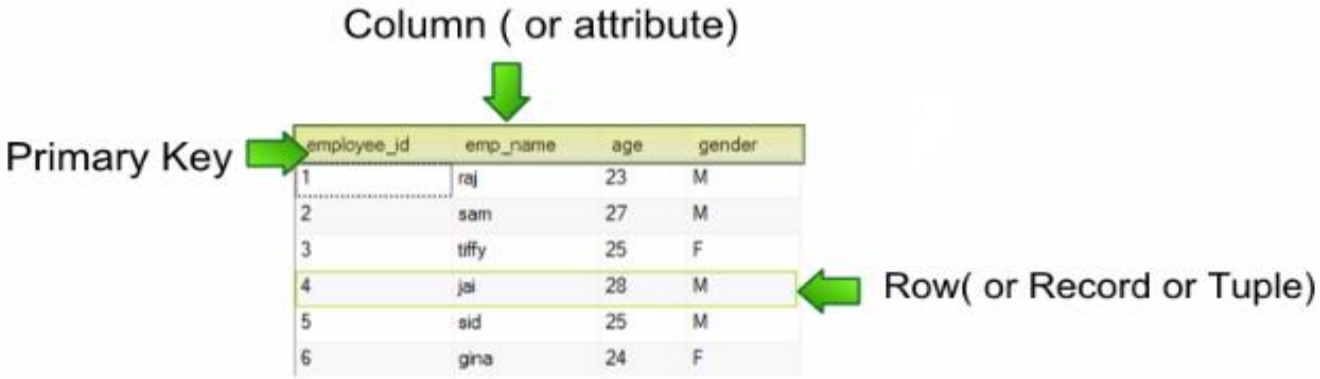
Database Design

Understanding Tables (or)Entity



A database is, an interrelated collection of many different types of tables.

A database management system (DBMS) is a generalized software system for manipulating databases.

Natural Vs Surrogate Keys

Natural Key:

Key is part of overall entity information

Eg: Employee(SSN_Num, name, age)

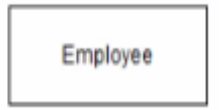
Student(Roll_Num, name, gender)

Surrogate Key:

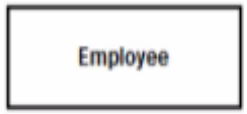
Key is not intimate part of entity information

Eg: Employee(Employee_id, name, age)

