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DATABASE DESIGN DETAILS for NNAP Car Dealers

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Contents

[Company Overview 2](#_Toc108298291)

[Company Product/Attribute 3](#_Toc108298292)

[Customer Sales Invoice 4](#_Toc108298293)

[ERD (M:M Relationships) 5](#_Toc108298294)

[ERD (M:M Relationships Resolved) 5](#_Toc108298295)

[ER Language 6](#_Toc108298296)

[Relational Model 8](#_Toc108298297)

[Relational - Schema: 12](#_Toc108298298)

[Business Rules/Constraints: 13](#_Toc108298299)

# **Company Overview**

NNAP is a car dealership company that sells brand new. Our main vision is to sell cars by ensuring quality and safety for customers. We sell all brands of cars according to the customer requirement. We make sure that all used cars in our company have proper documentation and follow all the safety protocols by providing used vehicle information package, safety standard certificate and emissions clean test. The main goal of the company is to satisfy customers with our guaranteed cost saving products and great customer experience. Additionally, we also service cars and get quality work done faster. Moreover, we safety check as per the standards on all the cars that we work on and provide excellent customer service.

NNAP has around 20 employees with excellent professional experience. Our salespersons ensure that the customer is satisfied with a product they are going to buy and take care of them until a purchase has been made. Furthermore, we have a well-experienced team of mechanics who have been working in this field for more than 10 years and they deal with all kinds of problems detected in the car and provide complete repairment services. We focus on using original parts and materials while servicing the cars and ensuring that they have an enduring life.

As the world is being digitalized, many companies have adopted selling their products through digital platforms. But for the cars, people want to visit the place to see and to test the cars. Therefore, we are focusing on making the location of the store convenient for potential customers. We are planning to expand our business by opening more branches of the company in different other locations so that our customers can have a convenient visit and a memorable test drive.

# **Company Product/Attribute**

**In this project, we have 15 entities. As our targeted product is a car, a car entity represents a set of cars that is a collection of cars of the same model. It consists of 9 attributes namely:**

* **car\_id,**
* **make,**
* **model,**
* **color,**
* **height,**
* **car\_length,**
* **width,**
* **engine\_cc,**
* **car\_for\_sale**

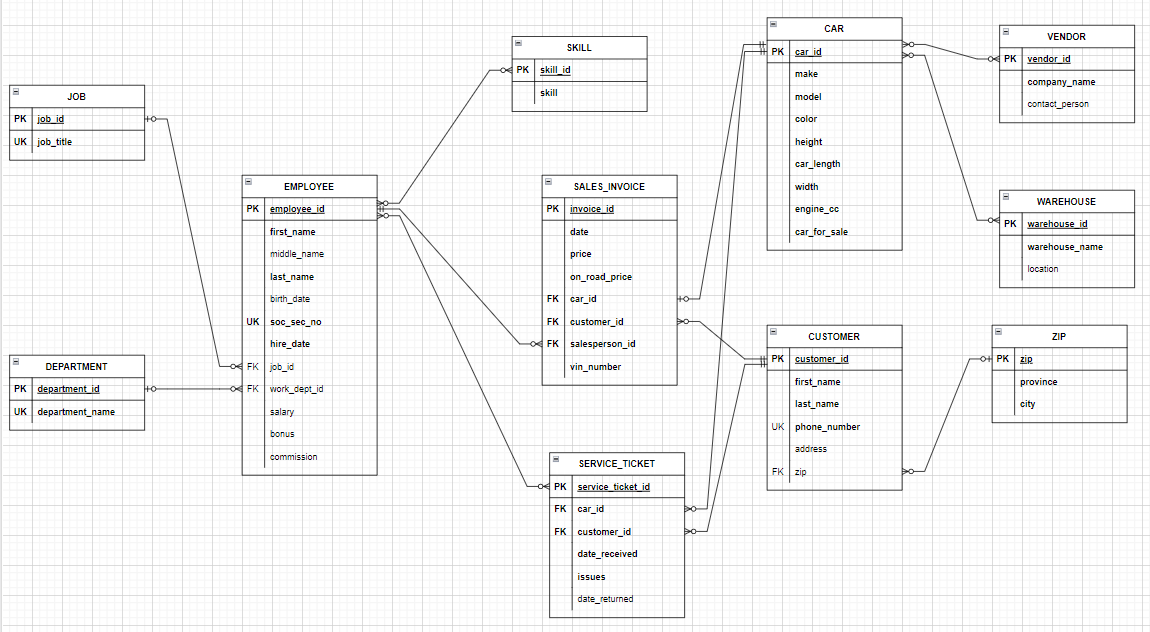
**A car is manufactured by assembling car parts from different vendors. A car is distributed across different warehouse locations. Similarly, a car can be sold to a customer and can be maintained. sales\_invoice entity is a sales invoice of exactly one car. It consists of attribute vin\_number. The vehicle identification number is 17 characters long which uniquely identifies a car. An employee entity has a salesperson that creates a sales invoice containing the details of the car and the customer who has made the purchase.**

