

**ASSIGNMENT TITLE:** Database Model for Commonwealth Transport Services

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| Declaration  Except where appropriately acknowledged, this assignment is our own work, has been  expressed in our own words and has not previously been submitted for assessment. We have  also retained a copy of this assessment piece for our own records. | | |
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**Statement of Completion:**

All tasks have been completed.

**Synopsis**

The purpose of this assignment is to create the database design for the Commonwealth Transport Services (CTS), a private company, specializes in providing transportation services to various events which is recently has been sub-contracted by the Commonwealth Games Federation to transport officials during the Commonwealth Games in 2022.

**Entity Relationship Diagram**

**LOCATION**

LocationId

S\_StreetNumber

S\_StreetName

S\_Suburb

S\_State

S\_PostalCode

E\_StreetNumber

E\_StreetName

E\_Suburb

E\_State

E\_PostalCode

Type

**COMPLETED**

*Reference*

StartDate

EndDate

StartOdometer

EndOdometer

**BOOKINGS**

Reference

*OfficialId*

*Vin*

*LicenseNumber*

StartDate

StartTime

EndDate

EndTime

*LocationId*

**OFFICIALS**

OfficialId

Country

Name

Role

PreferredLanguage

Usage

**CTS\_ASSETS**

Vin

RegistrationNo

Make

Model

Color

CurrentOdometer

PassengerCapacity

Availability

**REPAIR\_MAINTANANCE**

*InvoiceNo*

*Vin*

CurrentOdometer

Date

Cost

Description

Nature

**COUNTRIES**

CountryCode

Country

Languages

**DRIVERS**

LicenseNumber

Name

LevelOfClearence

Languages

*Figure 1: Entity Relationship Diagram*

**Assumptions**

1. Each country must get the service from the CTS and each country can have several vehicles to use but each vehicle will be allocated only per a single country official.
2. Each official can make one or many bookings according to their needs.
3. Vehicles either can be available or under one or many repairs/maintenances.
4. Vehicle must have a driver to be used but there can be freely available drivers as well.
5. All the bookings should have a vehicle but vehicles can be either booked or freely available.
6. All the bookings must have locations of picking and dropping and each location can be for a single booking or for a multiple booking.
7. To have a completed service it must have previously booked and each booking must fall into the completed slot.

**Normalization**

1. Relation Schema
2. CTS\_ASSETS (Vin, RegistrationNo, Make, Model, Color, CurrentOdometer, PassengerCapacity, Availability)
3. DRIVERS (LicenseNumber, Name, LevelOfClearence, Languages)
4. REPAIR\_MAINTANANCE (InvoiceNo, *Vin*, CurrentOdometer, Date, Cost, Description, Nature)
5. COUNTRIES (CountryCode, Country, Languages)
6. OFFICIALS (OfficialId, Country*,* Name, Role, PreferredLanguage, Usage)
7. BOOKINGS (Reference, *OfficialId, Vin, LicenseNumber,* StartDate, StartTime, EndDate, EndTime, *LocationId)*
8. LOCATIONS (LocationId, S\_StreetNumber, S\_StreetName, S\_Suburb, S\_State, S\_PostalCode, E\_StreetNumber, E\_StreetName, E\_Suburb, E\_State, E\_PostalCode, Type)
9. COMPLELTED (*Reference*, StartDate, EndDate, StartOdometer, EndOdometer)
10. Normalization
11. CTS\_ASSETS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Vin | RegistrationNo | Make | Model | Color | CurrentOdometer | PassengerCapacity | Availability |

This relational data structure is in a 3rd NF

1. DRIVERS

|  |  |  |  |
| --- | --- | --- | --- |
| LicenseNumber | Name | LevelOfClearence | Languages |

This relational data structure is not in any Normalization:

o It is because Languages is a multi-valued attribute because it contains a nested relation.

o Remove the attribute that violates 1NF and place it in a new relation with the primary key and create a new relation for the nested relation

* DRIVERS (LicenseNumber, Name, LevelOfClearence)
* LANGUAGE\_SECTION (LicenseNumber, Language)

Now this relational data structure is in 1NF

Finally, this new relational data structure is in a 3rd NF.

1. REPAIR\_MAINTANANCE

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| InvoiceNo | *Vin* | CurrentOdometer | Date | Cost | Description | Nature |

This relational data structure is in a 2ND NF:

o InvoiceNo -> *Vin*, Date, Cost, Description, Nature

o *Vin* -> CurrentOdometer

o There is a transitive functional dependency among InvoiceNo, Vin, and CurrentOdometer. The

CurrentOdometer is related to the Vin which is a foreign key therefore it is not in 3NF.

o However, CurrentOdometer doesn’t introduce big redundancy (only one attribute), so there is no need to decompose this table into two.

1. COUNTRIES

|  |  |  |
| --- | --- | --- |
| CountryCode | Country | Languages |

This relational data structure is not in any Normalization:

o It is because Languages is a multi-valued attribute because it contains a nested relation.

o Remove the attribute that violates 1NF and place it in a new relation with the primary key and create a new relation for the nested relation

* COUNTRIES (CountryCode, Country)
* COUNTRY\_LANGUAGES (CountryCode, Language)

Now this relational data structure is in 1NF

Finally, this new relational data structure is in a 3rd NF.

