COMPUTING SUBJECT:	Restful ASP.Net Core-services
TYPE:	Assignment
IDENTIFICATION:	RestService#1
COPYRIGHT:	*Peter Levinsky & Michael Claudius*
LEVEL:	Medium
TIME CONSUMPTION:	1½-2 hours
EXTENT:	120 lines
OBJECTIVE:	Restful services based on ASP.Net Core
PRECONDITIONS:	Rest service theory. Http-concepts Computer Networks Ch. 2.2
COMMANDS:	

IDENTIFICATION: RestService#1 / PELE with kindly respect and inspiration from MICL

Overall Purpose

The overall purpose for the group of 'RestService' assignments is to be able to provide and consume restful ASP.Net Core web services, to prepare the 'RestService' to be published in Azure, including testing the service and finally to setup the 'RestService' to be consumed from a browser (e.g. using Typescript) i.e. support CORS.

The whole group of assignments consist of 7 steps:

1. **A simple REST Service with CRUD. (this assignment)**
2. More advanced and complex URI's.
3. Adding help-pages to the REST Service (Swagger)
4. Testing a REST Service and publish in Azure.
5. Consuming a REST service from a C# Console application.
6. Adding Support for CORS to the REST Service
7. A REST Service using a database

Background Material:

The HTTP protocol: See Computer Network chap 2 pp. 111-136

Note of REST (Peter Levinsky): See NetHttpNote.pdf

Oswago Universitet: RESTful Service Best Practices: Recommendations for Creating Web Services: See http://cs.oswego.edu/~alex/teaching/csc435/RESTful.pdf

Usefull tools (Postman & Fiddler): See Tools.htm (tool #3 & tool #4)

This Assignment: RestService#1

Purpose

The purpose of this assignment is to be able to provide a simple Restful ASP.Net Core web services with CRUD.

Mission

You are to make a restful web services based on the ASP.Net Core services by setting up a service (provider). The service supports simple CRUD by implementing the classic GET, POST, PUT and DELETE requests. This we shall do in 2 major steps:

1. Investigate a simple default REST Service
    a. Create the REST Service
    b. Run the REST Service
    c. Try the REST Service (Postman or Fiddler)
    d. Explore the REST Service

2. Create your own REST simple Service
    a. Create a model class
    b. Create a controller
    c. Run and try your REST Service (Postman or Fiddler)

