Databases Advanced Exam - 15 August 2022

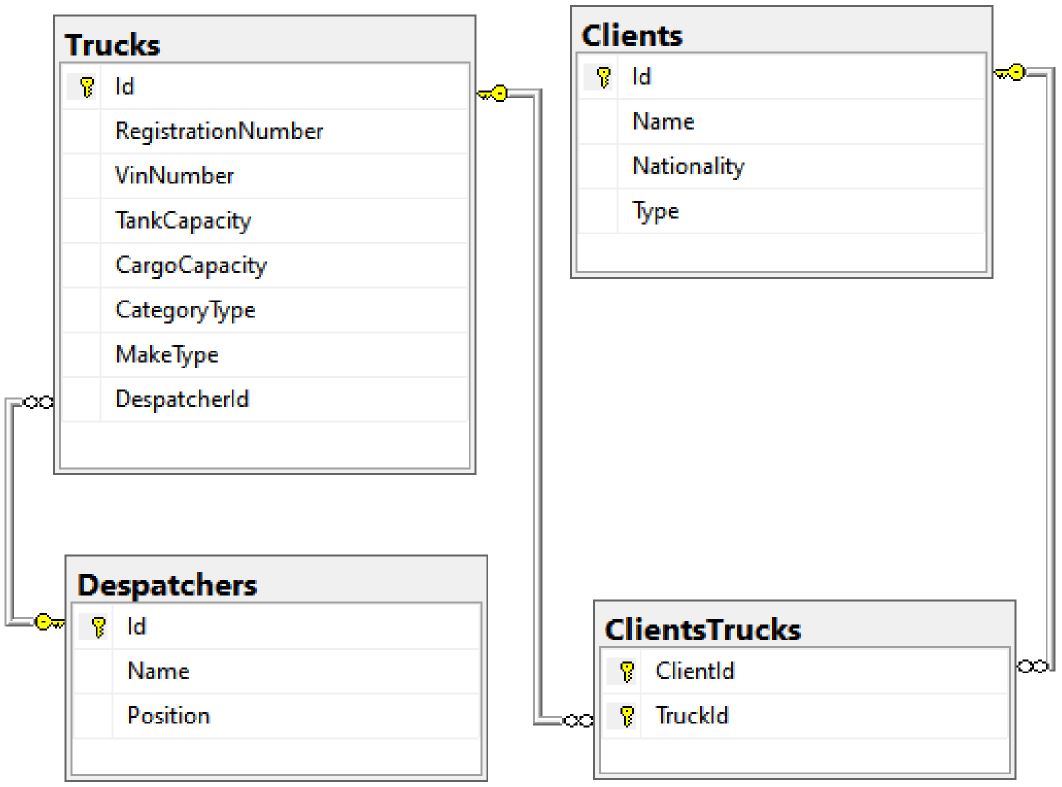
Exam problems for the Databases Advanced - Entity Framework course @ SoftUni.
Submit your solutions in the **SoftUni Judge** system (delete all **bin/obj** and **packages** folders) here.

NOTE: If you want to submit your solution in .NET Core 3.1, please use this link and the resources that are available in the Judge contest.

Before submitting your solutions in the **SoftUni Judge** system, delete all **bin/obj** and **packages** folders. If the **zip** file is still too large, you can delete the **ImportResults**, **ExportsResults** and **Datasets** folders too.

Your task is to create a **database application**, using **Entity Framework Core,** using the **Code First** approach. Design the **domain models** and **methods** for manipulating the data, as described below.

Trucks



1. Project Skeleton Overview

You are given a **project skeleton**, which includes the following folders:

- **Data** – contains the **TrucksContext** class, **Models** folder, which contains the **entity classes** and the **Configuration** class with **connection string**
- **DataProcessor** – contains the **Serializer** and **Deserializer** classes, which are used for **importing** and **exporting** data
- **Datasets** – contains the **.json** and **.xml** files for the import part
- **ImportResults** – contains the **import** results you make in the **Deserializer** class
- **ExportResults** – contains the **export** results you make in the **Serializer** class

2. Model Definition (50 pts)

The application needs to store the following data:

Truck

- **Id** – integer, **Primary Key**
- **RegistrationNumber** – text with length **8.** First two characters are upper letters [A-Z], followed by four digits and the last two characters are upper letters [A-Z] again.
- **VinNumber** – text with length **17** (**required**)
- **TankCapacity** – integer in range [**950…1420**]
- **CargoCapacity** – integer in range [**5000…29000**]
- **CategoryType** – enumeration of type **CategoryType**, with possible values **(Flatbed**, **Jumbo**, **Refrigerated**, **Semi)** (**required**)
- **MakeType** – enumeration of type **MakeType**, with possible values **(Daf**, **Man**, **Mercedes**, **Scania**, **Volvo)** (**required**)
- **DespatcherId** – integer, **foreign key** (**required**)
- **Despatcher** – **Despatcher**
- **ClientsTrucks** – collection of type **ClientTruck**

