Databases Advanced Exam - 08 August 2020

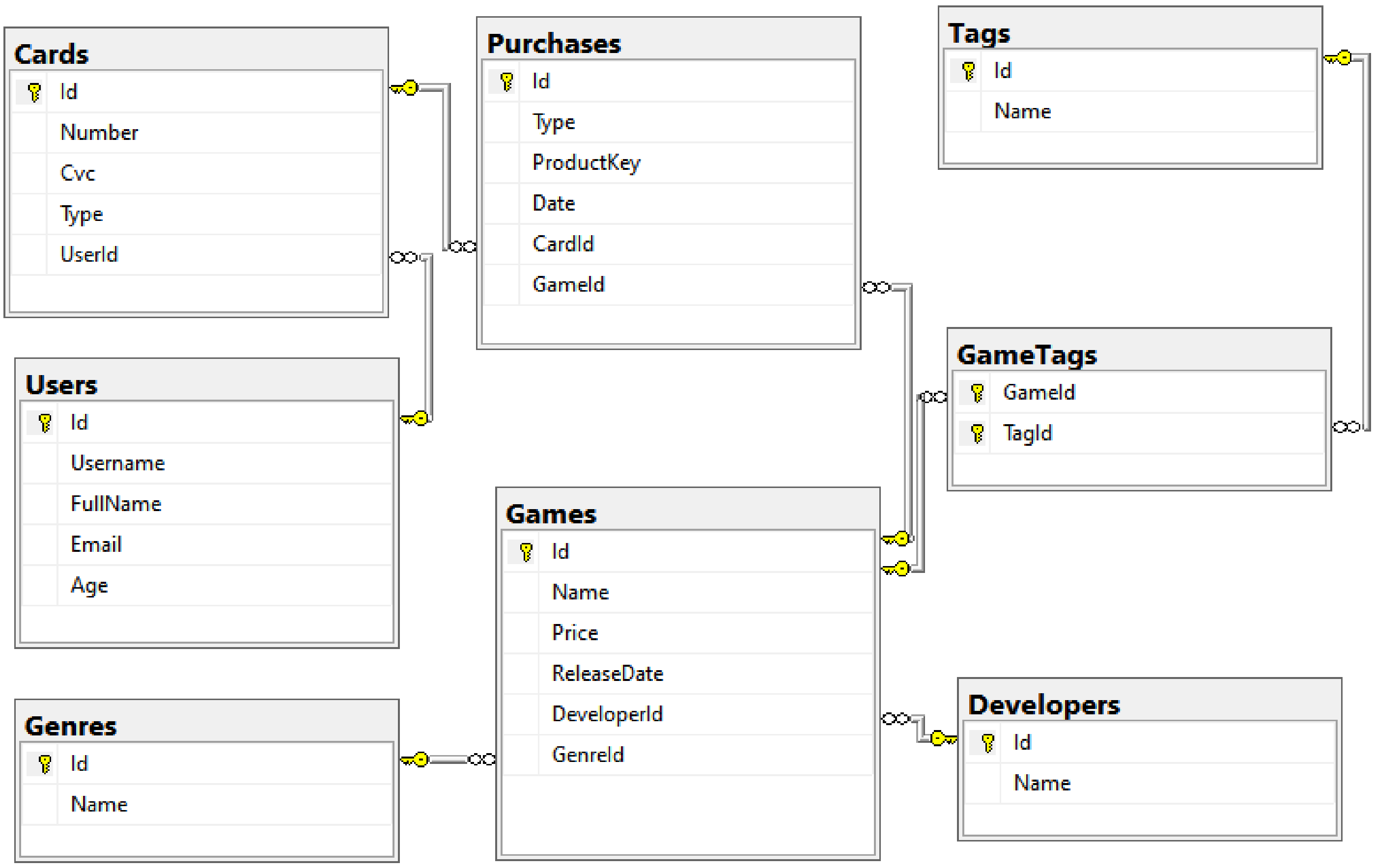
Exam problems for the [Databases Advanced - Entity Framework course @ SoftUni](#).
Submit your solutions in the **SoftUni Judge** system (delete all **`bin/obj`** and **`packages`** folders) [here](#).

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.

VaporStore



Project Skeleton Overview

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

- **`Data`** – contains the **`VaporStoreDbContext`** 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 **export** results you make in the **Deserializer** class
- **ExportResults** – contains the **import** results you make in the **Serializer** class

Problem 1. Model Definition (50 pts)

Note: Foreign key navigation properties are required!