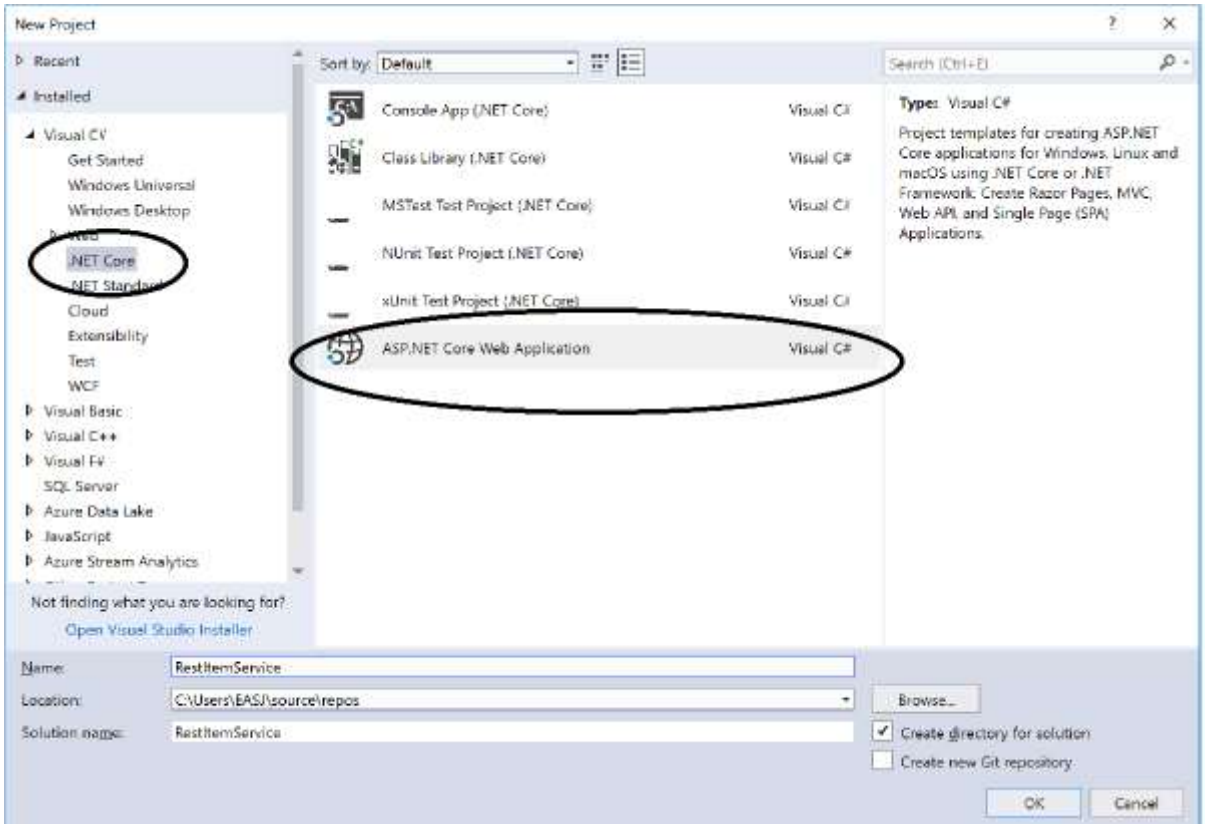
Domain description

First you shall just utilize the simple auto generated web service defined by ValuesContolller. Next you are to create your own REST Service (Provider), which can manipulate (make CRUD) on model elements ‘Item’s.

The Visual Studio 2019 version screen dumps are placed at the end. In the exercise text you see the 2017 version.

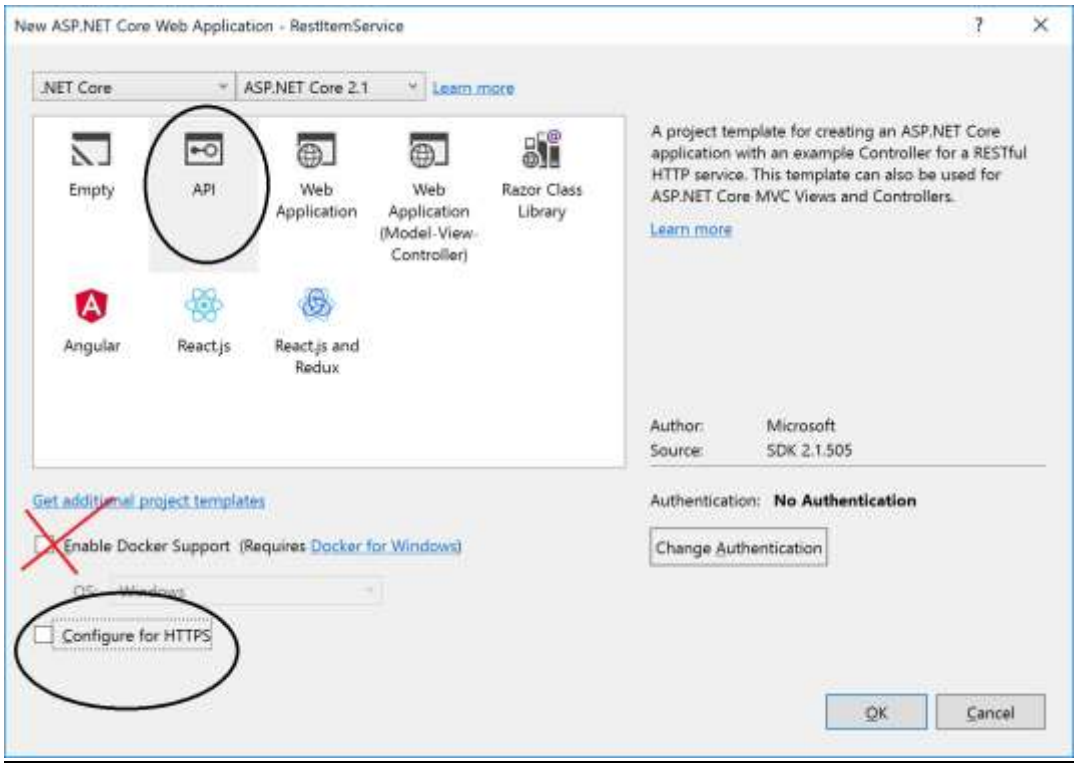
Assignment 1.a: Create The RESTful ASP.Net Core-service provider

