Databases Advanced Retake Exam – 11 April 2023

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.

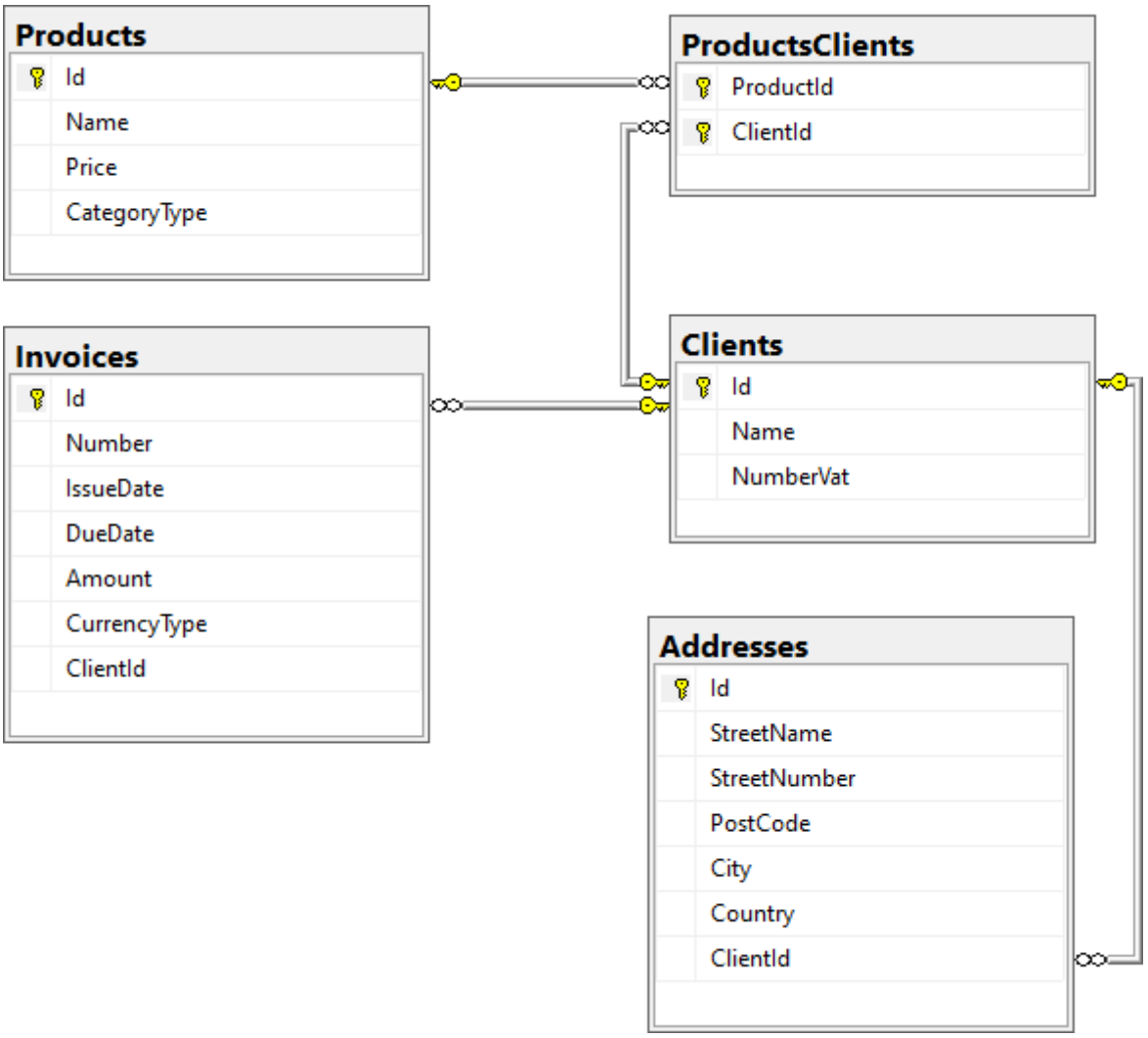
Before submitting your solutions in the **SoftUni Judge** system, delete all **bin/obj** and **packages** folders. If the **zip** file is still too large, you can delete the **ImportResults**, **ExportsResults** and **Datasets** folders too.

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.

NOTE: Don't forget that it's a good practice when implementing a **collection** to write your code orientied towards the **interface**, not the implementation.