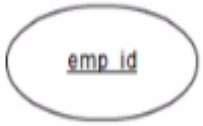
ER Diagram Vs UML Diagram



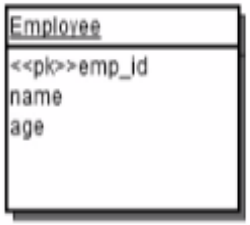
Entity



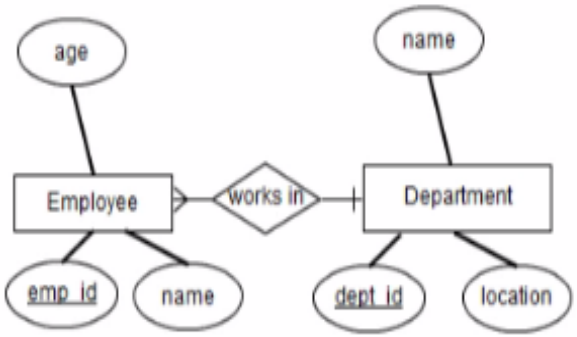
Relationship

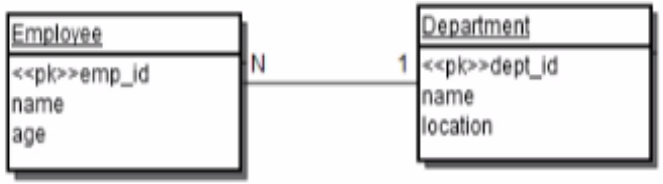


Key Attribute

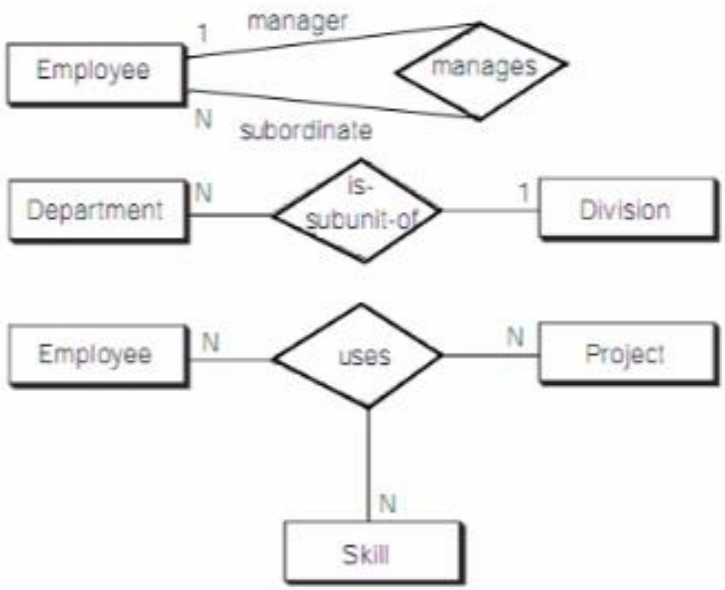


Non Key Attribute





Relationship Degree



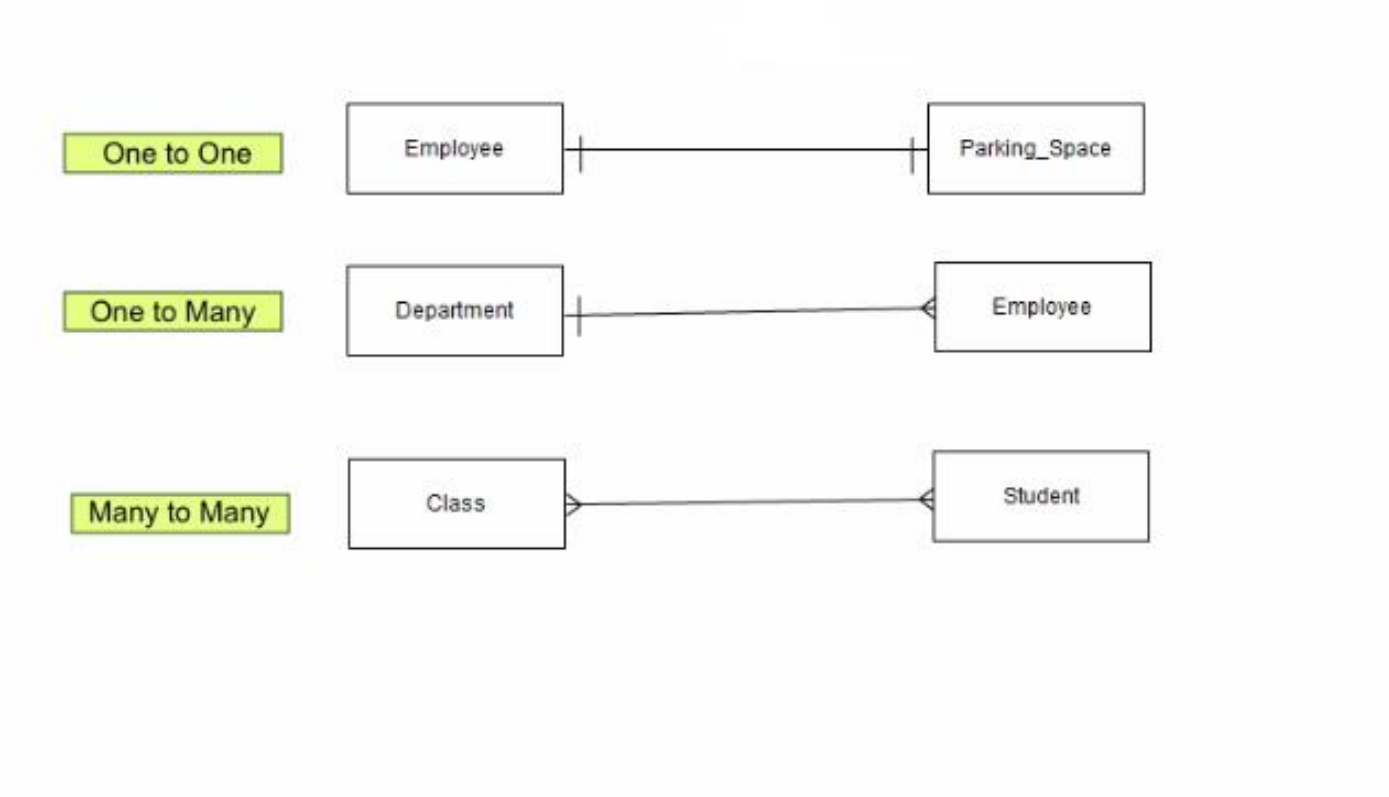
Recursive

Binary

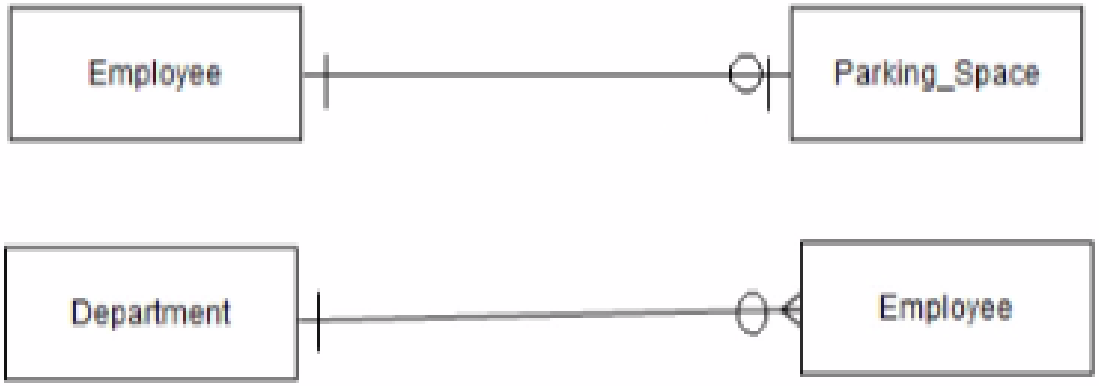
Ternary

n-ary

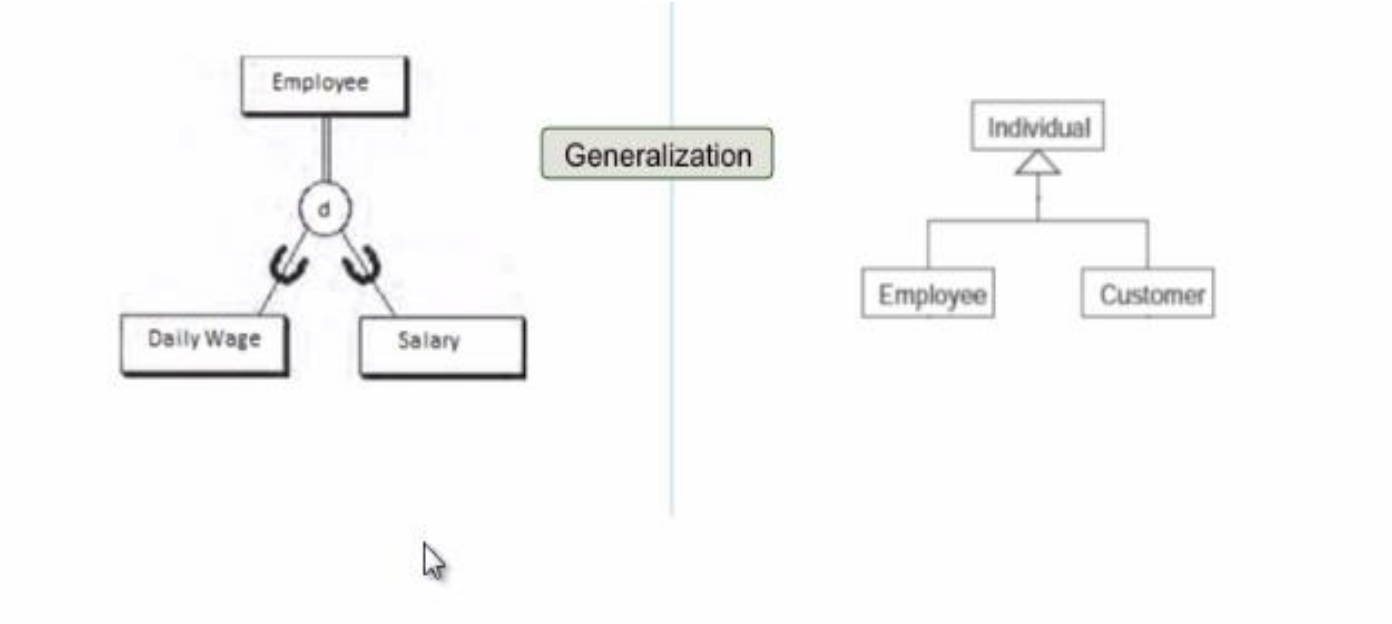
Relationship Multiplicity(type)



Relationship Optionality



ER Diagram Vs UML Diagram



Requirement Specification

We want to computerise our zoo information. We have different categories of animals(reptiles, mammals, birds, fish).

