# Databases Advanced Exam - 08 August 2020

Exam problems for the [Databases Advanced - Entity Framework course @ SoftUni.](https://softuni.bg/trainings/2843/entity-framework-core-june-2020/internal) Submit your solutions in the **SoftUni judge** system (delete all "**bin**"/"**obj**" and "**packages**" folders).

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 Deserializerclasses, 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** startwith 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 consistsof **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 consistsof **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** 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** 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**!

Използвайте метода, предоставен в скелета на проекта, който получава вид на покупка като низ. Експортирайте всички потребители, които имат някакви покупки. Експортирайте потребителското си име за всеки потребител, покупките за този вид покупка и общите суми, изразходвани за този вид покупка. За всяка покупка експортирайте номера на картата, CVC, датата във формат "yyyy-MM-dd HH:mm" (уверете се, че използвате CultureInfo.InvariantCulture) и играта. За всяка игра експортирайте заглавието (името), жанра и цената. Поръчайте на потребителите по общо изразходвани (низходящ), след това по потребителско име (възходящо). За всеки потребител поръчайте покупките по дата (възходящ). Не експортирайте потребители, които не разполагат с никакви покупки. Забележка: Всички цени трябва да бъдат десетични без никакво форматиране!

##### 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>  </Purchases>  <TotalSpent>69.98</TotalSpent>  </User>  ...  </Users> |