# **Customer Sales Invoice**

Table

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# **ERD (M:M Relationships)**



# **ERD (M:M Relationships Resolved)**

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# **ER Language**

1. Each **EMPLOYEE** (salesperson role) may have zero, one or more **SALES\_INVOICE**

2. Each **SALES\_INVOICE** must have one and only one salesperson

1. Each **CAR** may have zero or one **SALES\_INVOICE**

2. Each **SALES\_INVOICE** must have one and only one **CAR**

1. Each **CUSTOMER** may buy zero, one or more **SALES\_INVOICE**

2. Each **SALES\_INVOICE** must have one and only one **CUSTOMER**

1. Each **CAR** may include in zero, one or more **SERVICE\_TICKET**.

2. Each **SERVICE\_TICKET** must contain one and only one **CAR**.

1. Each **CUSTOMER** may create zero, one or more **SERVICE\_TICKET**.

2. Each **SERVICE\_TICKET** must contain one and only one **CUSTOMER**

1. Each **EMPLOYEE** (mechanic role) may include zero, one or more times in **SERVICE\_MECHANIC\_DETAIL.**

2. Each **SERVICE\_MECHANIC\_DETAIL** must include one and only one **EMPLOYEE** (mechanic role).

1.each **SERVICE\_TICKET** must have one or more **SERVICE\_MECHANIC\_DETAIL**

2.each **SERVICE\_MECHANIC\_DETAIL** must have one and only **SERVICE\_TICKET**

1.Each **JOB** may be held by zero, one or more **EMPLOYEE**

2. Each **EMPLOYEE** may hold zero or one **JOB**

1. Each **DEPARTMENT** may employ zero, one or more **EMPLOYEE**

2. Each **EMPLOYEE** must work for zero or one **DEPARTMENT**

1. Each **VENDOR** may supply zero, one or more **PART**.

2. Each **PART** must be purchased from one and only one **VENDOR**

1. Each **CAR** must be assembled with one or more **PART**

2. Each **PART** must assemble one and only one **CAR**.

1. Each **CAR** may be zero, one or more times in the **INVENTORY**

2. Each **INVENTORY** must have one and only one **CAR**

1. Each **WAREHOUSE** may have zero, one or more **INVENTORY**

2. Each **INVENTORY** must have one and only one **WAREHOUSE**.

1. Each **ZIP** may have zero, one or more **CUSTOMER**  
2. Each **CUSTOMER** must have zero or one **ZIP**

1. Each **EMPLOYEE** (mechanic) may have zero, one or more **EMPLOYEE\_SKILL**.

2. Each **EMPLOYEE\_SKILL** must have one and only one **EMPLOYEE** (mechanic)

1. Each **SKILL** may be present in zero one or more **EMPLOYEE\_SKILL**

2. Each **EMPLOYEE\_SKILL** must have one and only one **SKILL**

# **Relational Model**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CAR** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **car\_id** | **Numeric** | (4,0) |
|  | \* | make | Character | 30 |
|  | \* | model | Character | 20 |
|  | \* | height | Numeric | 10 |
|  | \* | color | Character | 10 |
|  | \* | car\_length | Numeric | (5,0) |
|  | \* | width | Numeric | (5,0) |
|  | \* | engine\_cc | Numeric | (5,0) |
|  | \* | car\_for\_sale | Character | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EMPLOYEE** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **employee\_id** | **Numeric** | (3,0) |
|  | \* | first\_name | Character | 20 |
|  | o | middle\_initial | Character | 1 |
|  | \* | last\_name | Character | 20 |
|  | o | birth\_date | Date | 10 |
| UK | \* | soc\_sec\_no | Numeric | (9,0) |
|  | \* | hire\_date | Date | 10 |
| FK | o | work\_dept\_id | Numeric | (2,0) |
| FK | o | job\_id | Numeric | (2,0) |
|  | o | salary | Numeric | (6,0) |
|  | o | bonus | Numeric | (7,2) |
|  | o | commission | Numeric | (7,2) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DEPARTMENT** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **department\_id** | **Numeric** | (2,0) |