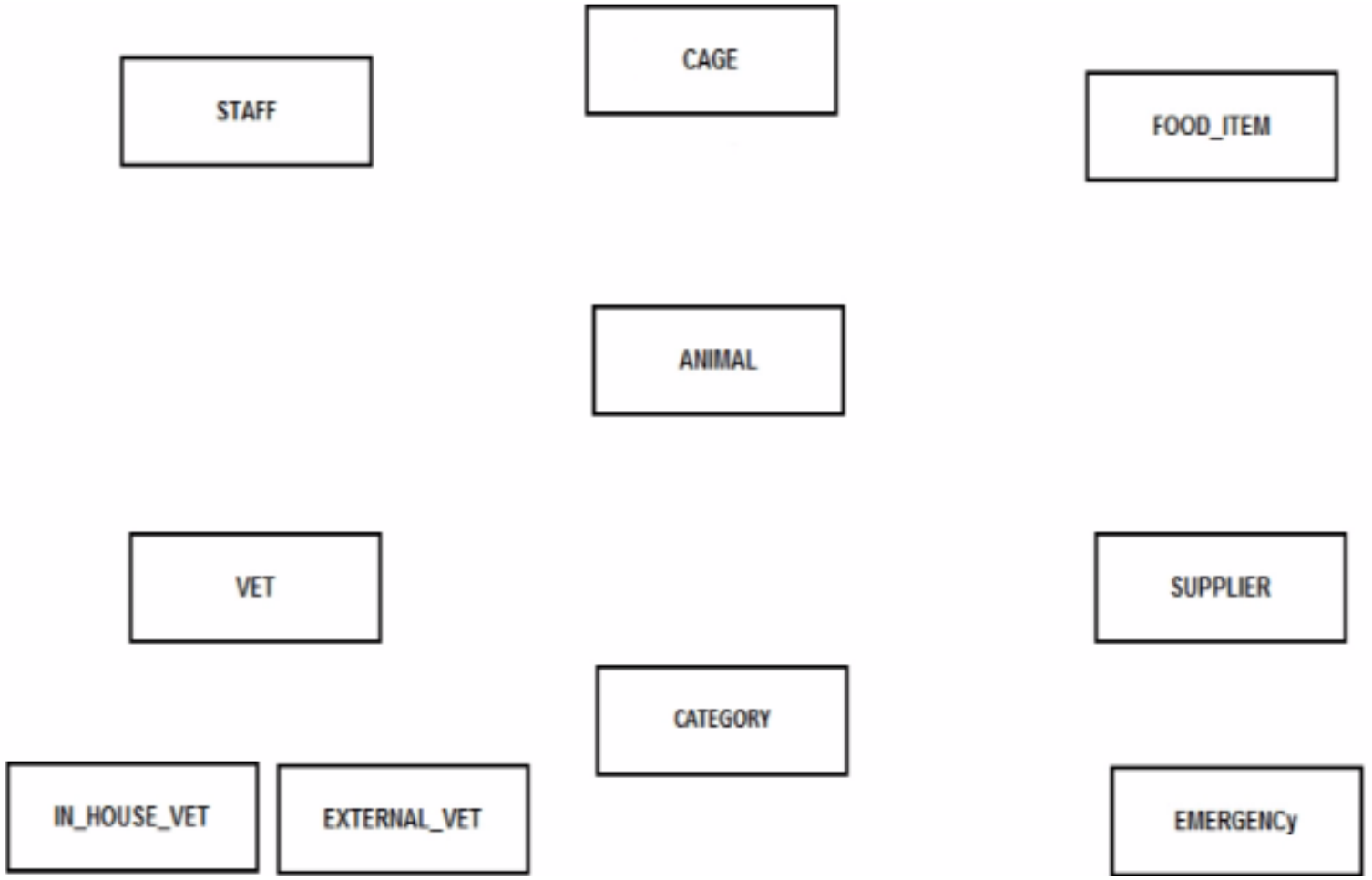
Every animal has a strict dietary schedule of food items. Our staff is supposed to feed them as per this schedule.Each food item has a specific supplier. We maintain a list of suppliers for these food items. We have a inhouse team of vets. However in emergencies and complications, when our inhouse vets cant handle the situation, we do call external vets. We need to maintain a record of emergencies and the amount spent on it(external vets fees, his flying bill, cost spent on stay etc).Each cage housing a particular animal are named(like A3, B5 etc).

Requirement Specification

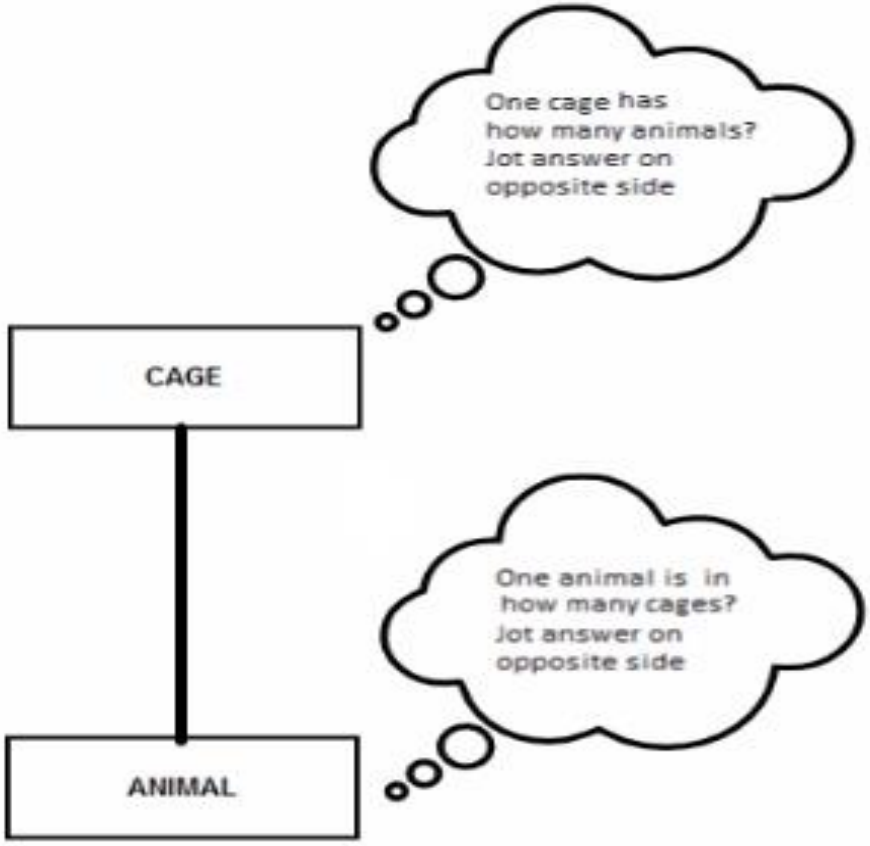
We want to computerise our zoo information. We have different categories of animals(reptiles, mammals, birds, fish).

Every animal has a strict dietary schedule of food items. Our staff is supposed to feed them as per this schedule.Each food item has a specific supplier. We maintain a list of suppliers for these food items. We have a inhouse team of vets. However in emergencies and complications, when our inhouse vets cant handle the situation, we do call external vets. We need to maintain a record of emergencies and the amount spent on it(external vets fees, his flying bill, cost spent on stay etc).Each cage housing a particular animal are named(like A3, B5 etc).