The application needs to store the following data:

Game

- **Id** – integer, **Primary Key**
- **Name** – **text (required)**
- **Price** – **decimal** (**non-negative, minimum value: 0**) **(required)**
- **ReleaseDate** – **Date (required)**
- **DeveloperId** – **integer**, foreign key **(required)**
- **Developer** – the game's **developer (required)**
- **GenreId** – **integer**, foreign key **(required)**
- **Genre** – the game's **genre (required)**
- **Purchases** - collection of type **Purchase**
- **GameTags** - collection of type **GameTag**. Each game must have **at least one** tag.

Developer

- **Id** – integer, **Primary Key**
- **Name** – **text (required)**
- **Games** - collection of type **Game**

Genre

- **Id** – integer, **Primary Key**
- **Name** – **text (required)**
- **Games** - collection of type **Game**

Tag

- **Id** – integer, **Primary Key**
- **Name** – **text (required)**
- **GameTags** – collection of type **GameTag**

GameTag

- **GameId** – integer, **Primary Key**, **foreign key (required)**
- **Game** – **Game**
- **TagId** – integer, **Primary Key**, **foreign key (required)**
- **Tag** – **Tag**

User

- **Id** – integer, **Primary Key**

- **`Username`** – **text with length `[3, 20]` (required)**
- **`FullName`** – **text,** which has **two** words, **consisting of Latin letters**. **Both** start with an **upper letter** and are followed by **lower letters**. The two words are separated by a **single space** (ex. **`"John Smith"`**) **(required)**
- **`Email`** – **text (required)**
- **`Age`** – **integer** in the **range `[3, 103]` (required)**
- **`Cards`** – collection of type **Card**

Card

- **`Id`** – integer, **Primary Key**
- **`Number`** – **text**, which consists of **4 pairs** of **4 digits**, separated by spaces (ex. "**`1234 5678 9012 3456`**") **(required)**
- **`Cvc`** – **text,** which consists of 3 digits (ex. "**`123`**") **(required)**
- **`Type`** – **enumeration** of type **`CardType`**, with possible values ("**`Debit`**", "**`Credit`**") **(required)**
- **`UserId`** – **integer**, foreign key **(required)**
- **`User`** – the card's **user (required)**
- **`Purchases`** – collection of type **Purchase**

Purchase

- **`Id`** – integer, **Primary Key**
- **`Type`** – **enumeration** of type **`PurchaseType`**, with possible values ("**`Retail`**", "**`Digital`**") **(required)**
- **`ProductKey`** – **text**, which consists of **3 pairs** of **4 uppercase Latin letters and digits**, separated by **dashes** (ex. "**`ABCD-EFGH-1J3L`**") **(required)**
- **`Date`** – **Date (required)**
- **`CardId`** – **integer**, foreign key **(required)**
- **`Card`** – the purchase's **card (required)**
- **`GameId`** – **integer**, foreign key **(required)**
- **`Game`** – the purchase's **game (required)**

Problem 2. Data Import (30pts)

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`

JSON Import (20 pts)

Import Games, Developers, Genres and Tags

Using the file "**`games.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 if a **`Price`** is negative, a **Name**/**`ReleaseDate`**/**`Developer`**/**`Genre`** is missing, **`Tags`** are **missing** or **empty**), **do not import any part of the entity** and **append an error message** to the **method output**.
- Dates are always in the format "**`yyyy-MM-dd`**". Do not forget to use **`CultureInfo.InvariantCulture`**!
- If a **developer/genre/tag** with that name **doesn't exist**, **create it**.
- If a game is **invalid**, **do not** import its **genre, developer or tags**.

Example

games.json

```
[
  {
    "Price": 0,
    "ReleaseDate": "2013-07-09",
    "Developer": "Valid Dev",
    "Genre": "Valid Genre",
    "Tags": ["Valid Tag"]
  },
  {
    "Name": "Invalid",
    "Price": -5,
    "ReleaseDate": "2013-07-09",
    "Developer": "Valid Dev",
    "Genre": "Valid Genre",
    "Tags": ["Valid Tag"]
  },
  {
    "Name": "Invalid",
    "Price": 0,
    "ReleaseDate": "2013-07-09",
    "Genre": "Valid Genre",
    "Tags": ["Valid Tag"]
  },
  {
    "Name": "Invalid",
    "Price": 0,
    "ReleaseDate": "2013-07-09",
    "Developer": "Valid Dev",
    "Tags": ["Valid Tag"]
  },
  {
    "Name": "Invalid",
    "Price": 0,
    "ReleaseDate": "2013-07-09",
    "Developer": "Valid Dev",
    "Genre": "Valid Genre",
    "Tags": []
  },
  {
    "Name": "Dota 2",
    "Price": 0,
    "ReleaseDate": "2013-07-09",
    "Developer": "Valve",
    "Genre": "Action",
    "Tags": [
      "Multi-player",
      "Co-op",
      "Steam Trading Cards",
      "Steam Workshop",
      "SteamVR Collectibles",
      "In-App Purchases",
      "Valve Anti-Cheat enabled"
    ]
  },
...
]
```

Output

```
Invalid Data
Invalid Data
Invalid Data
Invalid Data
Invalid Data
Added Dota 2 (Action) with 7 tags
...
```

Upon **successful import** you should **print** "Added `{gameName}` (`{gameGenre}`) with `{tagsCount}` tags"!