You are to make a Rest Service provider '**RestItemService'**.
Start Visual Studio:File -> New -> Project.
Choose: Web -> ASP.NET Core Web Application (**not .Net Framework**).
Browse to a convenient location and give the name '**RestItemService'**.



Click OK. **(For 2019 version see picture at the end)**

Now a project template with options are given.

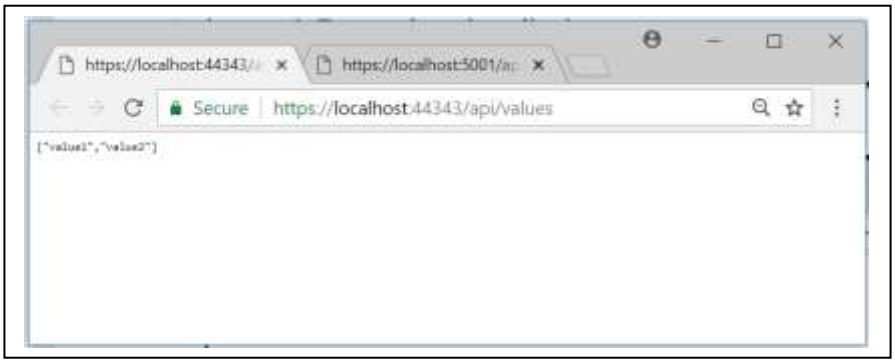


(For 2019 version see picture at the end)

Choose the API.
DON'T tick Docker support**.** But **Untick the HTTPS**
Now you have to wait a while…
Then we are ready to investigate the created project.

Assignment 1.b: Run the REST Service

Execute the web application (click the green arrow as usually) and it will open a local Browser.



As you can see the application is running on port 44343 on my computer (it will be different on yours).

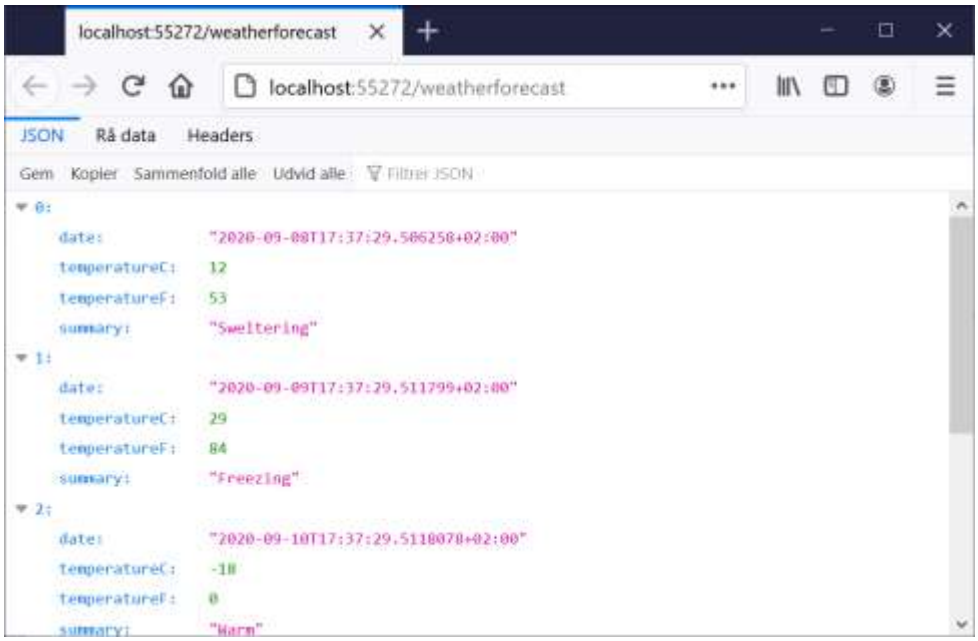
Try to give the url:

http://localhost:44343/api/values/5
and
http://localhost:44343/api/values/17

What do you get? (Remember to use your own port number)