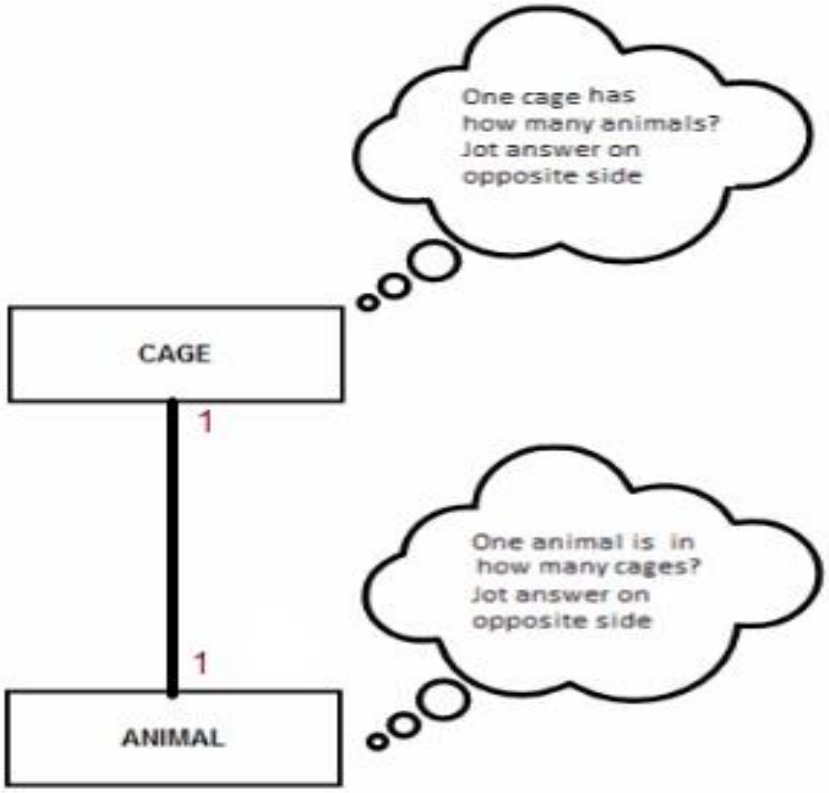
Step 1:Finding Entities



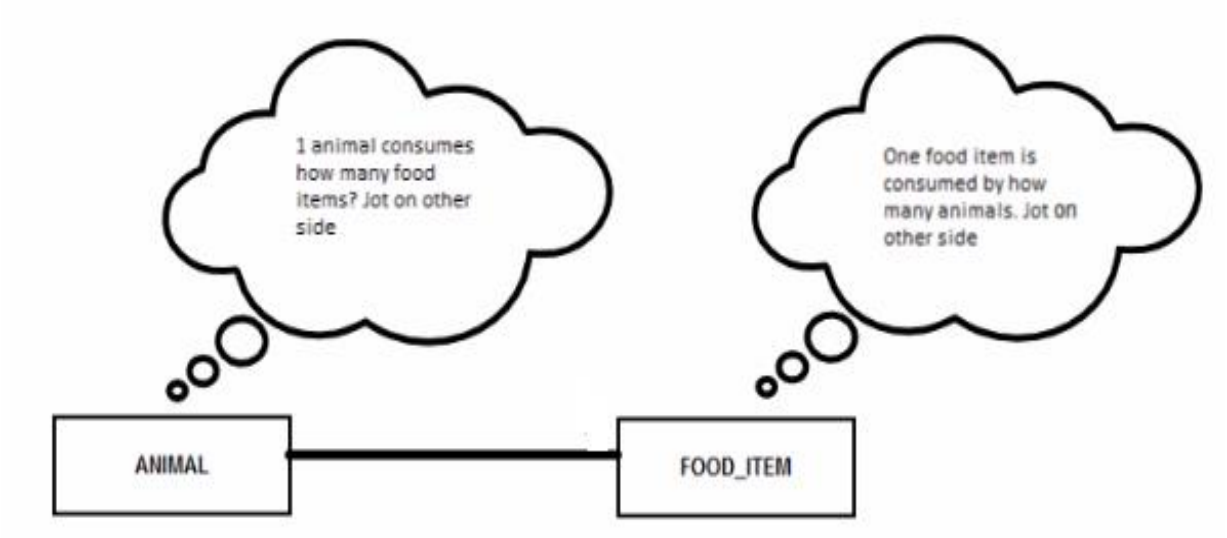
Step 2:Marking Relationship between Entities



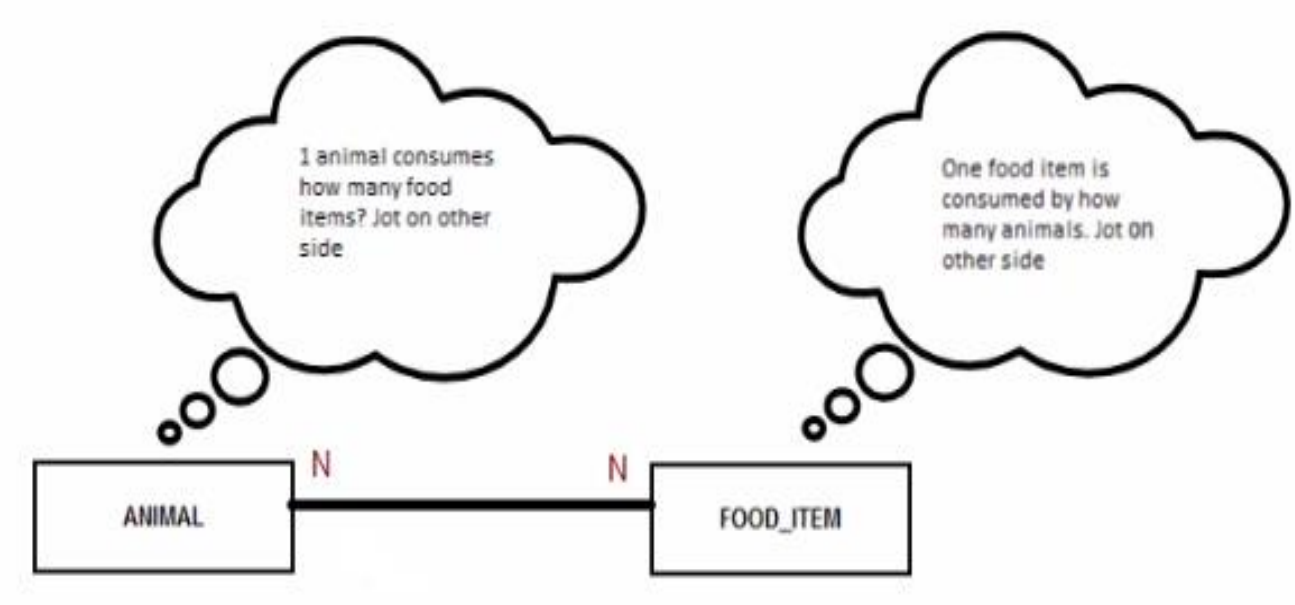
Step 2:Marking Relationship between Entities



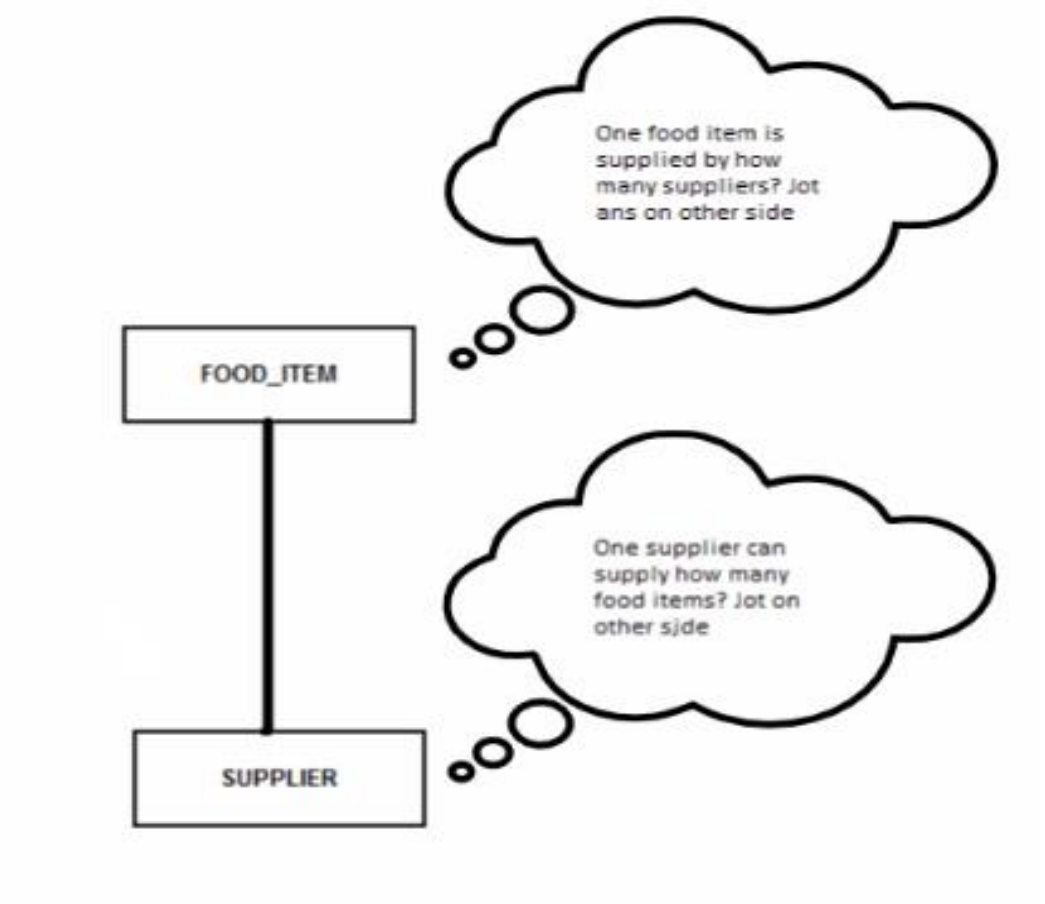
Step 2:Marking Relationship between Entities



