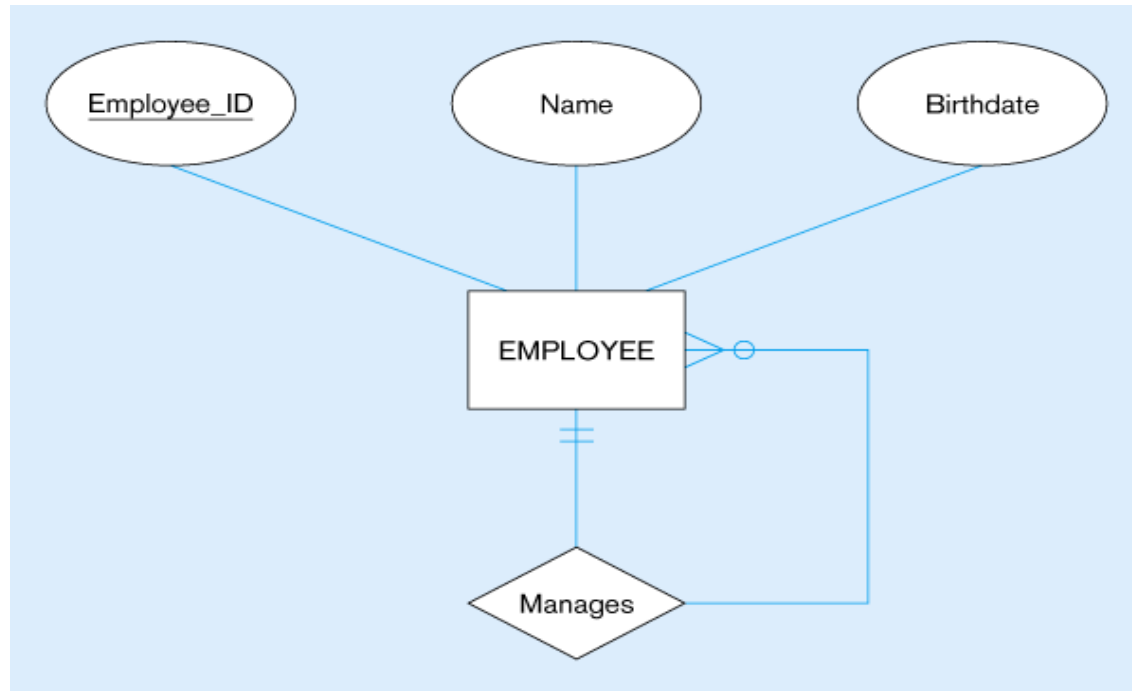
Converting ER Model to relational schema