NOTE: If you want to use AutoMapper, don't forget to go to the **methods** of the **Deserializer** and/or **Serializer** classes, in which you want to use automapping, and initialize the **MapperConfiguration**.

Invoices



1. Project Skeleton Overview

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

- **Data** – contains the **`InvoicesContext`** class, **`Models`** folder which contains the **entity classes,** and the **`Configuration`** class with **the connection string**
- **`DataProcessor`** – contains the **`Deserializer`** and **`Serializer`** 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:

Product

- **`Id`** – **integer**, **Primary Key**
- **`Name`** – **text** with length **[9…30] (required)**
- **`Price`** – **`decimal`** in range **[`5.00`…`1000.00`] (required)**
- **`CategoryType`** – **enumeration** of type **`CategoryType`**, with possible values **(ADR**, **`Filters`**, **`Lights`**, **`Others`**, **`Tyres`**) **(required)**
- **`ProductsClients`** – collection of type **`ProductClient`**

Address

- **`Id`** – **integer**, **Primary Key**
- **`StreetName`** – **text** with length **[10…20] (required)**
- **`StreetNumber`** – **integer (required)**
- **`PostCode`** – **text (required)**
- **`City`** – **text** with length **[5…15] (required)**
- **`Country`** – **text** with length **[5…15] (required)**
- **`ClientId`** – **integer**, **foreign key** (**required**)
- **`Client`** – **`Client`**

Invoice

- **`Id`** – **integer**, **Primary Key**
- **`Number`** – **integer** in range **[`1,000,000,000`…`1,500,000,000`] (required)**
- **`IssueDate`** – **`DateTime`** **(required)**
- **`DueDate`** – **`DateTime`** **(required)**
- **`Amount`** – **`decimal`** **(required)**
- **`CurrencyType`** – **enumeration** of type **`CurrencyType`**, with possible values **(BGN**, **EUR**, **USD) (required)**
- **`ClientId`** – **integer**, **foreign key** (**required**)
- **`Client`** – **`Client`**

Client

- **`Id`** – integer, **Primary Key**
- **`Name`** – **text** with length **[10…25] (required)**

- **NumberVat** – **text** with length **[10…15] (required)**
- **Invoices** – collection of type **Invoice**
- **Addresses** – collection of type **Address**
- **ProductsClients** – collection of type **ProductClient**

ProductClient

- **ProductId** – **integer**, **Primary Key**, **foreign key** (**required**)
- **Product** – **Product**
- **ClientId** – **integer**, **Primary Key**, **foreign key** (**required**)
- **Client** – **Client**

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**.

NOTE: 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 Clients

Using the file "**clients.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 **client** entity (such as **invalid name or vat number**), **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 **address** entity (such as invalid or null or empty **street name**, **invalid street number, invalid or missing post code, city or country**), **do not import it (only the address itself, not the whole client info)** and **append an error message to the method output**.

Success message
Successfully imported {**clientName**}.

Example

clients.xml

```
<?xml version="1.0" encoding="UTF-8" ?>
<Clients>
  <Client>
    <Name>LiCB</Name>
```

```
    <NumberVat>BG5464156654654654</NumberVat>
    <Addresses>
      <Address>
        <StreetName>Gnigler strasse</StreetName>
        <StreetNumber>57</StreetNumber>
        <PostCode>5020</PostCode>
        <City>Salzburg</City>
        <Country>Austria</Country>
      </Address>
    </Addresses>
  </Client>
  …
</Clients>
```

Output
Invalid data! Invalid data! Invalid data! Invalid data! Invalid data! Successfully imported client SPEDOX,SRO. ...

Upon **correct import logic**, you should have imported **29 clients**.

JSON Import

Import Invoices

Using the file "**invoices.json**", 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 (such as invalid **issue or due date, due date is before issue date, invalid amount, currency type or client**), **do not import any part of the entity** and **append an error message to the method output**.

NOTE: Do not forget to use **CultureInfo.InvariantCulture.**

Success message
Successfully imported invoice with number {**invoiceNumber**}.