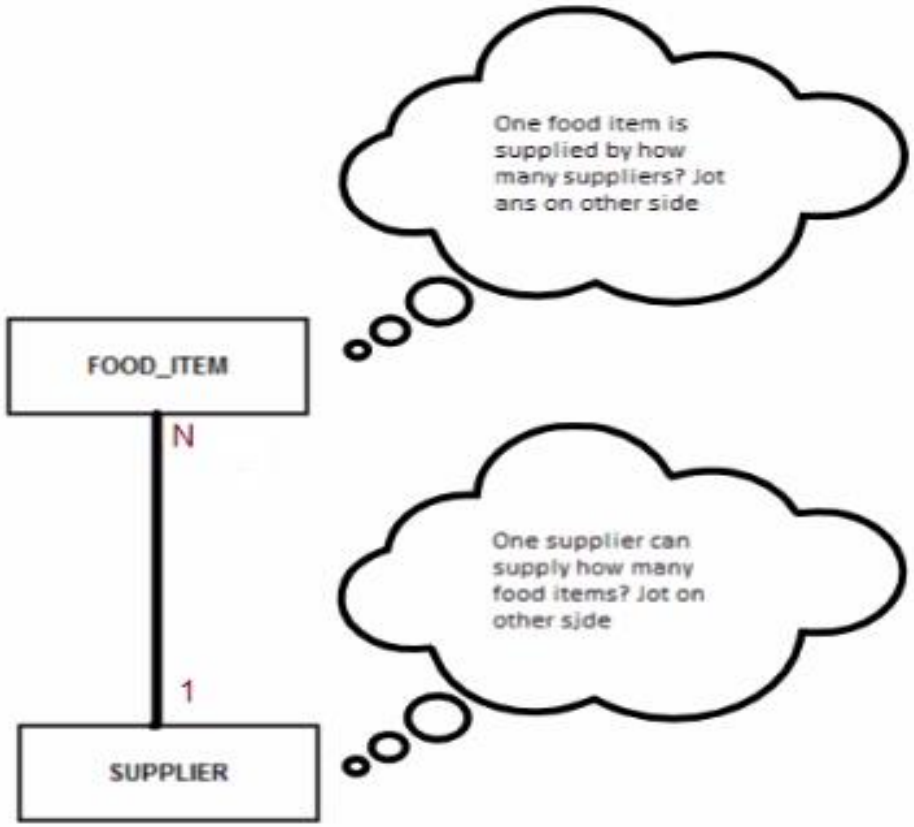
Step 2:Marking Relationship between Entities



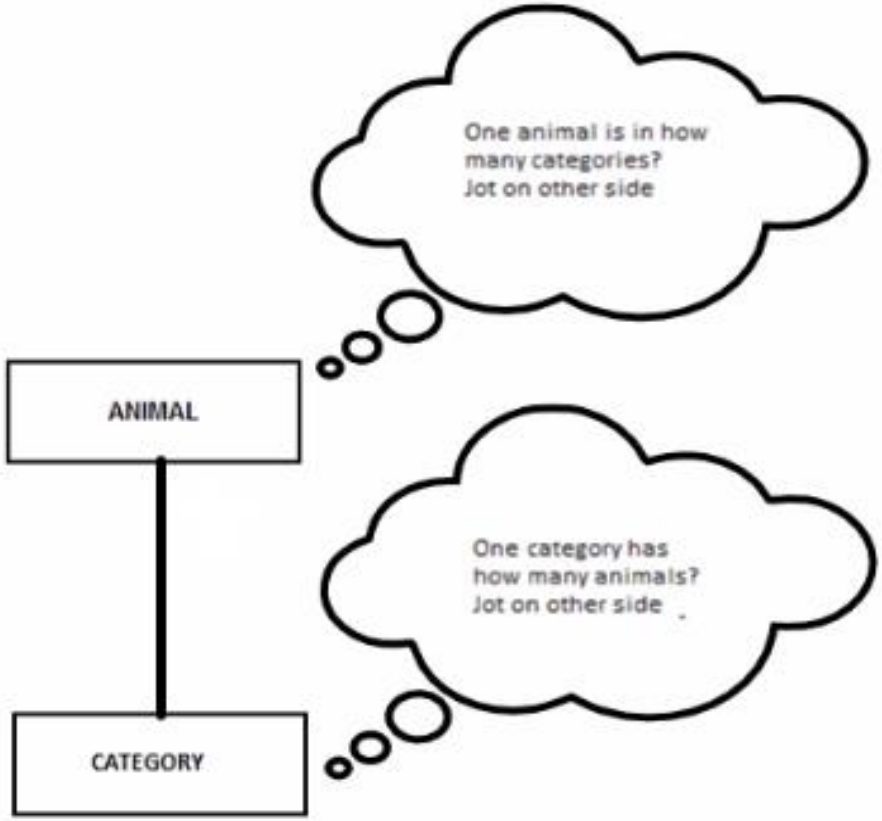
Step 2:Marking Relationship between Entities



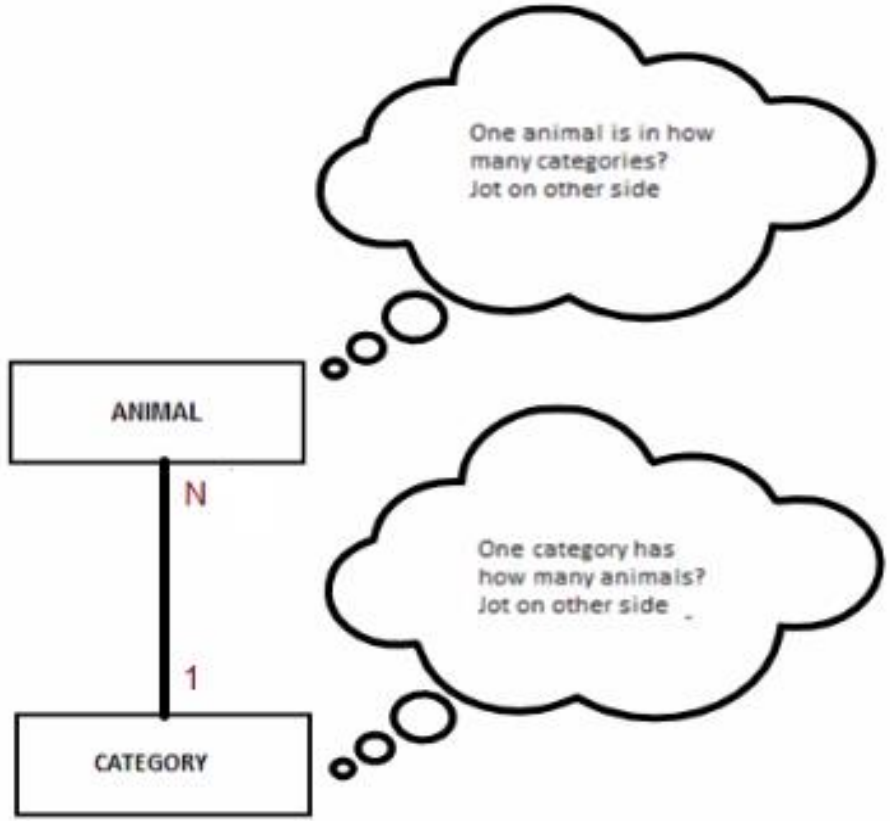
Step 2:Marking Relationship between Entities