|  | \* | department\_name | Character | 40 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SALES\_INVOICE** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **invoice\_id** | **Numeric** | (4,0) |
|  | \* | date | date | 30 |
|  | \* | price | Numeric | (8,0) |
|  | \* | on\_road\_price | Numeric | (8,0) |
| FK | \* | car\_id | Numeric | (4,0) |
| FK | \* | customer\_id | Numeric | (4,0) |
| FK | \* | sales\_person\_id | Numeric | (3,0) |
|  | \* | vin\_number | Character | 17 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CUSTOMER** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **customer\_id** | **Numeric** | (4.0) |
|  | \* | first\_name | Character | 30 |
|  | \* | last\_name | Character | 20 |
| UK | \* | phone\_number | Numeric | 10 |
|  | \* | address | Character | 25 |
| FK | \* | zip | Character | (6,0) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ZIP** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **zip** | **Character** | 6 |
|  | \* | province | Character | 10 |
|  | \* | city | Character | 20 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SERVICE\_TICKET** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **service\_ticket\_id** | **Numeric** | (4,0) |
| FK | \* | car\_id | Numeric | (4,0) |
| FK | \* | customer\_id | Numeric | (4,0) |
|  | \* | date\_received | Date |  |
|  | \* | issues | character | 100 |
|  | o | date\_returned | Date |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SERVICE\_MECHANIC \_DETAIL** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK, FK** | **\*** | **service\_ticket\_id** | **Numeric** | (4,0) |
| **PK, FK** | **\*** | **mechanic\_id** | **Numeric** | (3,0) |
|  | o | hours | Numeric | (2,0) |
|  | o | comments | Character | 100 |
|  | \* | rate\_per\_hour | Numeric | (2,0) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **VENDOR** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **vendor\_id** | **Numeric** | (4,0) |
|  | \* | company\_name | Character | 30 |
|  | \* | contact\_person | Character | 20 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PART** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
|  | o | part\_description | Character | 300 |
|  | \* | part\_cost | Character | 20 |
| **PK, FK** | **\*** | **vendor\_id** | **Numeric** | 10 |
| **PK, FK** | **\*** | **car\_id** | **Numeric** | (4,0) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SKILL** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **skill\_id** | **Numeric** | (3,0) |
|  | \* | skill | Character | 30 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MECHANIC\_SKILL** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK, FK** | **\*** | **mechanic\_id** | **Numeric** | (4,0) |
| **PK, FK** | **\*** | **skill\_id** | **Numeric** | (3,0) |
|  | o | experience | Numeric | (2,0) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WAREHOUSE** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **warehouse\_id** | **Numeric** | (4,0) |
|  | \* | warehouse\_name | Character | 30 |
|  | o | location | Character | 20 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **INVENTORY** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| PK, FK | \* | car\_id | Numeric | (4,0) |
| PK, FK | \* | warehouse\_id | Numeric | (4,0) |
|  | \* | availability | Character | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **JOB** | | | | |
| Key types | Column Optionality | Column Names | Data Types | Length |
| **PK** | **\*** | **job\_id** | Numeric | (2,0) |
| UK | \* | job\_title | Character | 20 |

