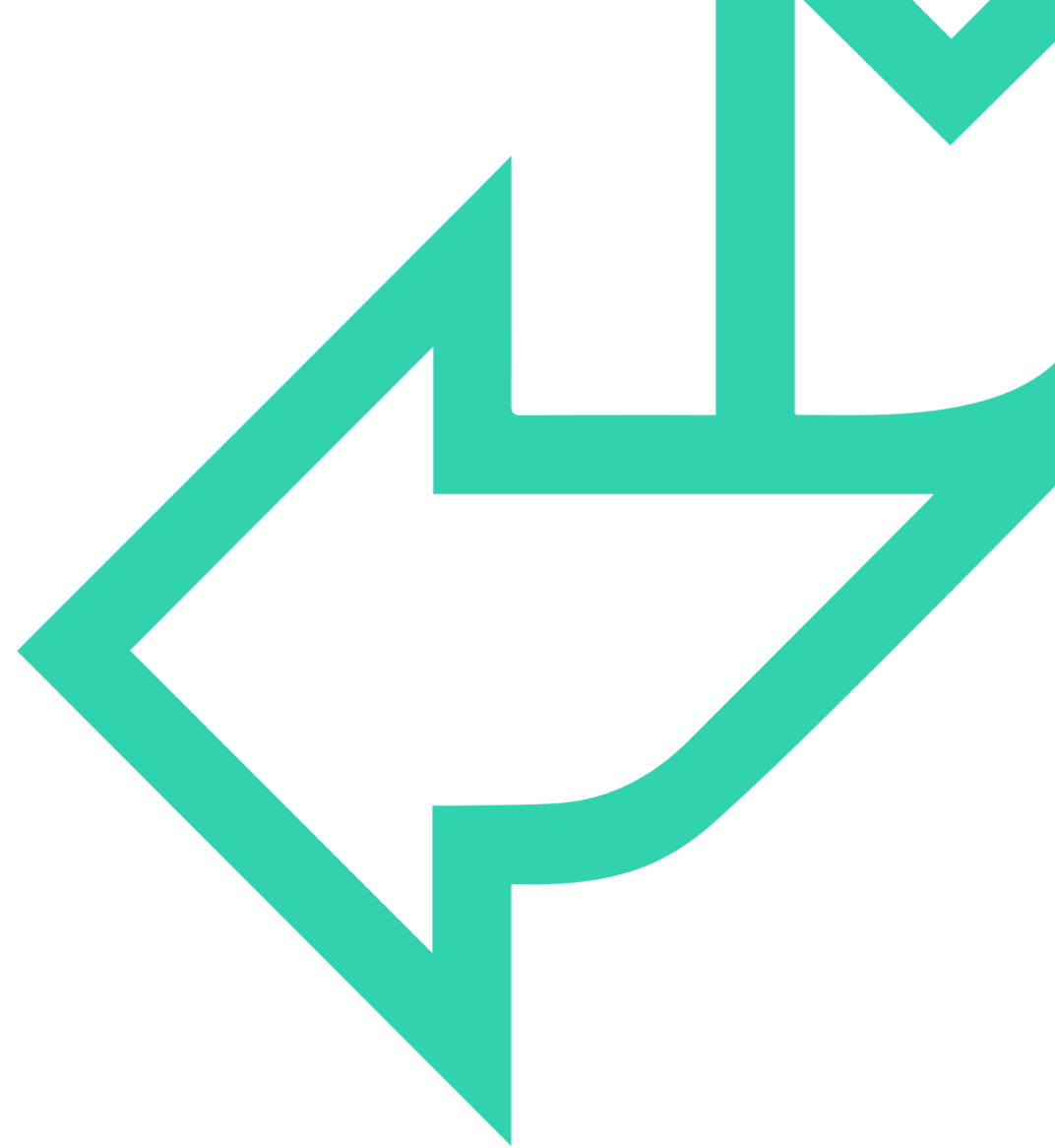




Databases and SQL

Tutor: Rob Menzies
Email: rob.menzies@qa.com

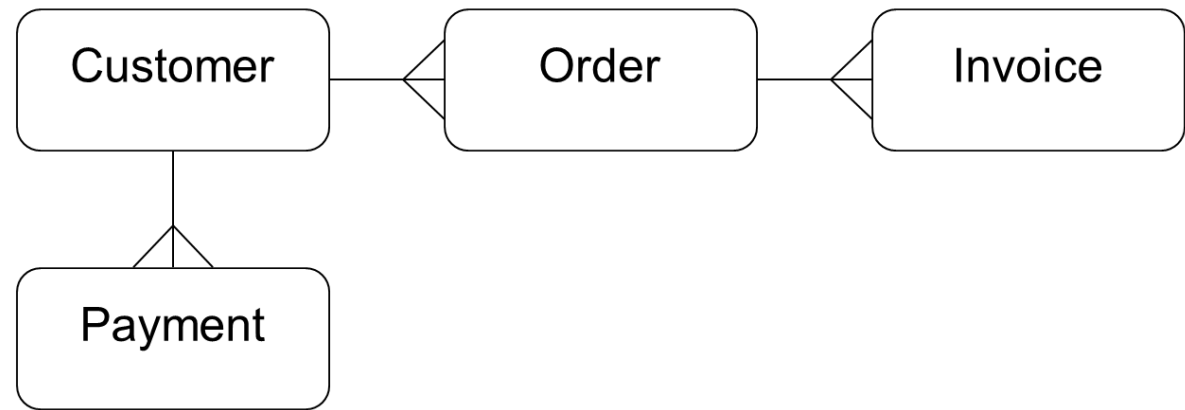




Entity Relationships



ENTITY RELATIONSHIP DIAGRAMS (ERD)





AN ENTITY



Invoice



RELATIONSHIPS

Relationships

Employees work in a department

Lawyers advise clients

A truck is a type of vehicle



BENEFITS OF E-R MODELLING