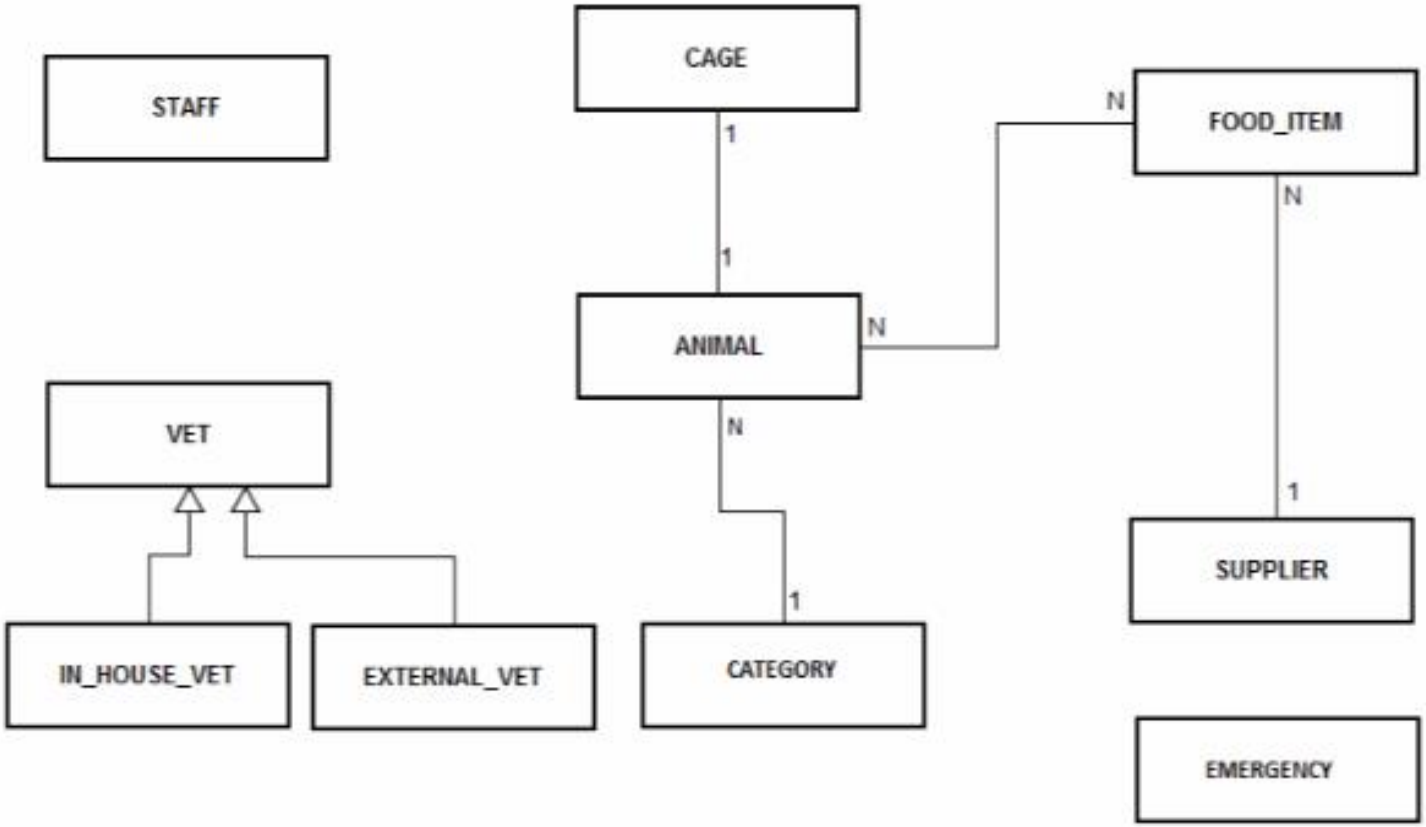
Step 2:Marking Relationship between Entities



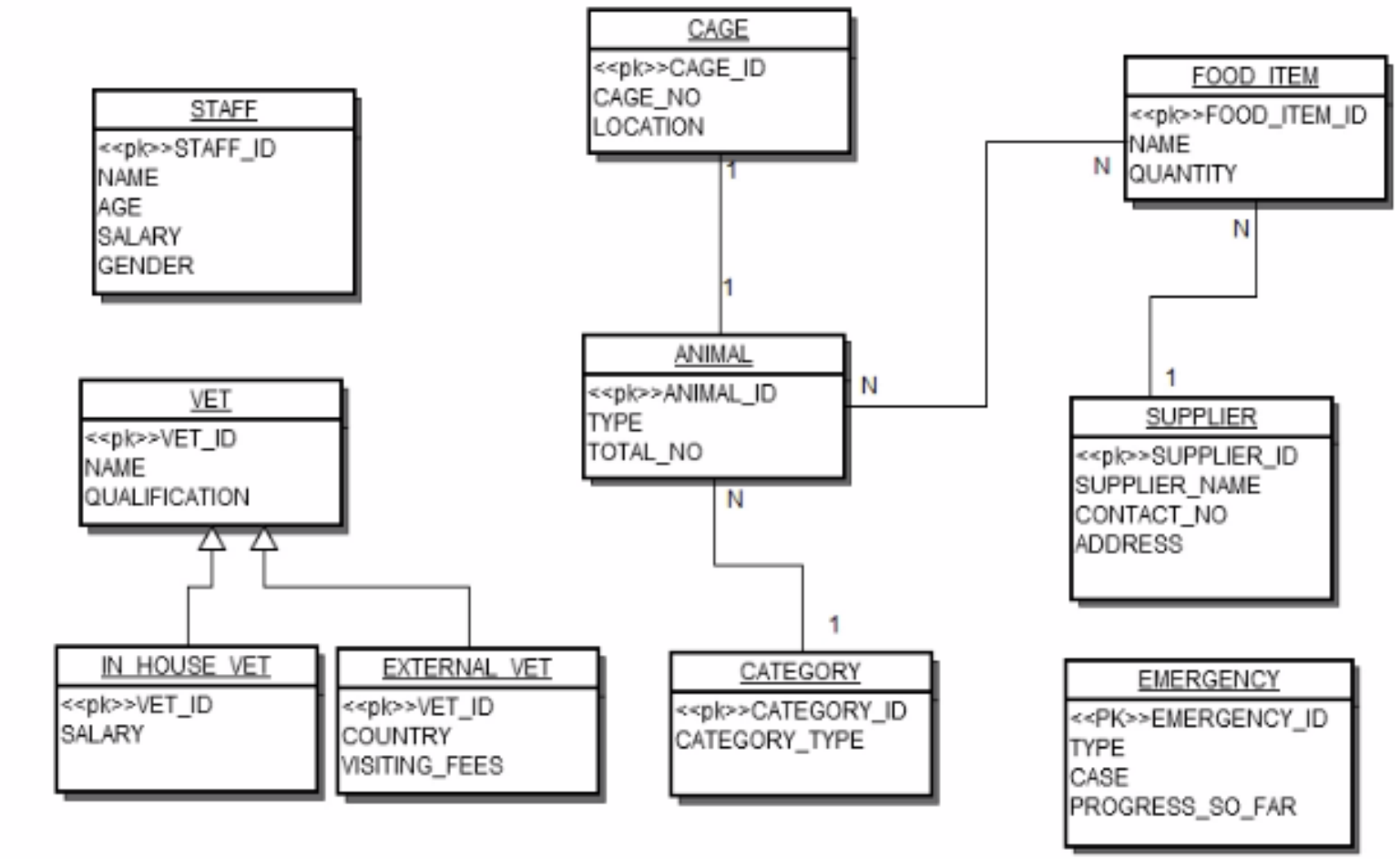
Step 2:Marking Relationship between Entities