# **Relational - Schema:**

* **JOB** (**job\_id**, job\_title)
* **DEPARTMENT** (**department\_id**, department\_name)
* **EMPLOYEE** (**employee\_id**, first\_name, middle\_name, last\_name, birth\_date, soc\_sec\_num, hire\_date, *work\_dept\_id*, *job\_id*, salary, bonus, commission)
* **MECHANICAL\_SKILL** (***skill\_id***, ***mechanic\_id***, experience)
* **SKILL** (**skill\_id**, skill)
* **SERVICE\_MECHANIC\_DETAIL** (***service\_ticket\_id***, ***mechanic\_id***, hours, comments, rate\_per\_hour)
* **SALES\_INVOICE** (**invoice\_id**, date, price, on\_road\_price, *car\_id*, *customer\_id*, *salesperson\_id,* vin\_number)
* **SERVICE\_TICKET** (**service\_ticket\_id**, *car\_id*, *customer\_id*, date\_received, issues, date\_returned)
* **CUSTOMER** (**customer\_id**, first\_name, last\_name, phone\_number, address, *zip*)
* **ZIP** (**zip**, province, city)
* **CAR** (**car\_id**, make, model, color, height, car\_length, width, engine\_cc, car\_for\_sale)
* **PART** (***vendor\_id***, ***car\_id***, part\_description, part\_cost)
* **VENDOR** (**vendor\_id**, company\_name, contact\_person)
* **WAREHOUSE** (**warehouse\_id**, warehouse\_name, location)
* **INVENTORY** (***car\_id***, ***warehouse\_id***, availability)

# **Business Rules/Constraints:**

1. **EMPLOYEE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL Capable** | **Constraints** |
| **employee\_id** (PK) | Numeric | 3,0 | N |  |
| first\_name | Character | 20 | N |  |
| middle\_Initial | Character | 1 | Y |  |
| last\_name | Character | 20 | N |  |
| birth\_date | Date | 10 | Y |  |
| soc\_sec\_no | Numeric | 9,0 | N | * UK |
| hire\_date |  | 10 | N | * If unknown, use current date * Must be greater than birth date |
| *work\_dept\_id* (FK) (())(FK) | Numeric | 2,0 | Y | * Must be a valid work department |
| *job\_id* (FK) | Numeric | 2,0 | Y | * Must be a valid job |
| salary | Numeric | 6,0 | Y | * Must be less than 92000.00 * Must be greater than commission |
| bonus | Numeric | 7,2 | Y | * Must have commission or bonus |
| commission | Numeric | 7,2 | Y | * Must have commission or bonus |

1. **JOB**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL Capable** | **Constraints** |
| **job\_id** (PK) | Numeric | 2,0 | N |  |
| job\_title UK | Character | 20 | N |  |

1. **DEPARTMENT**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL Capable** | **Constraints** |
| **department\_id** (PK) | Numeric | 2,0 | N |  |
| department\_name | Character | 40 | N |  |

1. **CAR**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL Capable** | **Constraints** |
| **car\_id** (PK) | Numeric | 4,0 | N |  |
| make | Character | 30 | N |  |
| model | Character | 20 | N |  |
| color | Character | 10 | N |  |
| height | Numeric | 5,0 | N |  |
| car\_for\_sale | Character | 1 | N | * Must be ‘Y’ or ‘N’ * If unknown, “N” |
| car\_length | Numeric | (5,0) | N |  |
| width | Numeric | (5,0) | N |  |
| engine\_cc | Numeric | (5,0) | N |  |