FOR VS 2019 version

The picture looks like:



Try to give the url:

http://localhost:55272/weatherforecast/2
and
http://localhost:55272/weatherforecast/7

What do you get? (Remember to use your own port number)

Assignment 1.c: Fiddler/Postman

Have the Postman or Fiddler installed – see tools.htm

Try to invoke the methods from Fiddler/Postman using the same url's as before. If you are not familiar with fiddler (or postman) for details see 2.c below.

Assignment 1.d: Exploring the REST Service i.e. the whole set up

Some questions arise:

Why does the project start with api/values?
Where are the Http-methods defined?

Why is it port 44343 (or more correct your port-number)?
How can it be executed in console mode on a different port?

To find the answers take a look in Solution Explorer:

Controller -> ValuesController
(or for the 2019 version WeatherForecastController)
Propeties -> LaunchSettings.json

Modify the Get method body to (2019: or insert the code)

```
[HttpGet("{id}")]
public ActionResult<int> Get(int id)
{return id;}
```

Execute again. Any difference? What happens?

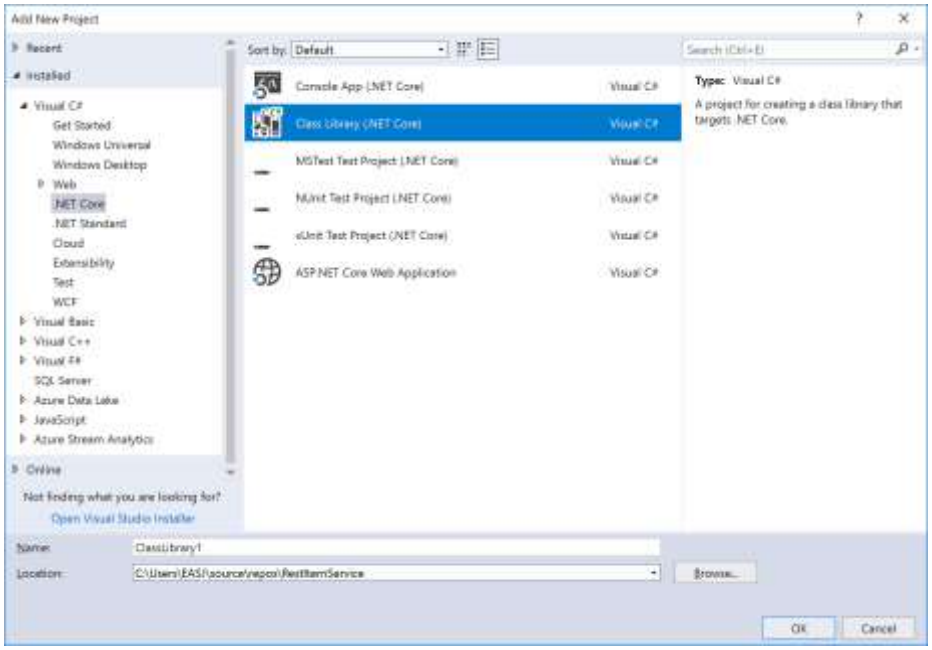
Finally, at the ‘green arrow’ change ‘IISExpress’ to ‘RestItemService’ and run the application again.
What could be the purpose of doing this?

This ends the investigation of the auto generated service.
In the following assignments you shall create your own service.

Assignment 2.a: Create a model class Item

We need a model class '**Item**' before you can make your own REST service.

Therefore to the Solution (right click -> add new project) create a new project (Class Library .Net Core) and named it '**ModelLib**'. Like this:



(For 2019 version see picture at the end)

In this new project create a folder '**model**' (right click project, choose Add -> Folder) and in this folder add a class, "**Item**", with the properties:

- int Id;
- string Name;
- string Quality;
- double Quantity;

Remember to two constructors:

- Data() { … }
  //empty constructor needed for JSON transfer. Serializable objects.

