# Databases Advanced Retake Exam – 16 December 2021

Exam problems for the [Databases Advanced - Entity Framework course @ SoftUni](https://softuni.bg/trainings/3492/entity-framework-core-october-2021). Submit your solutions in the **SoftUni judge** system (delete all "**bin**"/"**obj**" 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.

# Artillery



## Project Skeleton Overview

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

* Data – contains the **ArtilleryContext** class, **Models** folder which contains the **entity classes,**and the **Configuration**class with **the connection string**
* DataProcessor – contains the Deserializer and Serializerclasses, 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

## Model Definition (50 pts)

***Note: Foreign key navigation properties are required!***

The application needs to store the following data:

### Country

Id – integer, **Primary Key**

CountryName – **text with length [4, 60]** **(required)**

**ArmySize** – integer **in the range [50\_000….10\_000\_000]** **(required)**

CountriesGuns – a collection of CountryGun

### Manufacturer

Id – integer, **Primary Key**

ManufacturerName – **unique** text with length [4…40] (required)

Founded – **text with length [10…100] (required)**

Guns – a collection of Gun

### Shell

Id – integer, **Primary Key**

ShellWeight – double in range **[2…1\_680]** **(required)**

Caliber – text with length **[4…30] (required)**

Guns – a collection of Gun

### Gun

Id – integer, **Primary Key**

ManufacturerId – **integer, foreign key (required)**

GunWeight– integer **in range [100…1\_350\_000]** **(required)**

BarrelLength – **double in range [2.00….35.00] (required)**

NumberBuild – **integer**

Range – integer **in range [1….100\_000]** **(required)**

**GunType** – **enumeration** of **GunType**, with possible values **(Howitzer, Mortar,** **FieldGun, AntiAircraftGun, MountainGun, AntiTankGun)** **(required)**

ShellId – **integer, foreign key (required)**

CountriesGuns – a collection of CountryGun

### CountryGun

CountryId – **Primary Key integer, foreign key (required)**

* GunId – **Primary Key integer, foreign key (required)**

**Test your solution in judge, by uploading a .zip file with the following files:**

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## 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** is **optional but** **highly recommended**.

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 Countries

Using the file countries.xml, 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 unvalid **country name or army size,** **do not** import any part of the entity and **append an error message "Invalid data."** to the **method output**.

|  |
| --- |
| **Success message** |
| **Successfully import {countryName} with {armySize} army personnel.** |

##### Example

|  |
| --- |
| **countries.xml** |
| <?xml version='1.0' encoding='UTF-8'?>  <Countries>  <Country>  <CountryName>Afghanistan</CountryName>  <ArmySize>1697064</ArmySize>  </Country>  <Country>  <CountryName>Afghan</CountryName>  <ArmySize>16</ArmySize>  </Country>  <Country>  <CountryName>Albania</CountryName>  <ArmySize>6296389</ArmySize>  </Country>  <Country>  <CountryName></CountryName>  <ArmySize>2401223</ArmySize>  </Country>  <Country>  <CountryName>Algeria</CountryName>  <ArmySize>1284683</ArmySize>  </Country>  …  </Countries> |
| **Output** |
| **Successfully import Afghanistan with 1697064 army personnel.**  **Invalid data.**  **Successfully import Albania with 6296389 army personnel.**  **Invalid data.**  **Successfully import Algeria with 1284683 army personnel.**  **...** |

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

#### Import Manufacturers

Using the file manufacturers.xml, 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 **manufacturer name or founded**, **do not** import any part of the entity and **append an error message** **"Invalid data."** to the **method output**.

The **Founded** entity will be separated by comma and space **", "**.

|  |
| --- |
| **Success message** |
| **Successfully import manufacturer {manufacturerName} founded in {townName, countryName}.** |