Using the client requirements

- Start with Entities
- Then add the relationships
- Specify the attributes

Iterate



Simplified Model

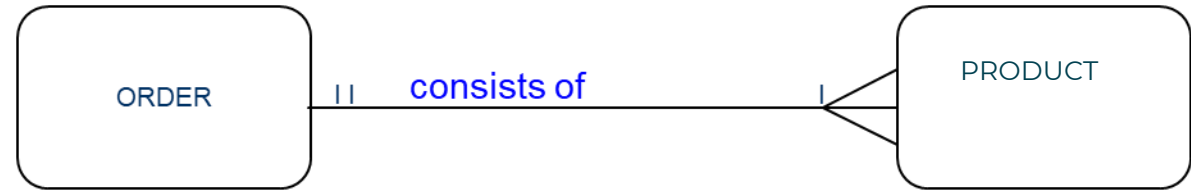
Storage Independence

**Independent of
Access Method**

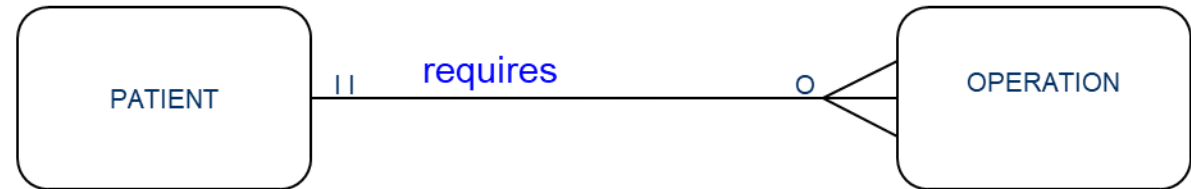
**Readable
by Analyst and End User**

OPTIONALITY AND NAMING RELATIONSHIPS

Mandatory:



Conditional:

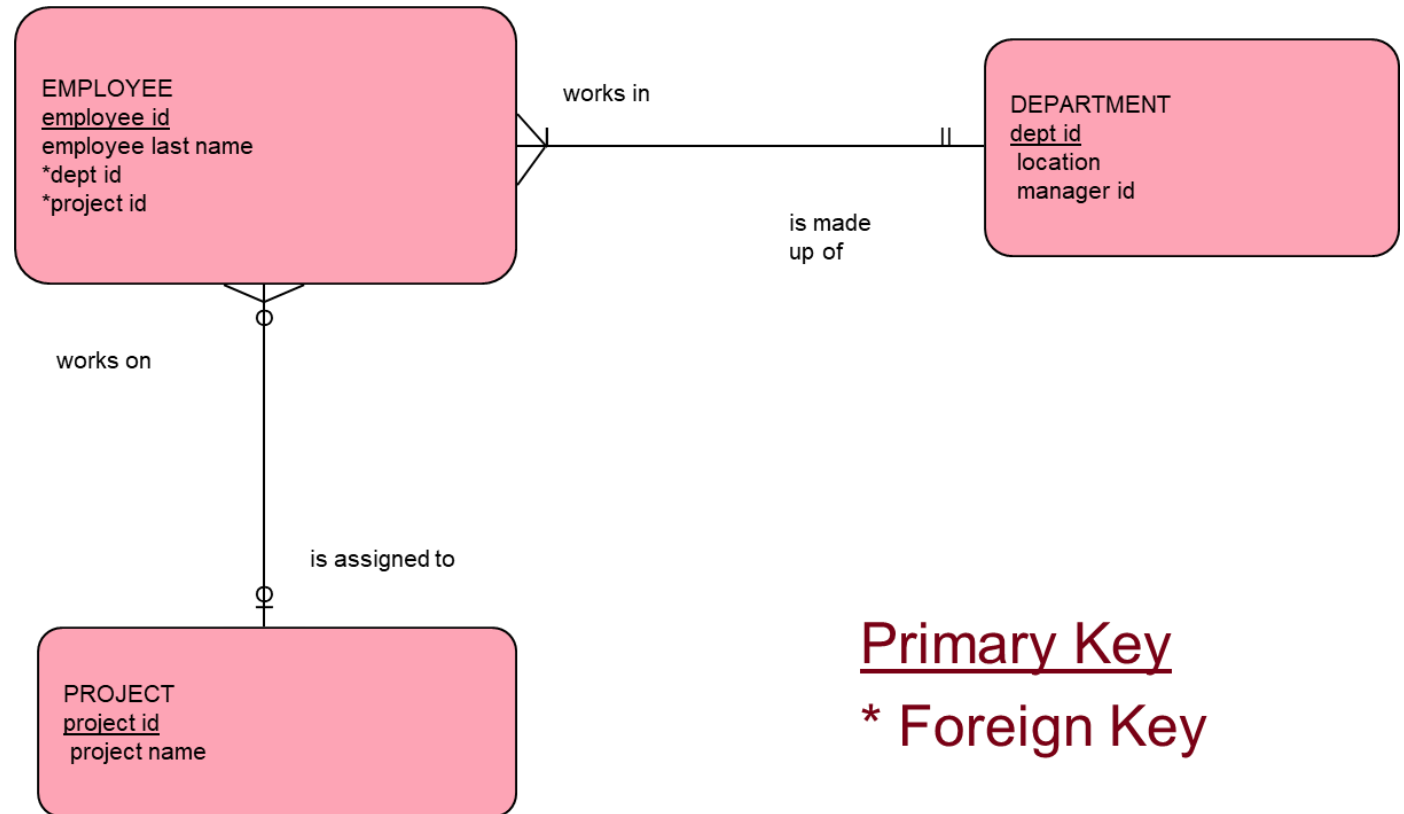


Optional:





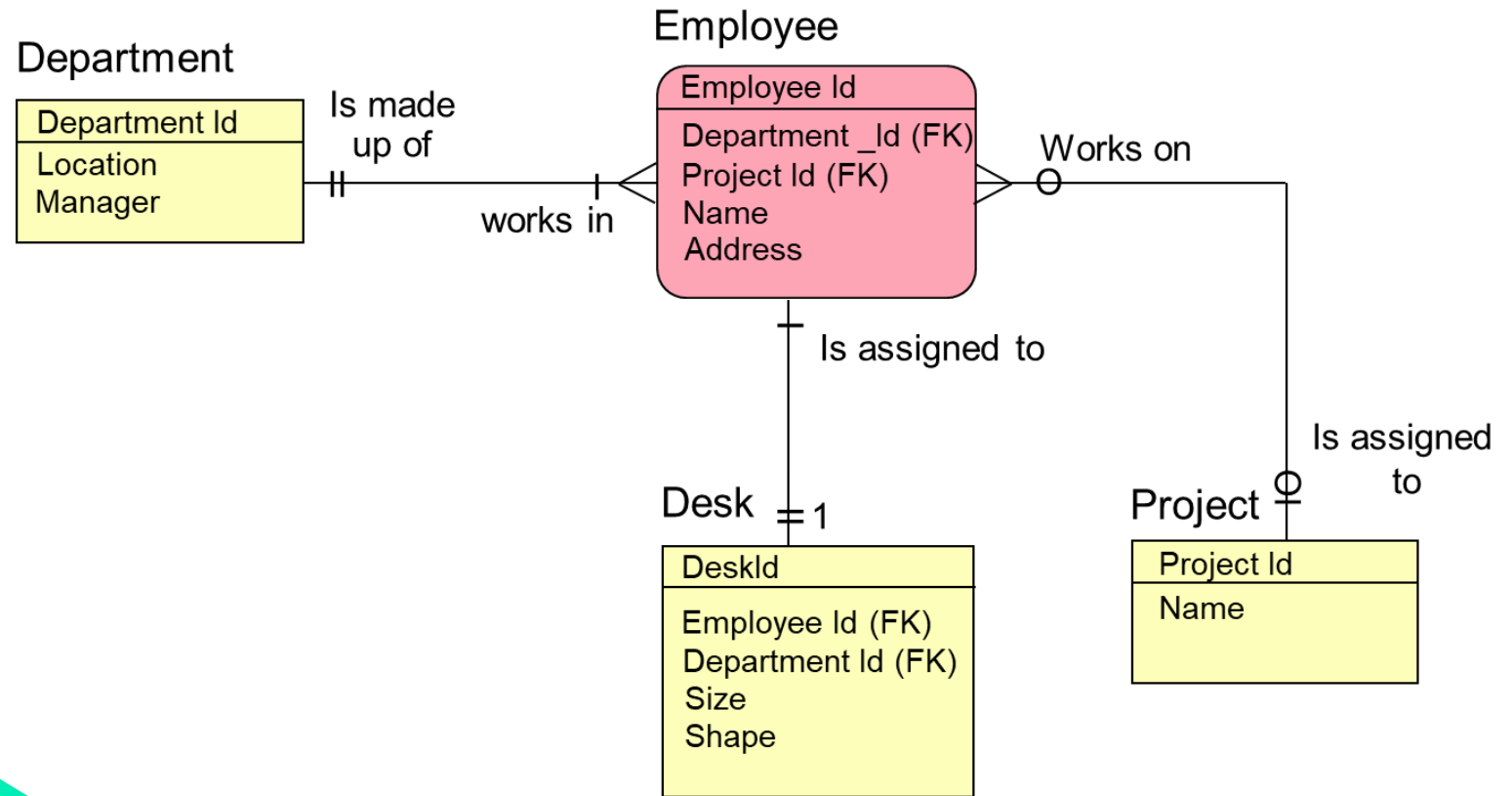
IE NOTATION: KEYS



Primary Key
* Foreign Key



AN EXAMPLE





APPROACH

1. Identify candidate entities
2. Identify relationships between candidate entities
3. Draw data model
4. Review and refine