- Item(int id, string name, string quality, double quantity) { … }
  Intializing all the data fields

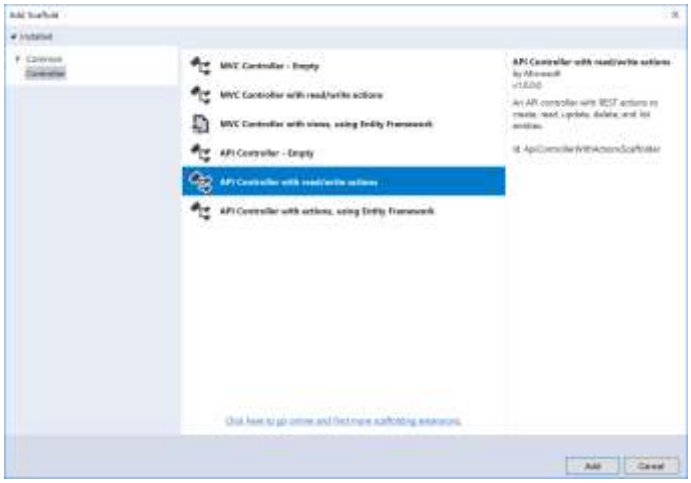
And make a ToString – method

Before you are finished, first make the class public and second remember to compile the library i.e. build the project. (If you are really nice delete the 'Class1' class in the library)

Now you are ready to the next step.

Assignment 2.b: Creating a controller (making the REST API operation)

In the solution in the controller folder, add (i.e. Right click) a new controller named '**ItemsController**'. Choose 'API Controller **with read/write actions**'.



Now you have a template controller (the url is: http://localhost:44343/api/Items with your port number).

To let your controller using your model class (Item) from 2.b, you have to add a reference to refer to your library i.e. right-click at the Dependencies -> add reference choose from your solution 'ModelLib'.

Modify the five signatures in the '**ItemsController**' to: (Modification marked with bold)

- public IEnumerable<**Item**> Get()
- public **Item** Get(int id)
- public void Post([FromBody] **Item** value)
- public void Put(int id, [FromBody] **Item** value)
- public void Delete(int id)

In this simple CRUD REST Service you are ***not* using a database**, but instead a static list of Item's as an instance field.

```
private static  List<Item> items = new List<Item>()
```

You can fill in some default values **e.g**. like:

```
private static readonly List<Item> items = new List<Item>()
    {
       new Item(1,"Bread","Low",33),
       new Item(2,"Bread","Middle",21),
       new Item(3,"Beer","low",70.5),
       new Item(4,"Soda","High",21.4),
       new Item(5,"Milk","Low",55.8)
    };
```

Now you can modify the body of your five controller method using this list.

- public IEnumerable<Item> Get()
  return items;

- public Item Get(int id)
  return items.Find(i => i.Id == id);

- public void Post([FromBody] Item value)
  items.Add(value);

- public void Put(int id, [FromBody] Item value)
  Item item = Get(id);
  if (item != null)
  {
  item.Id = value.Id;
  item.Name= value.Name;
  item.Quality = value.Quality;
  item.Quantity = value.Quantity;
  }

- public void Delete(int id)
  Item item = Get(id);
  items.Remove(item);

Now you can compile (build) and run your REST Service.

Try from your bowser

http://localhost:44343/api/Items
or
http://localhost:44343/api/Items/3

Can you call post from your browser?
What about put or delete?

Assignment 2.c: Run and try your REST Service (Postman or Fiddler)

Have Postman or Fiddler installed. (See previous exercises).
To be able to try all methods in your REST Service you need tools like Postman or Fiddler.

Open e.g. Fiddler and in the file-tab untick capture traffic, so you do not get all traffic in and out of your computer. (Then you can clear window by under the X click remove all).

Click on the **composer tab** and write the URL to your REST Service e.g. http://localhost:44343/api/Items click execute. To see the result click on the latest result in the window to the left.