##### Example

|  |
| --- |
| **manufacturers.xml** |
| <?xml version='1.0' encoding='UTF-8'?>  <Manufacturers>  <Manufacturer>  <ManufacturerName>BAE Systems</ManufacturerName>  <Founded>30 November 1999, London, England</Founded>  </Manufacturer>  <Manufacturer>  <ManufacturerName>BAE</ManufacturerName>  <Founded>30 November 1999, London, England</Founded>  </Manufacturer>  <Manufacturer>  <ManufacturerName>Aviation Industry Corporation of China</ManufacturerName>  <Founded>April 1, 1951, Chaoyang District, Beijing, China</Founded>  </Manufacturer>  <Manufacturer>  <ManufacturerName>General Dynamics</ManufacturerName>  <Founded>February 7, 1899, Reston, Virginia, United States</Founded>  </Manufacturer>  <Manufacturer>  <ManufacturerName>General Dynamics</ManufacturerName>  <Founded>February 7, 1899, Reston, Virginia, United States</Founded>  </Manufacturer>  <Manufacturer>  <ManufacturerName>Raytheon Technologies</ManufacturerName>  <Founded>2020, Waltham, Massachusetts, United States</Founded>  </Manufacturer>  <Manufacturer>  <ManufacturerName>Northrop Grumman</ManufacturerName>  <Founded>1994, 2980 Fairview Park Drive, West Falls Church, Virginia, United States</Founded>  </Manufacturer>  <Manufacturer>  <ManufacturerName>Lockheed Martin</ManufacturerName>  <Founded>March 15, 1995, Bethesda, Maryland, United States</Founded>  </Manufacturer>  …  </Manufacturers> |
| **Output** |
| **Successfully import manufacturer BAE Systems founded in London, England.**  **Invalid data.**  **Successfully import manufacturer Aviation Industry Corporation of China founded in Beijing, China.**  **Successfully import manufacturer General Dynamics founded in Virginia, United States.**  **Invalid data.**  **Successfully import manufacturer Raytheon Technologies founded in Massachusetts, United States.**  **Successfully import manufacturer Northrop Grumman founded in Virginia, United States.**  **Successfully import manufacturer Lockheed Martin founded in Maryland, United States. ...** |

Upon **correct import logic**, you should have imported **20 unique** manufacturers.

#### Import Shells

Using the file shells.xml, 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: **shell weight or caliber**, **do not** import any part of the entity and **append an error message "Invalid data."** to the **method output**.

|  |
| --- |
| **Success message** |
| **Successfully import shell caliber #{caliber} weight {shellWeigh} kg.** |

##### Example

|  |
| --- |
| **shells.xml** |
| <?xml version='1.0' encoding='UTF-8'?>  <Shells>  <Shell>  <ShellWeight>50</ShellWeight>  <Caliber>155 mm (6.1 in)</Caliber>  </Shell>  <Shell>  <ShellWeight>100</ShellWeight>  <Caliber>103 mm (8 in)</Caliber>  </Shell>  <Shell>  <ShellWeight>146</ShellWeight>  <Caliber>203 mm (8 in)</Caliber>  </Shell>  <Shell>  <ShellWeight>0</ShellWeight>  <Caliber>280 mm</Caliber>  </Shell>  <Shell>  <ShellWeight>300</ShellWeight>  <Caliber>280 mm (11 in)</Caliber>  </Shell>  <Shell>  <ShellWeight>460</ShellWeight>  <Caliber/>  </Shell>  <Shell>  <ShellWeight>1500</ShellWeight>  <Caliber>460 mm (18 in)</Caliber>  </Shell>  <Shell>  <ShellWeight>53</ShellWeight>  <Caliber>155mm</Caliber>  </Shell>  …  </Shells> |
| **Output** |
| **Successfully import shell caliber #155 mm (6.1 in) weight 50 kg.**  **Successfully import shell caliber #103 mm (8 in) weight 100 kg.**  **Successfully import shell caliber #203 mm (8 in) weight 146 kg.**  **Invalid data.**  **Successfully import shell caliber #280 mm (11 in) weight 300 kg.**  **Invalid data.**  **Successfully import shell caliber #460 mm (18 in) weight 1500 kg.**  **Successfully import shell caliber #155mm weight 53 kg.**  **...** |

Upon **correct import logic**, you should have imported **60 shells**.

### JSON Import

#### Import Guns

Using the file **guns.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 **gun weight, barrel length, range,** **gun-type**), **do not import** **any part of the entity** and **append an error message to the method output**.
* The **Countries** array will always contain valid ids.

|  |
| --- |
| **Success message** |
| **Successfully import gun {gunType} with a total weight of {gunWeight} kg. and barrel length of {barrelLength} m.** |