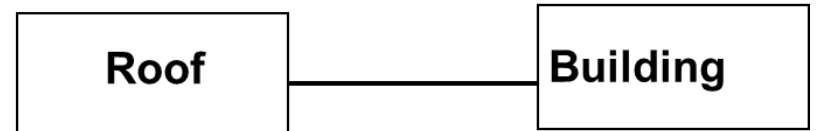




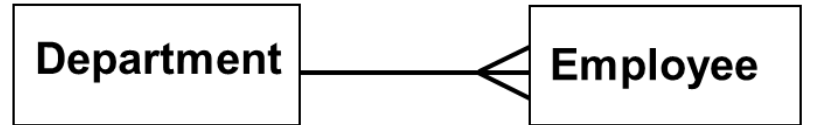
ONE TO ONE AND ONE TO MANY

SE crow's-foot (Bachman) Diagrams

“One to One”



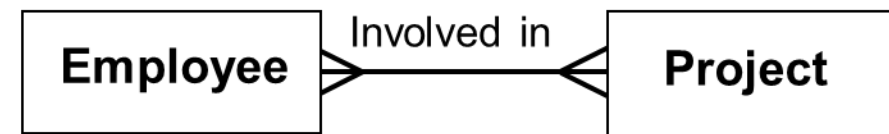
“One to Many”





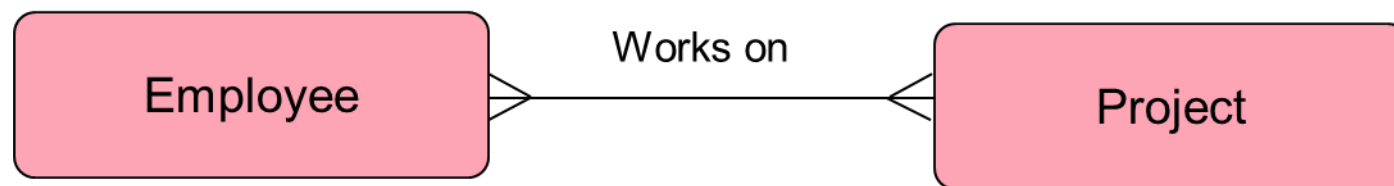
MANY TO MANY

“Many to Many”



THE MANY-TO-MANY PROBLEM

How can we store this data?

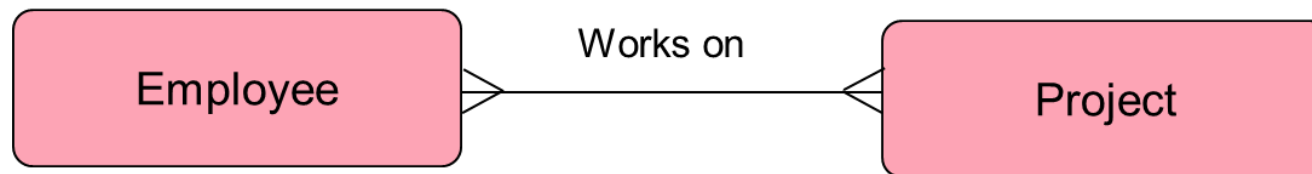


Employee	Project
E1	A, B, C
E2	D, E
E3	A, E
E4	B, E
E5	A, C, E
E6	D



THE MANY-TO-MANY PROBLEM (CONT.)

How can we store this data?



Perhaps we should store it like this?