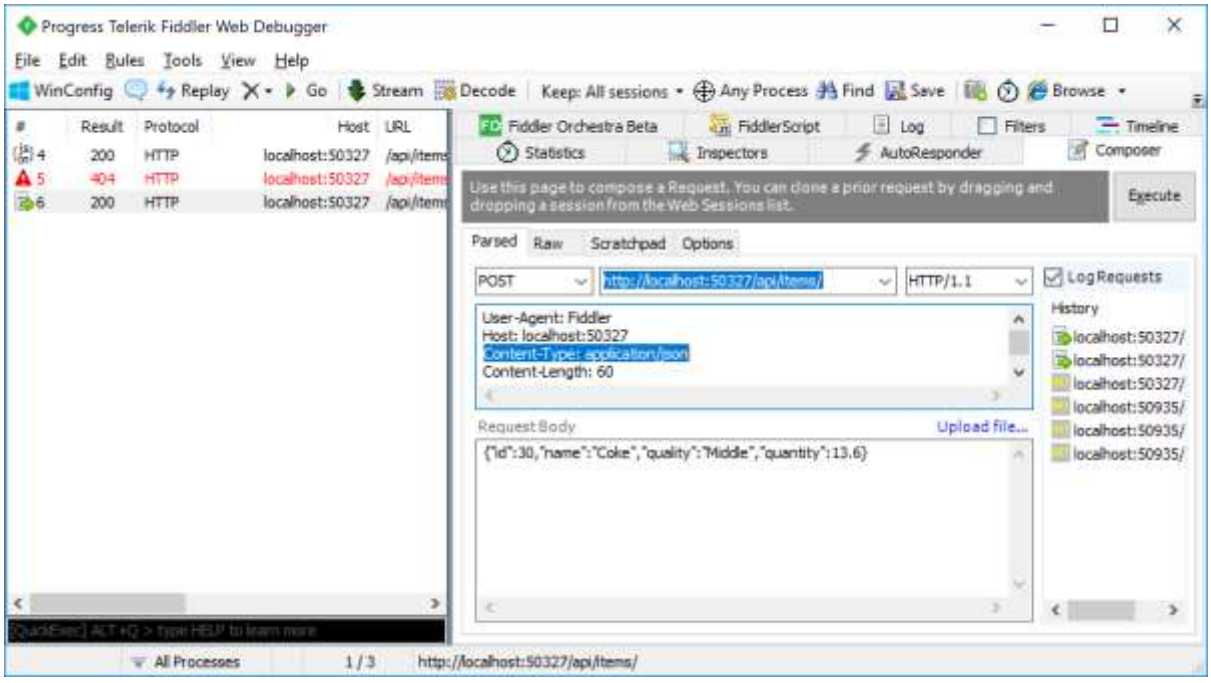
Now try with http://localhost:44343/api/Items/3 again look at the result.

All this is performing the GET method, next step is to try the other methods:

POST:

- First pick the POST method
- Set the Content-Type: application/json (just below the 'Host'-header)
- Request body must hold the data as a Json-string e.g.
  {"id":30,"name":"Coke","quality":"Middle","quantity":13.6}

It should look like:



- Execute the REST Call
- Lookup the result – what do you see?
- Try to get …./Items/30 – what do you get?

PUT:

- First pick the PUT method
- Change the URL to …../api/Items/30
- Set the Content-Type: application/json (just below the 'Host'-header)
- Request body must hold the data as a Json-string e.g.
  {"id":30,"name":"**Coca** Coke","quality":"Middle","quantity":13.6}

I.e. change the name

- Execute the REST call
- Try to get …./Items/30 – what do you get?