Upon **correct import logic**, you should have imported **74 games**, **66 developers**, **12 genres** and **25 tags**.

Import Users and Cards

Using the file "**`users.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 **full name**, too **short/long username**, missing **email**, too **low/high age**, incorrect **card number/CVC**, **no** cards, etc.), **do not import any part of the entity** and **append an error message to the method output**.
- If any validation errors occur with card entity (such as invalid **number/CVC**, invalid **Type**) you should not **import any part of the User entity holding this card** and **append an error message to the method output**.

Example

users.json

```
[
  {
    "FullName": "",
    "Username": "invalid",
    "Email": "invalid@invalid.com",
    "Age": 20,
    "Cards": [
      {
        "Number": "1111 1111 1111 1111",
        "CVC": "111",
        "Type": "Debit"
      }
    ]
  },
  {
    "FullName": "Invalid Invalidman",
    "Username": "",
    "Email": "invalid@invalid.com",
    "Age": 20,
    "Cards": [
      {
        "Number": "1111 1111 1111 1111",
        "CVC": "111",
        "Type": "Debit"
      }
    ]
  },
  {
    "FullName": "Invalid Invalidman",
    "Username": "invalid",
    "Email": "",
    "Age": 20,
    "Cards": [
      {
        "Number": "1111 1111 1111 1111",
        "CVC": "111",
        "Type": "Debit"
      }
    ]
  },
  {
    "FullName": "Invalid Invalidman",
    "Username": "invalid",
    "Email": "invalid@invalid.com",
    "Age": 2,
    "Cards": [
      {
        "Number": "1111 1111 1111 1111",
        "CVC": "111",
        "Type": "Debit"
      }
    ]
  },
  {
    "FullName": "Invalid Invalidman",
    "Username": "invalid",
    "Email": "invalid@invalid.com",
    "Age": 104,
    "Cards": [
      {
        "Number": "1111 1111 1111 1111",
        "CVC": "111",
        "Type": "Debit"
      }
    ]
  },
  {
    "FullName": "Lorrie Silbert",
    "Username": "lsilbert",
    "Email": "lsilbert@yahoo.com",
    "Age": 33,
    "Cards": [
      {
        "Number": "1833 5024 0553 6211",
        "CVC": "903",
        "Type": "Debit"
      },
      {
        "Number": "5625 0434 5999 6254",
        "CVC": "570",
        "Type": "Credit"
      },
      {
        "Number": "4902 6975 5076 5316",
        "CVC": "091",
        "Type": "Debit"
      }
    ]
  },
  {
    "FullName": "Anita Ruthven",
    "Username": "aruthven",
    "Email": "aruthven@gmail.com",
    "Age": 75,
    "Cards": [
      {
        "Number": "5208 8381 5687 8508",
        "CVC": "624",
        "Type": "Debit"
      }
    ]
  },
...
]
```

Output

```
Invalid Data
Invalid Data
Invalid Data
Invalid Data
Invalid Data
Imported lsilbert with 3 cards
Imported aruthven with 1 cards
```

Upon **successful import** you should **print** "**`Imported {username} with {cardsCount} cards`**"!

Upon **correct import logic**, you should have imported **30 users** and **61 cards**.

XML Import (10 pts)

Import Purchases

Using the file "**`purchases.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, **do not import any part of the entity** and **append an error message to the method output**.
- Dates will **always** be in the format: "**`dd/MM/yyyy HH:mm`**". Do not forget to use **`CultureInfo.InvariantCulture`**!

Example

`purchases.xml`

```
<Purchases>
  <Purchase title="Dungeon Warfare 2">
    <Type>Digital</Type>
    <Key>ZTZ3-0D2S-G4TJ</Key>
    <Card>1833 5024 0553 6211</Card>
    <Date>07/12/2016 05:49</Date>
  </Purchase>
  <Purchase title="The Crew 2">
    <Type>Retail</Type>
    <Key>DCU0-S60G-NTQJ</Key>
    <Card>5208 8381 5687 8508</Card>
    <Date>22/01/2017 09:33</Date>
  </Purchase>
  <Purchase title="Slay the Spire">
    <Type>Digital</Type>
    <Key>KIJH-7JG6-0BHP</Key>
    <Card>5208 8381 5687 8508</Card>
    <Date>11/01/2018 19:46</Date>
  </Purchase>
...
</Purchases>
```

Output

`Imported Dungeon Warfare 2 for lsilbert`
`Imported The Crew 2 for aruthven`
`Imported Slay the Spire for aruthven`
`...`

Upon **successful import** you should **print** "`Imported {gameName} for {username}`"!