Step 2:Mark Relationship

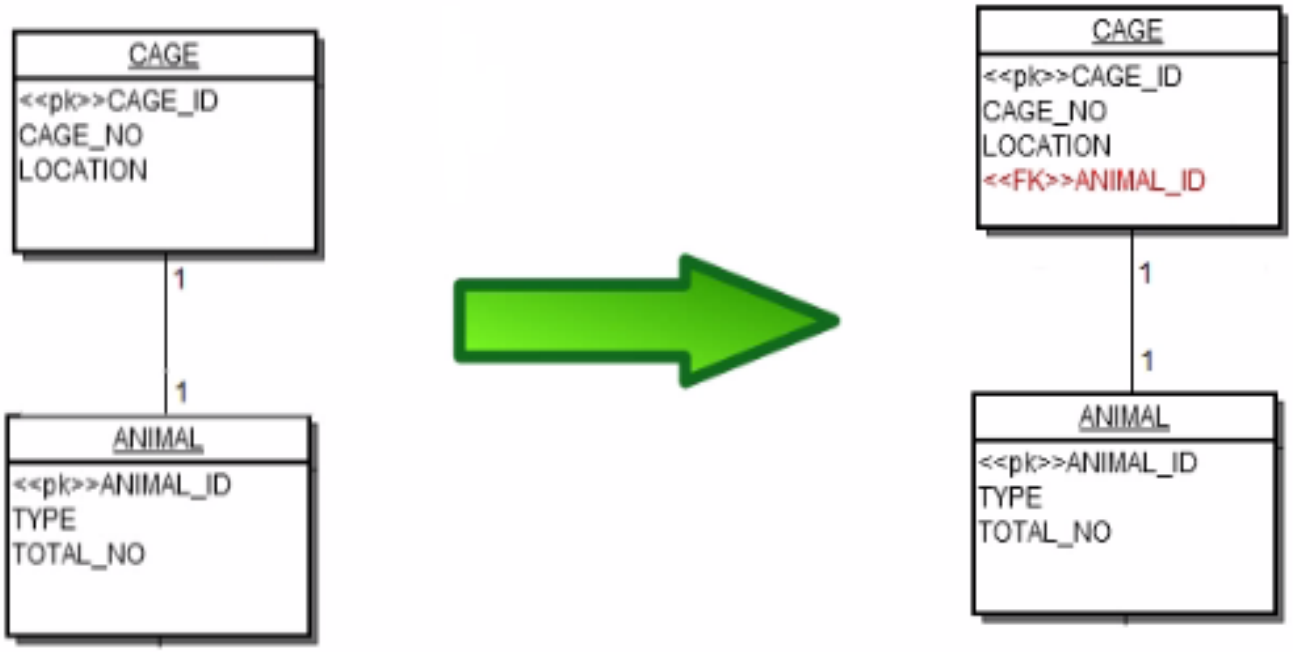


Step 3: Assign keys and find attributes

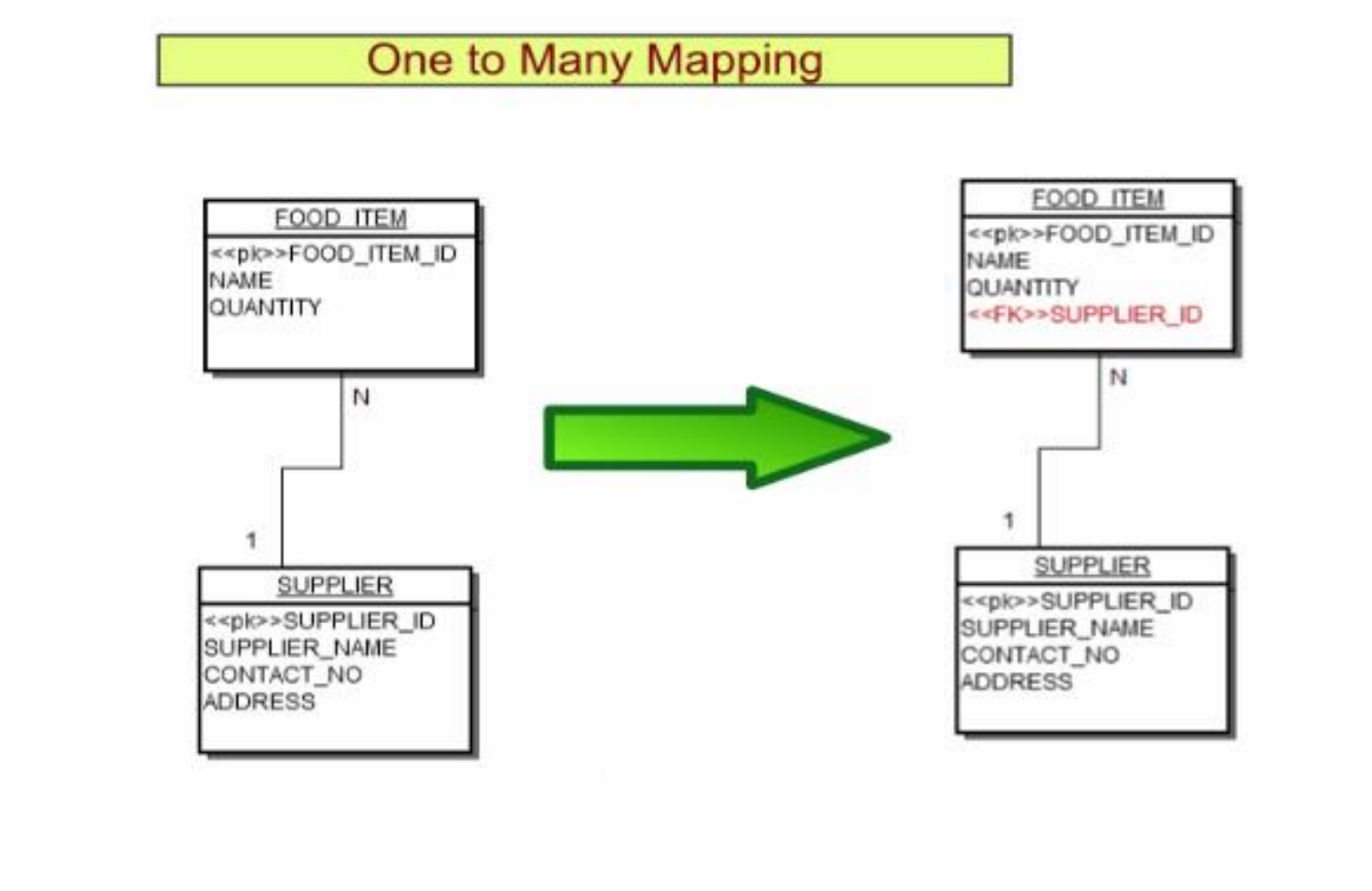


Step 4:Mapping attributes for Relationship

One to One Mapping

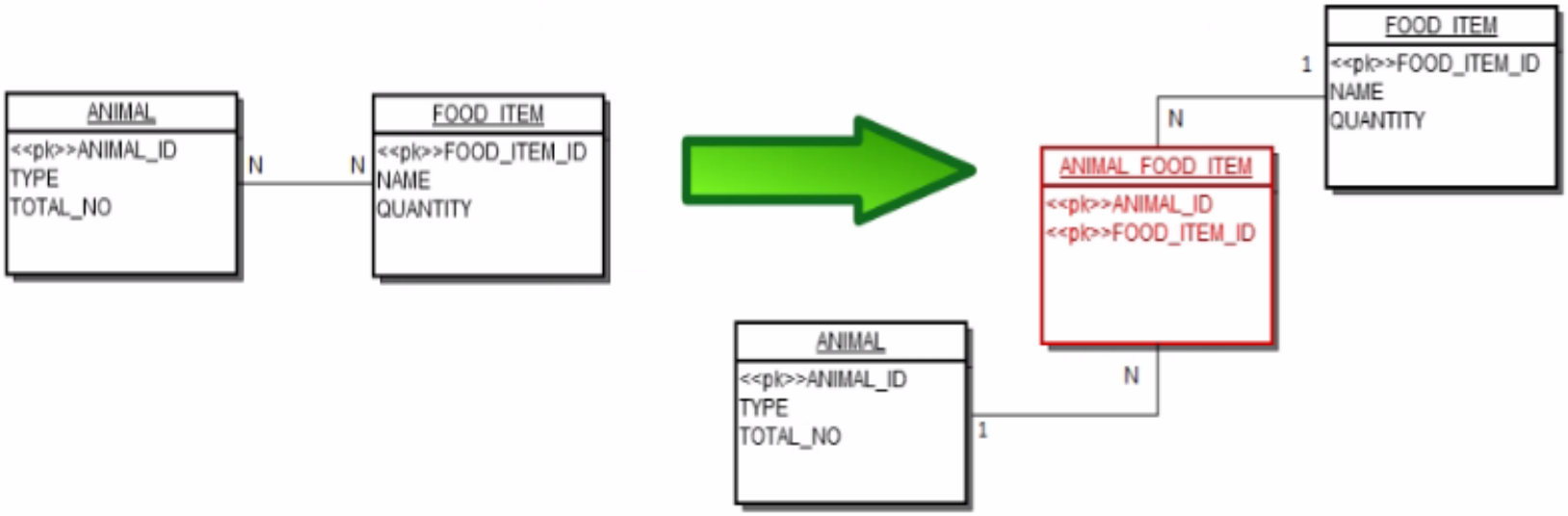


Step 4:Mapping attributes for Relationship

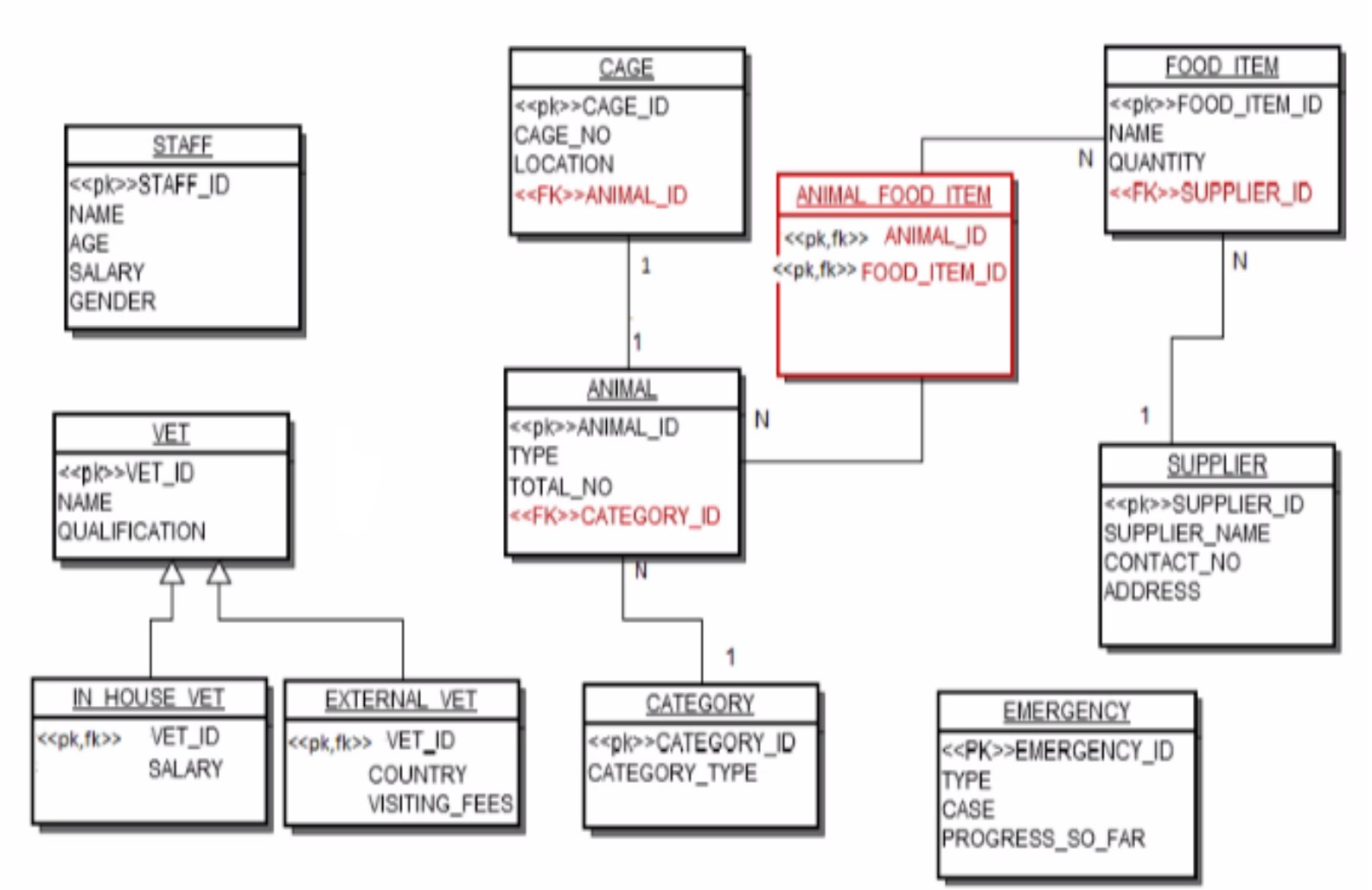


Step 4:Mapping attributes for Relationship

Many to Many Mapping



Step 4:Mapping attributes for Relationship



Normalization

First Normal Form

A table is not in first normal form if it is keeping multiple values for a piece of information.

Parent

parent_id	name	age	child	child2	child3
1	John	36	Emma	Steve	Josh
2	Rodney	38	Jack	NULL	NULL
3	Peter	31	NULL	NULL	NULL

Parent

parent_id	name	age	child
1	John	36	Emma,Steve,Josh
2	Rodney	38	Jack
3	Peter	31	NULL

Parent

parent_id	name	age
1	John	36
2	Rodney	38
3	Peter	31

Child

child_id	child_name	parent_id
1	Emma	1
2	Steve	1
3	Josh	1
4	Jack	2

Second Normal Form

A table is in second normal form if it is in first normal form AND we need all the fields in the key to determine the values of the non-key fields.

Employee

employee_id	project_id	employee_name	project_name	hours_worked
1000	1	Josh	CAD Design	8