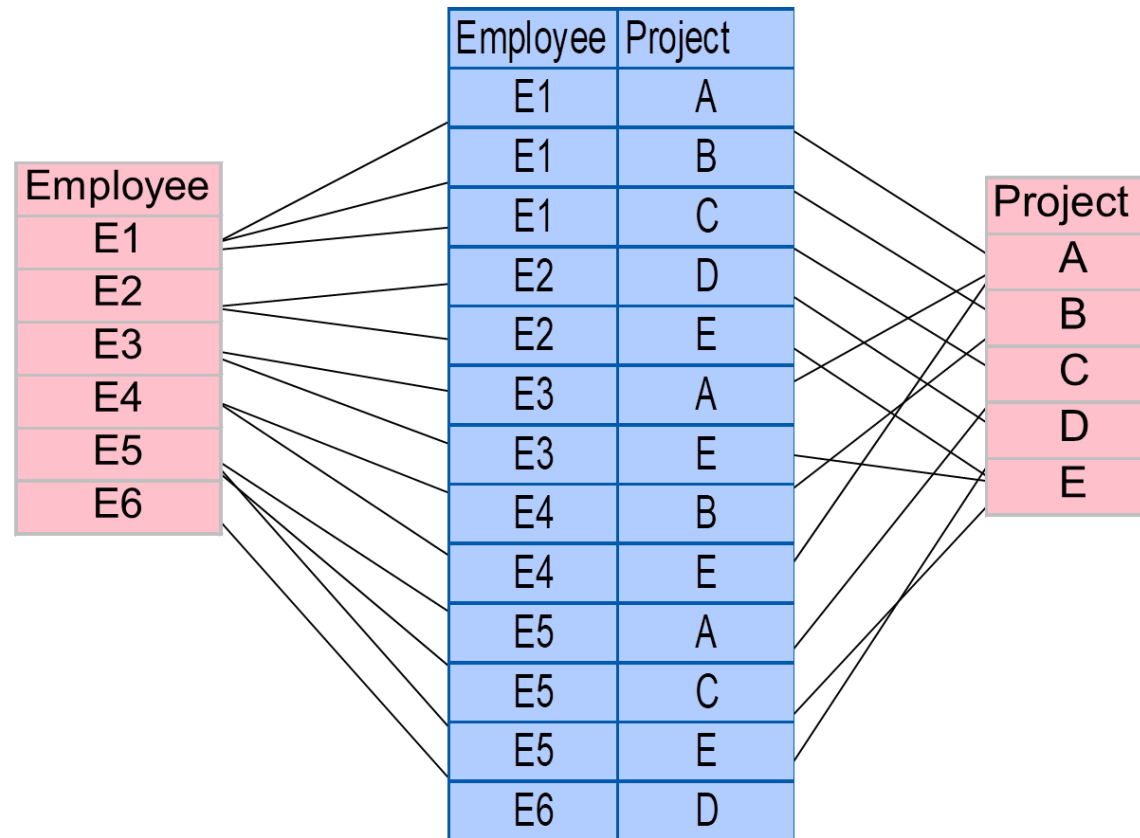
Project	Employee
A	E1,E3,E5
B	E1,E4
C	E1,E5
D	E2,E6
E	E2,E3,E4,E5



It depends what questions we wish to ask

THE MANY-TO-MANY SOLUTION

How about this?





THE MANY-TO-MANY PROBLEM EXAMPLE 2

How can we store this data?

Student ID	Class ID	Student Name
1	3, 5, 9	John
2	1, 4, 5, 9	Debbie

Perhaps we should store it like this?

Student ID	Class ID 1	Class ID 2	Class ID 3	Student Name
1	3	5	9	John
2	1	4	5	Debbie

Both of these will cause either problems of data redundancy or will simply be confusing.

Even if we try a one to many there will be repeated (redundant data) in one of the tables

THE MANY-TO-MANY SOLUTION

How about this?

Student ID	Student name
1	John
2	Debbie

Student ID	Class ID
1	3
1	5
1	9
2	1
2	4
2	5
2	9

Class ID	Class name
1	English
2	Maths
3	Spanish
4	Biology
5	Science
6	Programming
7	Law
8	Commerce
9	Physical Education

We use a joining or bridging table to avoid many to many relationships now we have no data redundancy



MANY TO MANY RELATIONSHIPS EXAMPLE 2



To which entity do you assign the attribute “quantity-on-hand”?

If you imagine we have 10 warehouses and the total quantity of parts we have in stock is divided amongst these warehouses, how does any individual warehouse know how many parts are available at any time?

MANY TO MANY RELATIONSHIPS EXAMPLE 2



To which entity do you assign the attribute “quantity-on-hand”?



ATTRIBUTES: Quantity on hand
Re-order Level etc.