Rule 4 – Convert binary relationship one to one

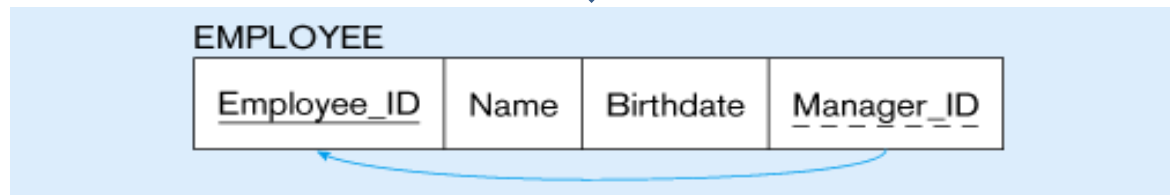


Converting ER Model to relational schema

Rule 5 – Convert Unary relationship one to many



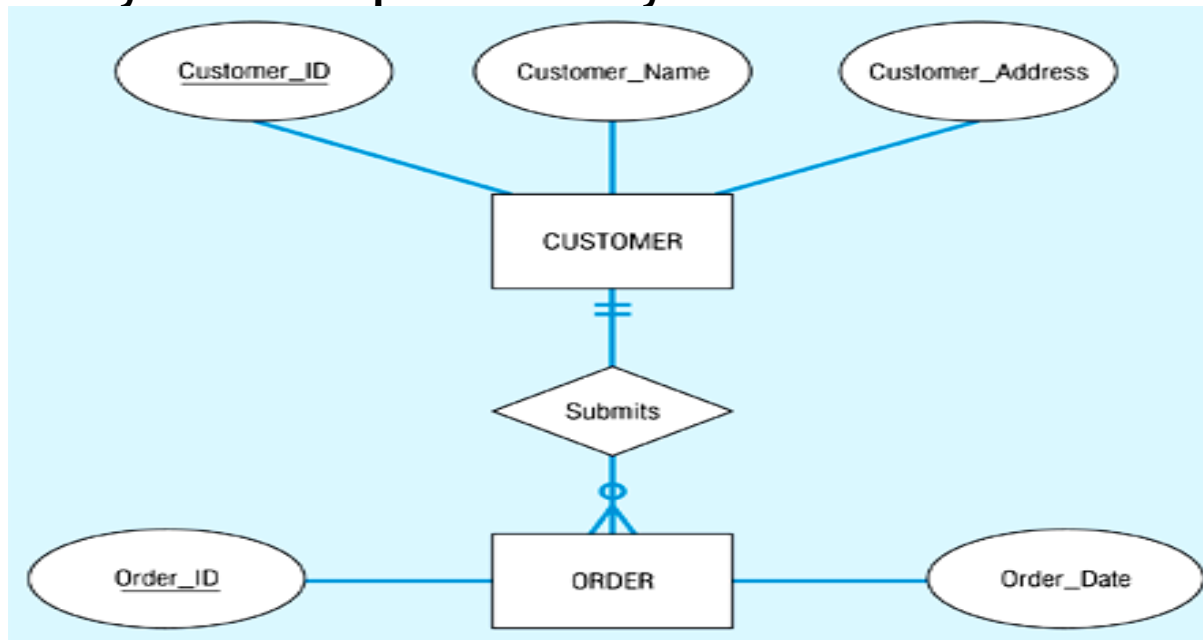
EMPLOYEE entity with Manages relationship



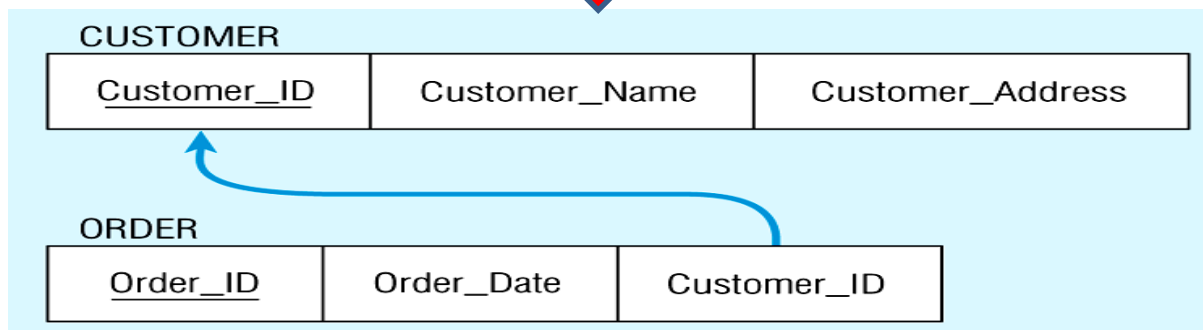
EMPLOYEE relation with recursive foreign key