1000	4	Josh	GUI Creation	14
1001	1	Ron	CAD Design	17
1004	3	Steve	DB Testing	5

Key: (employee_id,project_id)
employee_id -> employee_name
project_id -> project_name
employee_id, project_id -> hours_worked

Project

project_id	project_name
1	CAD Design
4	GUI Creation
3	DB Testing

Employee

employee_id	employee_name
1004	Steve
1000	Josh
1000	Josh
1001	Ron

Employee_Project

employee_id	project_id	hours_worked
1004	3	5
1000	1	8
1000	4	14
1001	1	17

Third Normal Form

A table is in third normal form if it is in second normal form AND no non-key fields depend on a field(s) that is not the primary key.fields.

Employee

employee_id	employee_name	dept_id	dept_name
1	John	1	IT
2	Sam	2	Accounts
3	Ron	1	IT
4	Raj	1	IT
5	Tina	3	Finance

Key: (employee_id)
employee_id -> employee_name
employee_id -> dept_id
employee_id -> dept_name
dept_id -> dept_name

Department

dept_id	dept_name
1	IT
2	Accounts
3	Finance

Employee

employee_id	employee_name
1	John
2	Sam
3	Ron
4	Raj
5	Tina

Employee_Dept

employee_id	dept_id
1	1
2	2
3	1
4	1
5	3

Normalization motto

- Dependencies only on the key, the whole key and nothing but the key.
- The First Normal Form : key
- The Second Normal Form : whole key
- The Third Normal Form : only on the key