1. 每个汽车厂商可以生产多个汽车品牌，但是一个汽车品牌只能属于一个厂商
2. 一个汽车品牌可以对应多个汽车型号，汽车型号是独特的，不能有重复
3. 一个零件厂商能生产多个零部件，同一个零部件可以由多个零部件厂商
4. 一个汽车厂可以从多个零件厂采购，一个零件厂同时也可以向多个汽车厂商售卖零件
5. 原材料可以由多家原材料供应商提供，一架供应商也可以提供多种原材料
6. 一家零件厂商可以从多个原料厂采购，一个原料厂可以向多个零件厂售卖原材料
7. 一个汽车品牌有多个汽车经销商，但是一个经销商只能属于一个汽车品牌
8. 每个经销商至少要有10个员工，一个经销商员工只能属于一家经销商
9. 经销商的员工可以管理其他一些员工
10. 用户可以去多个维修站进行修理，一个维修站也可以接待很多用户
11. 用户可以从多个保险公司买保险，同一家保险公司可以向多个用户出售保险
12. 员工可以从多个保险公司买保险，同一家保险公司可以向多个员工出售保险
13. 保险条例作为弱实体依赖于保险公司

### Step1：Identify entity

***Strong entity:***

* ****CarManufacturer****
* ****CarBrand****
* ****PartSupplier****
* ****CarPart****
* ****RawMaterialSupplier****
* ****RawMaterial****
* ****CarDealer****
* ****Employee****
* ****RepairStation****
* ****InsuranceProvider****
* ****InsurancePolicy****
* ****CarOwner****

***Weak entity:***

* ****StarffFamMem****

### Step2: Identify relation

1. carManufacturer 1..1 produce 1..\* carBrand
2. carBrand 1..1 open 1..\* carDealer
3. carManufacturer 0..\* buyFrom 0..\* carPart
4. carPart 0..\* proFrom 1..\* RawMaterial
5. carPart 0..\* proBy 1..\* partSupplier
6. RawMaterial 0..\* makeBy 1..\* rawMatericalSupplier
7. dealerEmployee 1..1 sale 0..\* carOwner
8. carDealer 1..1 employ 10..\* dealerEmployee
9. dealerEmployee 1..1 supervise 1..\* dealerEmployee
10. dealerEmployee 1..1 manage 1..1 carDealer
11. dealerEmployee 0..\* has 1..1 employeeFamMem(weak)
12. carOwner 0..\* repair 1..\* repairStation
13. carOwner 1..\* insure 0..\* insuranceProvider
14. InsuranceProvider0..\* provide 1..1 insurance policy

### Step3: identify and associate attributes with entities or relationships

**Entity Type attribute:**

1. **carManufacturer**: manufactureId ,manufactureName, yearFounded, phoneNumber, location, carPartNeed(1NF)
2. **carBrand**: brandID, brandName,carModel(multi)(1NF), releaseYear, discontinuedYear
3. **carPart**: partId, partName, partType, rawmaterialNeed(multi)(1NF)
4. **PartSupplier**: partSupplierId, supplierName, supplierPhone
5. **rawMaterial**: materialId, materialName, materialType
6. **rawMaterialSupplier**: rawSupplierId, rawSupplierName, rawMaterial
7. **carDealer**: dealerId, dealerName, location, brandSold(multi)(1NF)
8. **carOwner**: ownerId, name(fName, lName), address(street. Town, county), phone(multi), ownerCar(ownerCarId, ownerCarBrand, ownerCarModel, buyDate)(3NF)
9. **Employee**: employeeId, branchId, employeeName (fName, lName), address(street. Town, county), salary, DOB, branchName, workingHour(2NF)
10. **employeeFamMem**: memName(fName, lName), DOB
11. **RepairStation**: stationId, stationName, location, serveBrand(multi)
12. **insuranceProvider**: prociderId, providerName, phoneNumber(multi), insuranceType(multi)
13. **InsurancePolicy**: policyId, description

# **Step4: determine the attribute domain**

1. **carManufacturer**:

manufactureId int auto\_increment primary key

manufactureName varchar(20)

yearFounded DATE

phoneNumber int

location varchat(20)

carPartNeed varchat(500)

1. **carBrand**:

brandID int auto\_increment primary key

brandName varchat(20)

carModel(multi) varchat(500)

releaseYear DATE

discontinuedYear DATE

1. **carPart**:

partId int auto\_increment primary key

partName varhcat(20)

partType varchat(20)

raw material Need(multi) varchat(500)

1. **PartSupplier**:

partSupplierId int auto\_increment primary key

supplierName varchat(20)

supplierPhone int

1. **rawMaterial**:

materialId int auto\_increment primary key

materialName varchat(20)

materialType varchat(20)

1. **rawMaterialSupplier**:

rawSupplierI int auto\_increment primary key

rawSupplierName varchat(20)

rawMaterial varchat(20)