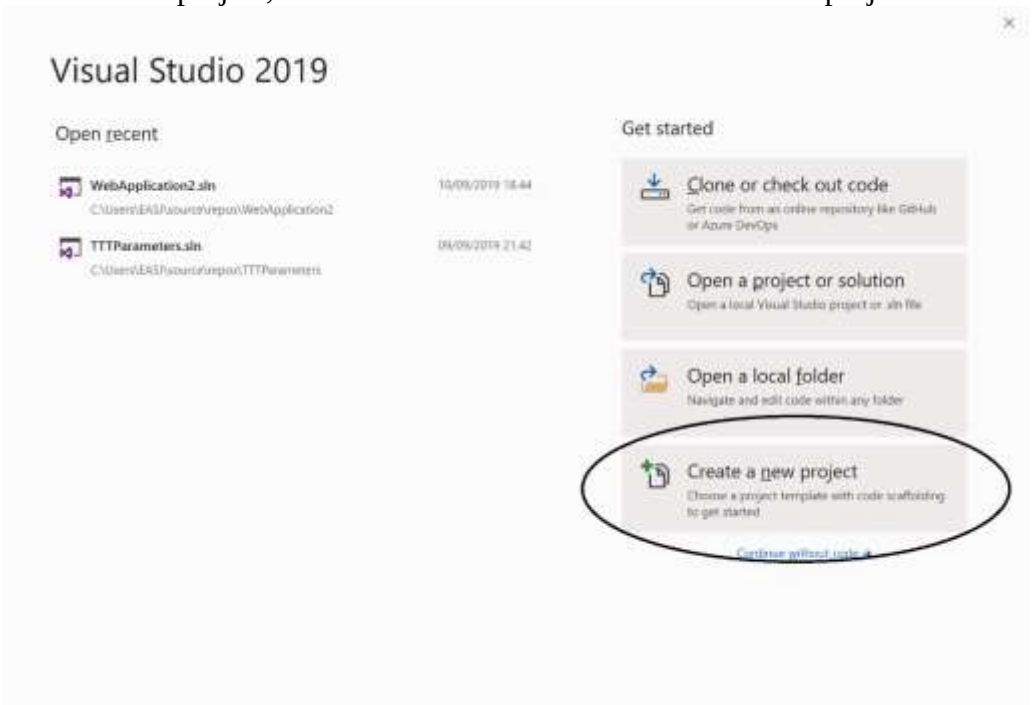
DELETE:

- First pick the PUT method
- Change the URL to …../api/Items/30
- Execute the REST call
- Try to get …./Items/30 – what do you get?

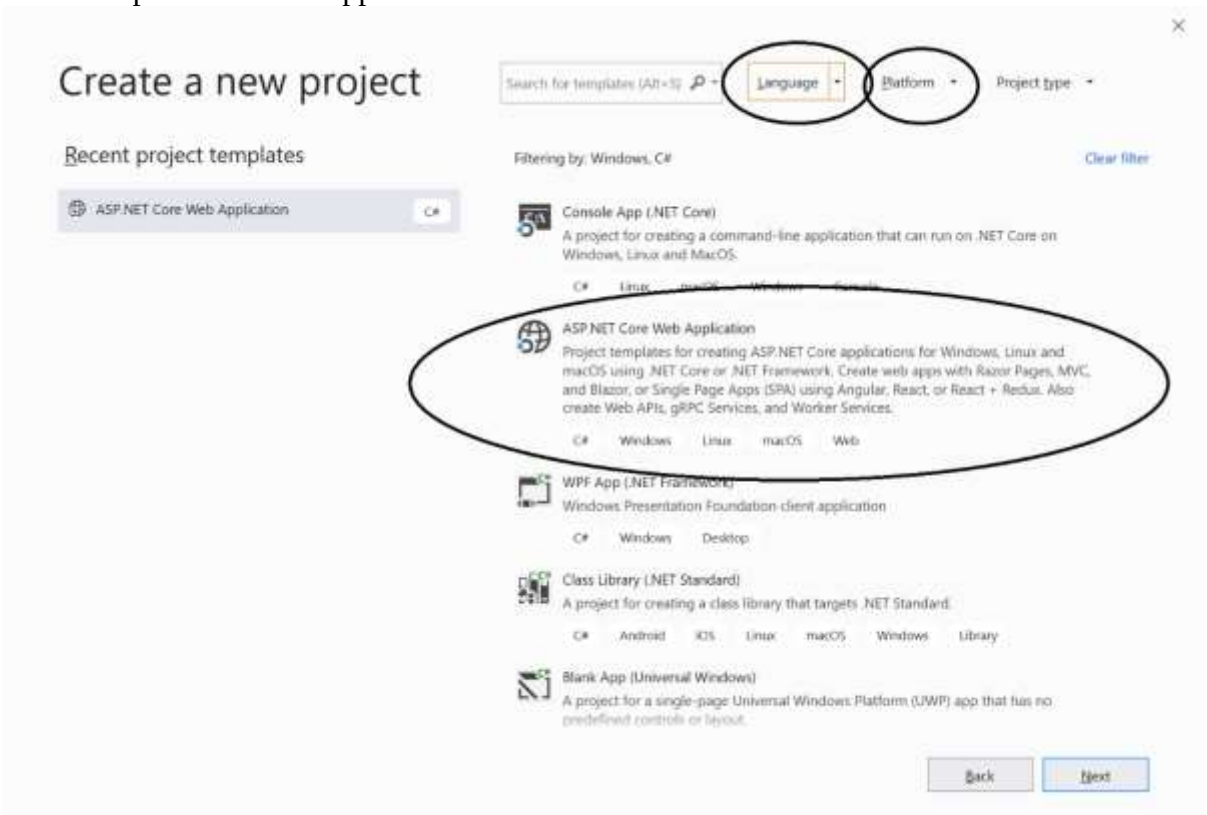
That was all – You have nicely finished a simple crud REST-Service and you are ready to do more advanced REST services.