1. OFFICIALS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| OfficialId | Country | Name | Role | PreferredLanguage | Usage |

This relational data structure is in a 3rd NF

1. BOOKINGS

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Reference | *OfficialId* | *Vin* | *LicenseNumber* | StartDate | StartTime | EndDate | EndTime | *LocationId* |

This relational data structure is in a 3rd NF

1. LOCATIONS

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| LocationId | S\_StreetNumber | S\_StreetName | S\_Suburb | S\_State | S\_PostalCode | E\_StreetNumber | E\_StreetName | E\_Suburb | E\_State | E\_PostalCode | Type |

This relational data structure is in a 2ND NF:

o LocationId ->, S\_StreetNumber, S\_StreetName, E\_StreetNumber, E\_StreetName, type

o S\_Suburb, S\_State -> S\_PostalCode

o E\_Suburb, E\_State -> E\_PostalCode

E stands for the End and S stands for the Start.

o There are two transitive functional dependencies among LocationId, S\_Suburb, S\_State, E\_Suburb,

E\_State, S\_PostalCode and E\_PostalCode. The S\_PostalCode and E\_PostalCode and related to the Suburb and the State therefore it is not in 3NF.

o However, S\_PostalCode and E\_PostalCode don’t introduce big redundancy (only two simple attributes), so there is no need to decompose this table into two.

1. COMPLELTED

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Reference* | StartDate | EndDate | StartOdometer | EndOdometer |

This relational data structure is in a 3rd NF

**Relational Database Schema**

|  |  |  |  |
| --- | --- | --- | --- |
| **Table Name** | **Field** | **Type** | **Description** |
| CTS\_ASSETS | Vin | VARCHAR (20) | PRIMARY KEY |
|  | RegistrationNo | VARCHAR (6) |  |
|  | Make | VARCHAR (10) |  |
|  | Model | VARCHAR (10) |  |
|  | Color | VARCHAR (10) |  |
|  | CurrentOdometer | INT |  |
|  | PassengerCapacity | INT (2) |  |
|  | Availability | ENUM | ENUM (‘YES’, ‘NO’) |
|  |  |  |  |
| DRIVERS | LicenseNumber | VARCHAR (18) | PRIMARY KEY |
|  | Name | VARCHAR (20) |  |
|  | LevelOfClearence | ENUM | ENUM (‘1’, ‘2’, ‘3’, ‘4’) |
|  | Languages | BLOB (20) | ISO639-1 FORMAT ONLY |
|  |  |  |  |
| REPAIR\_MAINTANANCE | InvoiceNo | INT | PRIMARY KEY  NOT NULL  AUTO\_INCREMENT |
|  | Vin | VARCHAR (20) | FOREIGN KEY REFERENCES  CTS\_ASSETS(Vin) |
|  | CurrentOdometer | INT |  |
|  | Date | DATE | FORMAT: DD-MM-YYYY |
|  | Cost | DOUBLE |  |
|  | Description | VARCHAR (100) |  |
|  | Nature | ENUM | ENUM (‘R’, ‘M’) |
|  |  |  |  |
| COUNTRIES | CountryCode | BLOB (2) | PRIMARY KEY  ISO3166-1 FORMAT ONLY |
|  | Country | VARCHAR (10) |  |
|  | Languages | BLOB (20) | ISO639-1 FORMAT ONLY |
|  |  |  |  |
| OFFICIALS | OfficialId | VARCHAR (10) | PRIMARY KEY |
|  | Country | VARCHAR (10) |  |
|  | Name | VARCHAR (20) |  |
|  | Role | VARCHAR (10) |  |
|  | PreferredLanguage | CHAR (2) | ISO639-1 FORMAT ONLY |
|  | Usage | VARCHAR (10) |  |
|  |  |  |  |
| BOOKINGS | Reference | VARCHAR (15) | PRIMARY KEY |
|  | OfficialId | VARCHAR (10) | FOREIGN KEY REFERENCES  OFFICIALS(OfficialId) |
|  | Vin | VARCHAR (20) | FOREIGN KEY REFERENCES  CTS\_ASSETS(Vin) |
|  | LicenseNumber | VARCHAR (18) | FOREIGN KEY REFERENCES  DRIVERS(LicenseNumber) |
|  | StartDate | DATE | FORMAT: DD-MM-YYYY |
|  | StartTime | TIME | FORMAT: HH:MM:SS |
|  | EndDate | DATE | FORMAT: DD-MM-YYY |
|  | EndTime | TIME | FORMAT: HH:MM:SS |
|  | LocationId | INT | FOREIGN KEY REFERENCES  LOCATIONS(LocationId) |
|  |  |  |  |
| LOCATIONS | LocationId | INT | PRIMARY KEY  NOT NULL  AUTO\_INCREMENT |
|  | S\_StreetNumber | VARCHAR (6) |  |
|  | S\_StreetName | VARCHAR (30) |  |
|  | S\_Suburb | VARCHAR (15) |  |
|  | S\_State | VARCHAR (4) |  |
|  | S\_PostalCode | VARCHAR (5) |  |
|  | E\_StreetNumber | VARCHAR (6) |  |
|  | E\_StreetName | VARCHAR (30) |  |
|  | E\_Suburb | VARCHAR (15) |  |
|  | E\_State | VARCHAR (4) |  |
|  | E\_PostalCode | VARCHAR (5) |  |
|  | Type | VARCHAR (10) |  |
|  |  |  |  |
| COMPLETED | Reference | VARCHAR (15) | PRIMARY KEY  FOREIGN KEY REFERENCES  BOOKINGS(Reference) |
|  | StartDate | DATE | FORMAT: DD-MM-YYYY |
|  | EndDate | DATE | FORMAT: DD-MM-YYYY |
|  | StartOdometer | INT |  |
|  | EndOdometer | INT |  |