Converting ER Model to relational schema

Rule 6 – Convert Binary relationship one to many



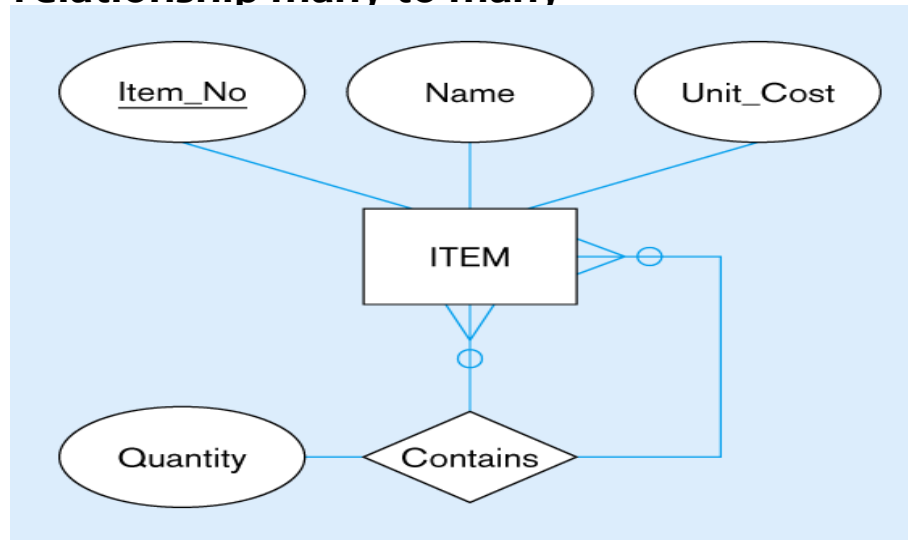
Note the mandatory one



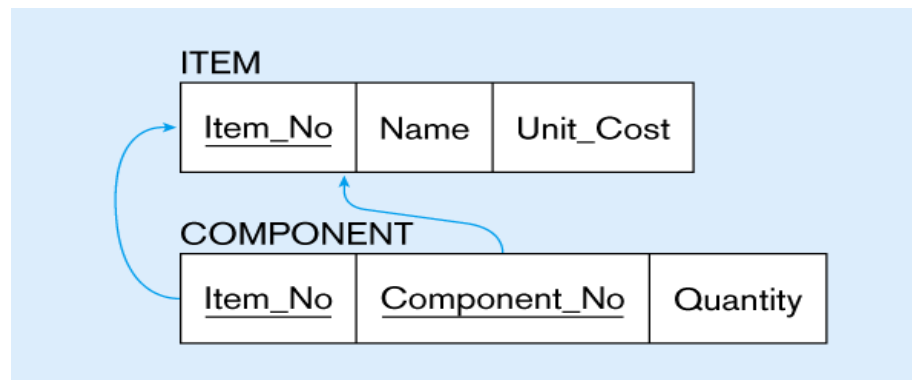
Again, no null value in the foreign key...this is because of the mandatory minimum cardinality

Converting ER Model to relational schema

Rule 7 – Convert Unary relationship many to many



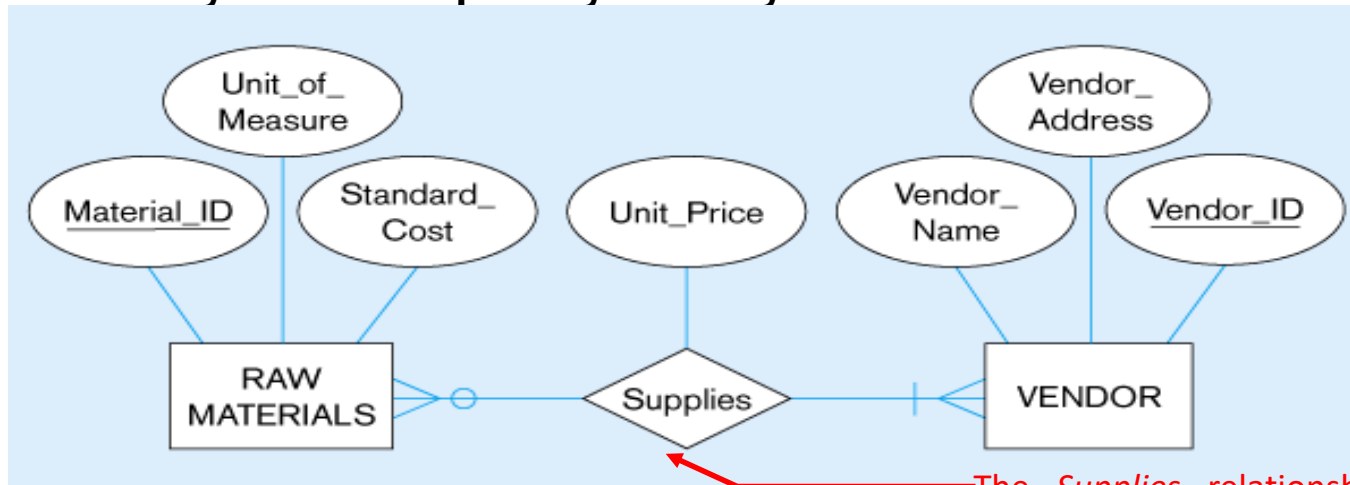
Bill-of-materials relationships (M:N)