Example

invoices.json

```
[
  {
    "Number": 1427940691,
    "IssueDate": "2022-08-29T00:00:00",
    "DueDate": "2022-10-28T00:00:00",
    "Amount": 913.13,
    "CurrencyType": 1,
    "ClientId": 1
  },
  {
    "Number": 142796902,
    "IssueDate": "2022-08-31T00:00:00",
```

```
    "DueDate": "2022-10-30T00:00:00",
    "Amount": 891.76,
    "CurrencyType": 2,
    "ClientId": 2
  },
  {
    "Number": 1427940690,
    "IssueDate": "2022-09-05T00:00:00",
    "DueDate": "2022-11-04T00:00:00",
    "Amount": 704.48,
    "CurrencyType": 3,
    "ClientId": 3
  },
…
]
```

Output

`Successfully imported invoice with number 1427940691.`
`Invalid data!`
`Invalid data!`
`Invalid data!`

Upon **correct import logic**, you should have imported **55 invoices**.

Import Products

Using the file "**products.json**", 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 (such as invalid product name, invalid price or category type), **do not import any part of the entity** and **append an error message to the method output**.
- Take only unique clients.
- If a **client** does **not exist** in the database, **append an error message** to the **method output** and **continue** with the next **client**.

Success message
`Successfully imported product - {productName} with {clientsCount} clients.`

Example

products.json

```
[
  {
    "Name": "ADR plate",
    "Price": 14.97,
    "CategoryType": 1,
    "Clients": [
      1,
      105,
      1,
      5,
      15
    ]
  },
  {
    "Name": "ADR light",
```

```
    "Price": 21.25,
    "CategoryType": 1,
    "Clients": [
      1,
      85,
      81,
      80,
      5,
      9
    ]
  },
…
]
```

Output

```
Invalid data!
Successfully imported product - ADR plate with 3 clients.
Invalid data!
Invalid data!
Invalid data!
Successfully imported product - ADR light with 3 clients.
```

Upon **correct import logic**, you should have imported **91 products** with **137 clients**.

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 Products With Most Clients

Select the **top 5 products** that have been **sold to at least one client, where the client's name is at least as long as the given number. Select** them with their **clients** who meet the **same criteria** (the client's name is at least as long as the given number). For each **product**, export their **name, price, category type** and their **clients.** For each **client**, export their **name** and **vat number.** Order the **clients** by **name** (**ascending**). Order the **products** by **all clients** (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.ExportProductsWithMostClients(context, nameLength)`

```
[
  {
    "Name": "MAHLE KX400KIT",
    "Price": 26.13,
    "Category": "Tyres",
    "Clients": [
      {
        "Name": "BTS GMBH CO KG",
        "NumberVat": "DE814592224"
      },
      {
        "Name": "DPS EUROPE AB",
        "NumberVat": "SE556488676901"
```

```
      },
      {
        "Name": "FREIGHTS PC",
        "NumberVat": "EL801106064"
      },
      {
        "Name": "KAMEEN LOGISTIC KG",
        "NumberVat": "ATU75339778"
      },
    …
  },
…
]
```

XML Export

Export Clients with Their Invoices

Export all **clients** that have at least one issued **invoices**, issued after the given date. For each **client**, export their **name, vat number** and **invoices count**. For each **invoice**, export its **number, amount, currency** and **due date.** Order the **invoices** by **issue date** (**ascending**), then by **due date** (**descending**). Order the **clients** by **invoices 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**).

NOTE: Do not forget to use **`CultureInfo.InvariantCulture`.** Use formatting (**"d"**).

Example

`Serializer.ExportClientsWithTheirInvoices(context, date)`

```
<?xml version="1.0" encoding="utf-16"?>
<Clients>
  <Client InvoicesCount="9">
    <ClientName>SPEDOX,SRO</ClientName>
    <VatNumber>SK2023911087</VatNumber>
    <Invoices>
      <Invoice>
        <InvoiceNumber>1063259096</InvoiceNumber>
        <InvoiceAmount>167.22</InvoiceAmount>
        <DueDate>02/19/2023</DueDate>
        <Currency>EUR</Currency>
      </Invoice>
      <Invoice>
        <InvoiceNumber>1427940691</InvoiceNumber>
        <InvoiceAmount>913.13</InvoiceAmount>
        <DueDate>10/28/2022</DueDate>
        <Currency>EUR</Currency>
      </Invoice>
      …
    </Invoices>
    …
  </Client>
  …
</Clients>
```