Client

- **Id** – integer, Primary Key
- **Name** – text with length **[3, 40]** (**required**)
- **Nationality** – **text** with length **[2, 40]** (**required**)
- **Type** – **text** (**required**)
- **ClientsTrucks** – collection of type **ClientTruck**

Despatcher

- **Id** – integer, **Primary Key**
- **Name** – **text** with length **[2, 40]** (**required**)
- **Position** – **text**
- **Trucks** – collection of type **Truck**

ClientTruck

- **ClientId** – integer, **Primary Key**, **foreign key** (**required**)
- **Client** – **Client**
- **TruckId** – integer, **Primary Key**, **foreign key** (**required**)
- **Truck** – **Truck**

3. Data Import (25pts)

For the functionality of the application, you need to create several methods that manipulate the database. The **project skeleton** already provides you with these methods, inside the **Deserializer class**. Usage of Data Transfer Objects and AutoMapper is optional.

Use the provided **JSON** and **XML** files to populate the database with data. Import all the information from those files into the database.

You are **not allowed** to modify the provided **JSON** and **XML** files.

If a record does not meet the requirements from the first section, print an error message:

Error message
`Invalid Data!`

XML Import

Import Despatchers

Using the file "**`despatchers.xml`**", import the data from the file into the database. Print information about each imported object in the format described below.

Constraints

- If there are **any validation errors** for the **despatcher** entity (such as invalid **name**), **do not** import any part of the entity and **append an error message** to the **method output**.
- If there is a **null or empty position** for **despatcher entity**, **do not** import any part of the entity and **append an error message** to the **method output**.
- If there are **any validation errors** for the **truck** entity (such as invalid **registration number** or **missing VIN number**, **tank capacity** or **weight capacity** is invalid), **do not import it (only the truck itself, not the whole despatcher info)** and **append an error message to the method output**.

Success message
`Successfully imported despatcher - {`**`despatcherName`**`} with {`**`trucksCount`**`} trucks.`

Example

`despatchers.xml`

```
<?xml version='1.0' encoding='UTF-8'?>
<Despatchers>
   <Despatcher>
      <Name>Genadi Petrov</Name>
      <Position>Specialist</Position>
      <Trucks>
         <Truck>
            <RegistrationNumber>CB0796TP</RegistrationNumber>
            <VinNumber>YS2R4X211D5318181</VinNumber>
            <TankCapacity>1000</TankCapacity>
            <CargoCapacity>23999</CargoCapacity>
            <CategoryType>0</CategoryType>
            <MakeType>3</MakeType>
         </Truck>
         <Truck>
            <RegistrationNumber>CB0818TP</RegistrationNumber>
            <VinNumber>YS2R4X211D5318128</VinNumber>
            <TankCapacity>1400</TankCapacity>
            <CargoCapacity>29004</CargoCapacity>
            <CategoryType>3</CategoryType>
            <MakeType>0</MakeType>
        </Truck>
      </Trucks>
   </Despatcher>
...
</Despatchers>
```

Output

```
Invalid data!
Successfully imported despatcher - Genadi Petrov with 1 trucks.
Invalid data!
...
```

Upon **correct import logic**, you should have imported **30 despatchers** and **65 trucks**.

JSON Import

Import Clients

Using the file "**clients.json**", import the data from that file into the database. Print information about each imported object in the format described below.

Constraints

- If any validation errors occur (such as invalid **name**, missing or invalid **nationality** or type "**usual**"), **do not** import any part of the entity and **append an error message** to the **method output**.
- Take only the unique trucks.
- If a **truck** does **not exist** in the database, **append an error message** to the **method output** and **continue** with the next **truck**.

Success message
`Successfully imported client - {clientName} with {clientTrucksCount} trucks.`

Example

clients.json

```
[
  {
    "Name": "Kuenehne + Nagel (AG & Co.) KGKuenehne + Nagel (AG & Co.) KGKuenehne + 
Nagel (AG & Co.) KG",
    "Nationality": "The Netherlands",
    "Type": "golden",
    "Trucks": [
      1,
      68,
      73,
      17,
      98,
      98
    ]
  },
  {
    "Name": "DHL SERVICES LIMITED",
    "Nationality": "The United Kingdom",
    "Type": "golden",
    "Trucks": [
      4,
      17,
      17,
      98
    ]
  }
…
]
```

Output

```
Invalid data!
Invalid data!
Successfully imported client - DHL SERVICES LIMITED with 2 trucks.
...
```

Upon **correct import logic**, you should have imported **32 clients** and **113 trucks**.