1. **SALES\_INVOICE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL Capable** | **Constraints** |
| **invoice\_id** (PK) | Numeric | 4,0 | N | * Auto increment |
| date | Character | 30 | N | * If unknown, use current date |
| price | Numeric | 8,0 | N |  |
| on\_road\_price | Numeric | 8,0 | N | * Must be greater than price |
| *car\_id (FK)* | Numeric | 4,0 | N | * Must be a valid car\_id |
| *customer\_id (FK)* | Numeric | 4,0 | N | * Must be a valid customer |
| *salesperson\_id (FK)* | Numeric | 3,0 | N | * Must be valid employee\_id |
| vin\_number | Character | 17 | N |  |

1. **CUSTOMER**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL Capable** | **Constraints** |
| **customer\_id** (PK) | Numeric | 4,0 | N | * Auto increment |
| first\_name | Character | 30 | N |  |
| last\_name | Character | 20 | N |  |
| phone\_number (UK) | Numeric | 10 | N | * Must me unique |
| address | Character | 25 | N |  |
| zip | Character | 6,0 | N | * Must be valid zip |

1. **ZIP**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL Capable** | **Constraints** |
| **zip** (PK) | Character | 6,0 | N |  |
| province | Character | 5 | N |  |
| city | Character | 20 | N |  |

1. **SERVICE\_TICKET**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL** | **Constraints** |
| **service\_ticket\_id** (PK) | Numeric | 4,0 | N |  |
| *car\_id (FK)* | Numeric | 4,0 | N | * Must be valid car\_id |
| *customer\_id (FK)* | Numeric | 4,0 | N | * Must be valid customer |
| date\_received | Date |  | N | * If unknown, current date |
| issues | Character | 100 | N |  |
| date\_returned | Date |  | Y |  |

1. **SERVICE\_MECHANIC\_DETAIL**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL** | **Constraints** |
| ***service\_ticket\_id*** (PK,FK) | Numeric | 4,0 | N | * Must be valid service\_ticket |
| ***mechanic\_id*** (PK,FK) | Numeric | 3,0 | N | * Must be valid employee |
| hours | Numeric | 2,0 | Y |  |
| comments | Character | 100 | Y |  |
| rate\_per\_hour | Numeric | 2,0 | N |  |

1. **VENDOR**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL** | **Constraints** |
| **vendor\_id** (PK) | Numeric | 4,0 | N |  |
| company\_name | Character | 30 | N |  |
| contact\_person | Character | 20 | N |  |

1. **PART**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL** | **Constraints** |
| part\_description | Character | 300 | Y |  |
| part\_cost | Character | 20 | N |  |
| ***vendor\_id*** (PK, FK) | Character | 4,0 | N | * Must be valid vendor id |
| ***car\_id*** (PK, FK) | Numeric | 4,0 | N | * Must be valid car\_id |

1. **SKILL**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL** | **Constraints** |
| **skill\_id** (PK) | Numeric | 3,0 | N |  |
| skill | Character | 30 | N |  |

1. **MECHANIC\_SKILL**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL** | **Constraints** |
| ***mechanic\_id*** (PK, FK) | Numeric | 4,0 | N | * Must be valid employee. |
| ***skill\_id*** (PK, FK) | Numeric | 3,0 | N | * Must be valid skill. |
| experience | Numeric |  | Y |  |

1. **WAREHOUSE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL** | **Constraints** |
| **warehouse\_id** (PK) | Numeric | 4,0 | N | * Must be unique |
| warehouse\_name | Character | 30 | N |  |
| location | Character | 20 | Y |  |

1. **INVENTORY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Length** | **NULL** | **Constraints** |
| ***car\_id*** (PK, FK) | Numeric | 4,0 | N | * Must be valid employee. |
| ***warehouse\_id*** (PK, FK) | Numeric | 4,0 | N | * Must be valid warehouse\_id |
| availability | Character | 1 | N | * If unknown “Y” * Must be Y or N |