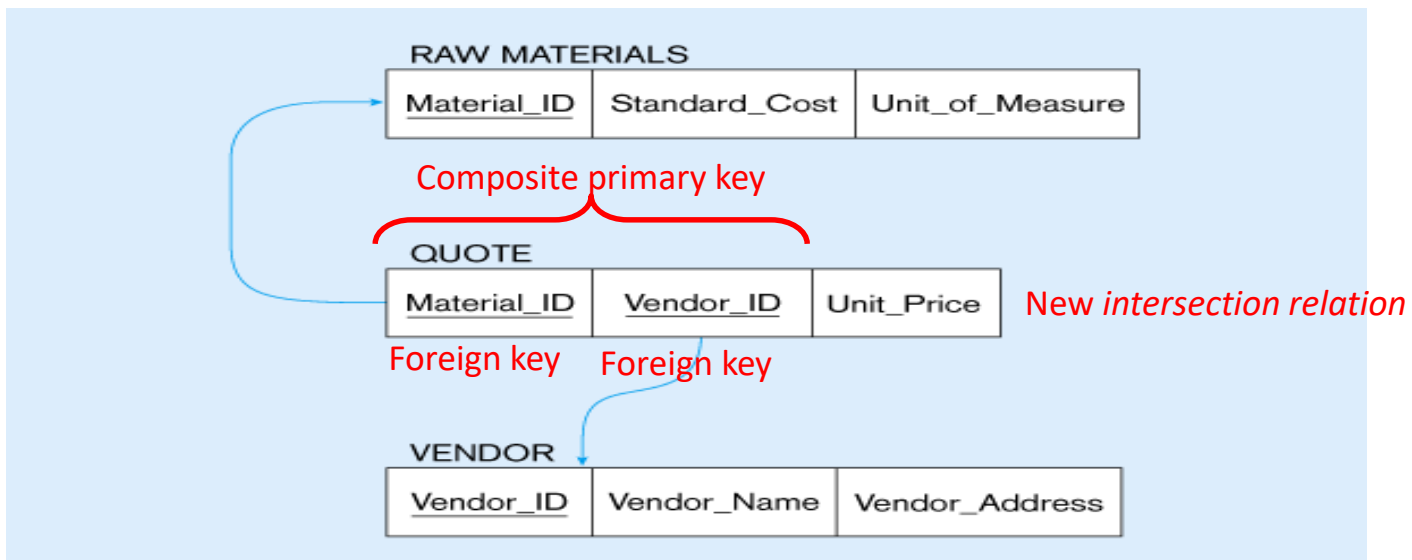
ITEM and COMPONENT relations

Converting ER Model to relational schema

Rule 8 – Convert Binary relationship many to many

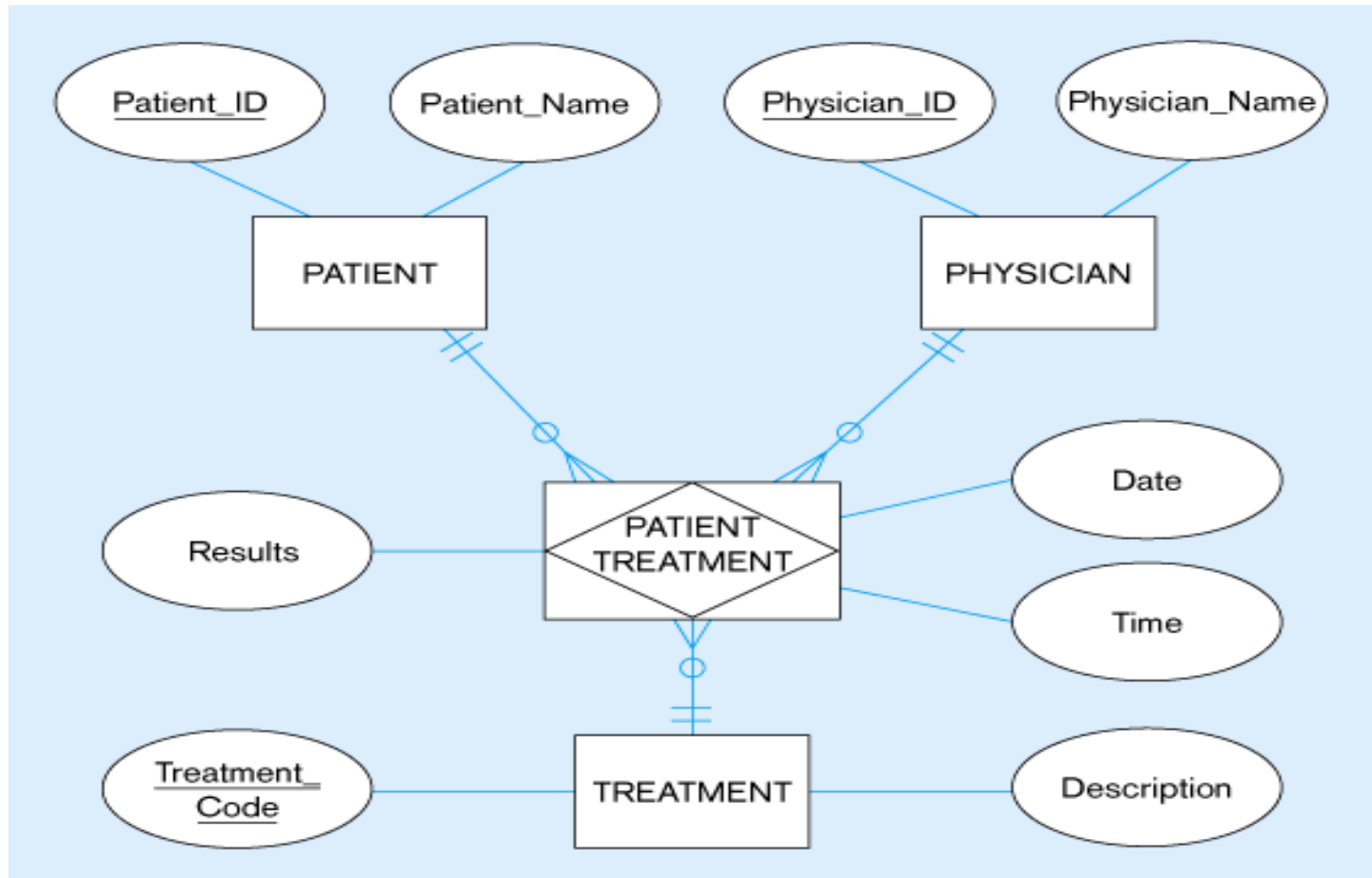


The *Supplies* relationship will need to become a separate relation