##### Example

|  |
| --- |
| **guns.json** |
| [  {  "ManufacturerId": 14,  "GunWeight": 531616,  "BarrelLength": 6.86,  "NumberBuild": 287,  "Range": 120000,  "GunType": "Howitzer",  "ShellId": 41,  "Countries": [  { "Id": 86 },  { "Id": 57 },  { "Id": 64 },  { "Id": 74 },  { "Id": 58 }  ]  },  {  "ManufacturerId": 8,  "GunWeight": 801684,  "BarrelLength": 31.18,  "NumberBuild": 620,  "Range": 19118,  "GunType": "AntiTankGun",  "ShellId": 38,  "Countries": [  { "Id": 47 },  { "Id": 3 },  { "Id": 85 },  { "Id": 35 },  { "Id": 49 },  { "Id": 53 },  { "Id": 30 },  { "Id": 39 },  { "Id": 62 },  { "Id": 6 },  { "Id": 76 },  { "Id": 78 },  { "Id": 43 },  { "Id": 72 },  { "Id": 23 },  { "Id": 9 },  { "Id": 1 },  { "Id": 21 },  { "Id": 8 },  { "Id": 67 },  { "Id": 2 },  { "Id": 33 },  { "Id": 28 },  { "Id": 17 },  { "Id": 54 },  { "Id": 4 }  ]  }  …  ] |
| **Output** |
| **Invalid data.**  **Successfully import gun AntiTankGun with a total weight of 801684 kg. and barrel length of 31.18 m.**  **...** |

Upon **correct import logic**, you should have imported **138 guns and 785 countries' guns**.

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## Data Export (25 pts)

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

### JSON Export

#### Export Shells

The given method in the project’s skeleton receives a double representing the shell weight. Export **all shells** which weights more than the given and **the guns which use this shell**. For each **Shell**, export its **ShellWeight**, **Caliber, and Guns. Export only the guns which are AntiAircraftGun** gun type. For every gun export **GunType**, **GunWeight**, **BarrelLength**, and **Range** (if the **range is bigger than 3000**, export "**Long-range**", otherwise export "**Regular range**"). Order the guns by **GunWeight** (**descending**). Order the shells by **ShellWeight** (**ascending**).

##### Example

|  |
| --- |
| **Serializer.** **ExportShells(context, shellWeight)** |
| [  {  "ShellWeight": 124.0,  "Caliber": "155 mm HE ERFB RA-BB",  "Guns": [  {  "GunType": "AntiAircraftGun",  "GunWeight": 250138,  "BarrelLength": 6.55,  "Range": "Long-range"  }  ]  },  {  "ShellWeight": 146.0,  "Caliber": "203 mm (8 in)",  "Guns": []  },  ...  ] |

### XML Export

#### Export Guns

Use the method provided in the project skeleton, which receives a **manufacturer**. Export all guns with a manufacturer equal to the given. For each **gun**, export **Manufacturer**, **GunType, BarrelLength, GunWeight, Range,** and**Countries** that use this gun. Select only the **Countries** which has **ArmySize** bigger than **4500000**.For each country export **CountryName** and **ArmySize**. Order the countries by**army size (ascending).**Order**guns by BarrelLength (ascending).**

##### Example

|  |
| --- |
| Serializer.ExportGuns(context, manufacturer) |
| <?xml version="1.0" encoding="utf-16"?>  <Guns>  <Gun Manufacturer="Krupp" GunType="Mortar" GunWeight="1291272" BarrelLength="8.31" Range="14258">  <Countries>  <Country Country="Sweden" ArmySize="5437337" />  <Country Country="Portugal" ArmySize="9523599" />  </Countries>  </Gun>  <Gun Manufacturer="Krupp" GunType="AntiAircraftGun" GunWeight="1280923" BarrelLength="10.89" Range="16530">  <Countries>  <Country Country="Albania" ArmySize="6296389" />  <Country Country="United Kingdom" ArmySize="7242451" />  <Country Country="China" ArmySize="9944746" />  </Countries>  </Gun>  <Gun Manufacturer="Krupp" GunType="Howitzer" GunWeight="656499" BarrelLength="13.04" Range="80235">  <Countries>  <Country Country="Malta" ArmySize="8507869" />  </Countries>  </Gun>  <Gun Manufacturer="Krupp" GunType="FieldGun" GunWeight="431716" BarrelLength="15.7" Range="28309">  <Countries>  <Country Country="Cape Verde" ArmySize="7704194" />  <Country Country="Equatorial Guinea" ArmySize="9751317" />  </Countries>  </Gun>  <Gun Manufacturer="Krupp" GunType="Mortar" GunWeight="388420" BarrelLength="15.87" Range="6288">  <Countries>  <Country Country="Norway" ArmySize="6282380" />  <Country Country="Myanmar" ArmySize="9883310" />  </Countries>  …  </Guns> |

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