Upon **correct import logic**, you should have imported **88 purchases**.

Problem 3. Data Export (20 pts)

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

JSON Export (10 pts)

Export All Games by Genres

The given method in the project skeleton receives an **array of genre names**. Export all **games** in those **genres, which have any purchases**. For each **genre**, export its **id**, **genre name**, **games** and **total players** (total purchase count). For each **game**, export its **id**, **name**, **developer**, tags (separated by **", "**) and **total player count (purchase count)**. Order the **games** by **player count** (**descending**), then by **game id** (**ascending**).

Order the **genres** by **total player count (descending)**, then by **genre id** (**ascending**)

Example

`Serializer.ExportGamesByGenres(context, new[] { "Nudity", "Violent" })`

```
[
  {
    "Id": 4,
    "Genre": "Violent",
    "Games": [
      {
        "Id": 49,
        "Title": "Warframe",
        "Developer": "Digital Extremes",
        "Tags": "Single-player, In-App Purchases, Steam Trading Cards, Co-op, Multi-
player, Partial Controller Support",
        "Players": 6
      },
      {
        "Id": 22,
        "Title": "Soul at Stake",
        "Developer": "Chongming Studio",
        "Tags": "Co-op, Multi-player, Online Multi-Player, Steam Cloud, Online Co-
op",
        "Players": 2
      },
      {
        "Id": 40,
        "Title": "Black Desert Online",
        "Developer": "Pearl Abyss",
        "Tags": "In-App Purchases, Steam Trading Cards, Online Multi-Player, Online
Co-op, MMO, Partial Controller Support",
        "Players": 1
      },
      {
        "Id": 71,
        "Title": "Dead by Daylight",
        "Developer": "Behaviour Digital Inc.",
        "Tags": "Steam Trading Cards, Co-op, Multi-player, Steam Achievements,
Online Multi-Player, Full controller support, Steam Cloud, Online Co-op",
        "Players": 1
      }
    ],
    "TotalPlayers": 10
  }
...
]
```

XML Export (10 pts)

Export User Purchases by Type

Use the method provided in the project skeleton, which receives a **purchase type** as a **string**. Export all users who have any purchases. For each **user**, export their **username**, **purchases for that purchase type** and **total money spent for that purchase type**. For each **purchase**, export its **card number**, **CVC**, **date** in the format "**`yyyy-MM-dd HH:mm`**" (make sure you use **`CultureInfo.InvariantCulture`**) and the **game**. For each **game**, export its **title** (name), **genre** and **price**. Order the **users** by **total spent** (**descending**), then by **username** (**ascending**). For each user, order the purchases by **date (ascending)**. **Do not** export users, who **don't have any purchases**.

Note: **All prices** must be in **decimal** without any **formatting**!

Example

`Serializer.ExportUserPurchasesByType(context, "Digital")`

```
<Users>
  <User username="mgraveson">
    <Purchases>
      <Purchase>
        <Card>7991 7779 5123 9211</Card>
        <Cvc>340</Cvc>
        <Date>2017-08-31 17:09</Date>
        <Game title="Counter-Strike: Global Offensive">
          <Genre>Action</Genre>
          <Price>12.49</Price>
        </Game>
      </Purchase>
      <Purchase>
        <Card>7790 7962 4262 5606</Card>
        <Cvc>966</Cvc>
        <Date>2018-02-28 08:38</Date>
        <Game title="Tom Clancy's Ghost Recon Wildlands">
          <Genre>Action</Genre>
          <Price>59.99</Price>
        </Game>
      </Purchase>
    </Purchases>
    <TotalSpent>72.48</TotalSpent>
  </User>
  <User username="vsjollema">
    <Purchases>
      <Purchase>
        <Card>8608 6806 8238 3092</Card>
        <Cvc>081</Cvc>
        <Date>2017-10-01 01:14</Date>
        <Game title="Garry's Mod">
          <Genre>Indie</Genre>
          <Price>9.99</Price>
        </Game>
      </Purchase>
      <Purchase>
        <Card>4846 1275 4235 3039</Card>
        <Cvc>268</Cvc>
        <Date>2017-11-12 03:51</Date>
        <Game title="Total War: WARHAMMER II">
          <Genre>Action</Genre>
          <Price>59.99</Price>
        </Game>
      </Purchase>
```

```xml
    </Purchases>
    <TotalSpent>69.98</TotalSpent>
  </User>
...
</Users>
```