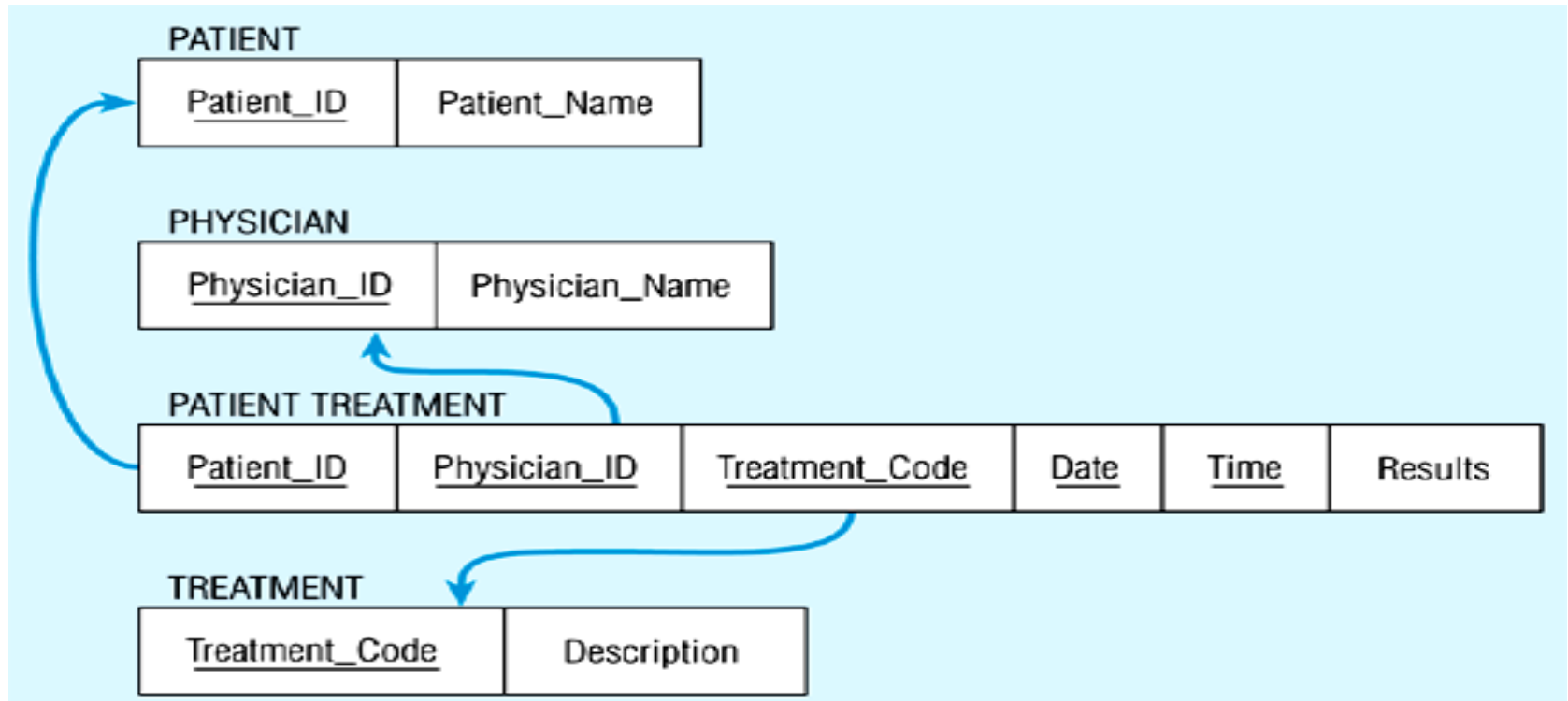
Converting ER Model to relational schema

Another - Convert Ternary relationship



Converting ER Model to relational schema

Another- Convert Ternary relationship (2)



✓ SQL Overview

- SQL, SQL Process, SQL Command

✓ The Relational Database

- Table, Field, Record, Schema

✓ RDBMS Concepts

- RDBMS, RDBMS vs DBMS

✓ ER Model

- Design Process, **Notation**, Converting ER Model to relational schema



Thank you