4. Data Export (25 pts)

Use the provided methods in the `Serializer` class. Usage of **Data Transfer Objects** and **`AutoMapper`** is **optional**.

JSON Export

Export Clients With Most Trucks

Select the **top 10 clients** that have **at least one truck** that **their tank capacity is bigger or equal** to the **given capacity. Select** them with their **trucks** which meet the **same criteria** (their tank capacity is bigger or equal to the given one). For each **client**, export their **name** and their **trucks.** For each **truck**, export its **registration number**, **VIN number**, **tank capacity**, **cargo capacity**, **category** and **make type.** Order the **trucks** by **make type (ascending),** then by **cargo capacity** (**descending**). Order the **clients** by **all trucks** (**meeting above condition**) **count** (**descending**), then by **name** (**ascending**).

NOTE: You **may** need to **call `.ToArray()`** function **before the selection** in order to **detach entities from the database** and **avoid runtime errors** (**EF Core bug**).

Example

Serializer.ExportClientsWithMostTrucks(context, capacity)

```
[
    {
    "Name": "Gebr. Mayer GmbH & Co. KG",
    "Trucks": [
      {
        "TruckRegistrationNumber": "CT5206MM",
        "VinNumber": "WDB96341311261287",
        "TankCapacity": 1420,
        "CargoCapacity": 28058,
        "CategoryType": "Flatbed",
        "MakeType": "Daf"
      },
      {
        "TruckRegistrationNumber": "CT4453MP",
        "VinNumber": "WDB96341311269859",
        "TankCapacity": 1420,
        "CargoCapacity": 28058,
        "CategoryType": "Jumbo",
        "MakeType": "Man"
      },
      {
        "TruckRegistrationNumber": "CT6631TT",
        "VinNumber": "XLRTE47MS1G141929",
        "TankCapacity": 1200,
        "CargoCapacity": 27303,
        "CategoryType": "Refrigerated",
        "MakeType": "Scania"
      },
      {
        "TruckRegistrationNumber": "CT5204MM",
        "VinNumber": "WDB96341311261293",
        "TankCapacity": 1420,
        "CargoCapacity": 28058,
        "CategoryType": "Jumbo",
        "MakeType": "Volvo"
      },
      {
        "TruckRegistrationNumber": "CT2706TT",
        "VinNumber": "YS2R4X211D5333237",
        "TankCapacity": 1400,
        "CargoCapacity": 27000,
        "CategoryType": "Flatbed",
        "MakeType": "Volvo"
      }
    ]
  }
…
]
```

XML Export

Export Despatchers with Their Trucks

Export all **despatchers** that are managing at least **one** truck. For each **despatcher**, export their **name** and **trucks count**. For each **truck**, export its registration number and **make type.** Order the **trucks** by **registration number** (**ascending**). Order the **despatchers** by **trucks count** (**descending**), then by **name** (**ascending**).

NOTE: You **may** need to **call .ToArray()** function **before the selection,** in order to **detach entities from the database** and **avoid runtime errors** (**EF Core bug**).

Example

Serializer.ExportDespatchersWithTheirTrucks(context)

```
<?xml version="1.0" encoding="utf-16"?>
<Despatchers>
  <Despatcher TrucksCount="6">
    <DespatcherName>Vladimir Hristov</DespatcherName>
    <Trucks>
      <Truck>
        <RegistrationNumber>CT2462BX</RegistrationNumber>
        <Make>Scania</Make>
      </Truck>
      <Truck>
        <RegistrationNumber>CT2699CK</RegistrationNumber>
        <Make>Daf</Make>
      </Truck>
      <Truck>
        <RegistrationNumber>CT5203MM</RegistrationNumber>
        <Make>Mercedes</Make>
      </Truck>
      <Truck>
        <RegistrationNumber>CT5204MM</RegistrationNumber>
        <Make>Volvo</Make>
      </Truck>
      <Truck>
```

```
        <RegistrationNumber>CT5205MM</RegistrationNumber>
        <Make>Scania</Make>
      </Truck>
      <Truck>
        <RegistrationNumber>CT5206MM</RegistrationNumber>
        <Make>Daf</Make>
      </Truck>
    </Trucks>
  </Despatcher>
…
</Despatchers>
```