1. **carDealer**:

dealerId int auto\_increment primary key

dealerName varchat(20)

Location varchat(50)

brandSold(multi) varchat(500)

1. **carOwner**:

ownerId int auto\_increment primary key

name(

fName varchat(20)

lName) varchat(20)

address(

Street varchat(20)

Town varchat(20)

county) varchat(20)

phone(multi)

ownerCar(

ownerCarId int auto\_increment int

ownerCarBrand varchat(20)

ownerCarModel varchat(20)

buyDate) DATE

1. **Employee**:

employeeId int auto\_increment primary key

branchId int auto\_increment primary key

employeeName (

fName varchat(20)

lName) varchat(20)

address(

street varchat(20)

town varchat(20)

county) varchat(20)

salary varchat(20)

DOB DATE

branchName varchat(20)

WorkingHour int

1. **employeeFamMem**:

memName(

fName varchat(20)

lName) varchat(20)

DOB DATE

1. **RepairStation**:

stationId int auto\_increment primary key

stationName varchat(20)

Location varchat(20)

serveBrand(multi) varchat(500)

1. **insuranceProvider:**

prociderId int auto\_increment primary key

providerName varchat(20)

phoneNumber(multi) int

insuranceType(multi) varchat(500)

1. **InsurancePolicy**:

policyId int auto\_increment primary key

description varchat(100)

## **Step5:Determine candidate, primary, and alternate key attributes**

1. **carManufacturer**: manufactureId ,manufactureName, yearFounded, phoneNumber, location, carPartNeed

Primary key: manufactureId

Candidate key:manufactureId ,manufactureName, yearFounded, phoneNumber, location, carPartNeed

Alternate key: manufactureName, yearFounded, phoneNumber, location, carPartNeed

1. **carBrand**: brandID, brandName,carModel(multi), releaseYear, discontinuedYear

Priamry key: brandID

Candidate key: brandID, brandName,carModel(multi), releaseYear, discontinuedYear

Alternate key: brandID, brandName,carModel(multi), releaseYear, discontinuedYear

1. **carPart**: partId, partName, partType, raw material Need(multi)

Primary key: partId

Candidate key: partId, partName, partType, raw material Need(multi)

Alternate key: partName, partType, raw material Need(multi)

1. **PartSupplier**: partSupplierId, supplierName, supplierPhone

Primary key: partSupplierId

Candidate key: partSupplierId, supplierName, supplierPhone

Alternate key: supplierName, supplierPhone

1. **rawMaterial**: materialId, materialName, materialType

Primary key: materialId

Candidate key: materialId, materialName, materialType

Alternate key: materialName, materialType

1. **rawMaterialSupplier**: rawSupplierId, rawSupplierName, rawMaterial

Priamry key: rawSupplierId

Candidate key: rawSupplierId, rawSupplierName, rawMaterial

Alternate key: rawSupplierName, rawMaterial

1. **carDealer**: dealerId, dealerName, location, brandSold(multi)

Primary key: dealerId

Candidate key: dealerId, dealerName, location, brandSold(multi)

Alternate key: dealerName, location, brandSold(multi)

1. **carOwner**: ownerId, name(fName, lName), address(street. Town, county), phone(multi), ownerCar(ownerCarId, ownerCarBrand, ownerCarModel, buyDate)

Primary key: ownerId

Candidate key: ownerId, name(fName, lName), address(street. Town, county), phone(multi), ownerCar(ownerCarId, ownerCarBrand, ownerCarModel, buyDate)

Alternate key: , name(fName, lName), address(street. Town, county), phone(multi), ownerCar(ownerCarId, ownerCarBrand, ownerCarModel, buyDate)

1. **Employee**: employeeId, branchId, employeeName (fName, lName), address(street. Town, county), salary, DOB, branchName, workingHour

Primary key: employeeId, branchId

Candidate key: employeeId, branchId, employeeName (fName, lName), address(street. Town, county), salary, DOB, branchName, workingHour

Alternate key: employeeName (fName, lName), address(street. Town, county), salary, DOB, branchName, workingHour

1. **employeeFamMem**: memName(fName, lName), DOB

Primary key:

Candidate key: memName(fName, lName), DOB

Alternate key: memName(fName, lName), DOB

1. **RepairStation**: stationId, stationName, location, serveBrand(multi)

Primary key: stationId

Candidate key: stationId, stationName, location, serveBrand(multi)

Alternate key: stationName, location, serveBrand(multi)

1. **insuranceProvider**: prociderId, providerName, phoneNumber(multi), insuranceType(multi)

Primary key: prociderId

Candidate key: prociderId, providerName, phoneNumber(multi), insuranceType(multi)

Alternate key: providerName, phoneNumber(multi), insuranceType(multi)

1. **InsurancePolicy**: policyId, description

Primary key: policyId

Candidate key: policyId, description

Alternate key: description