The Visual Studio 2019 version

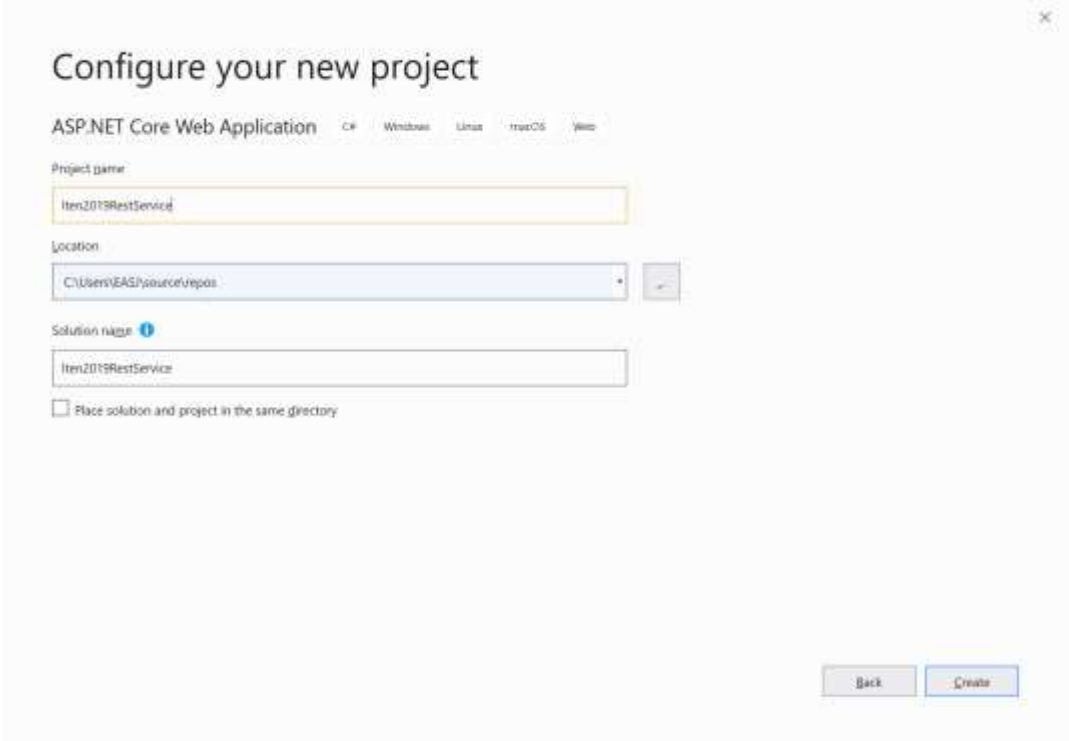
To create the project, start Visual Studio and choose create new project



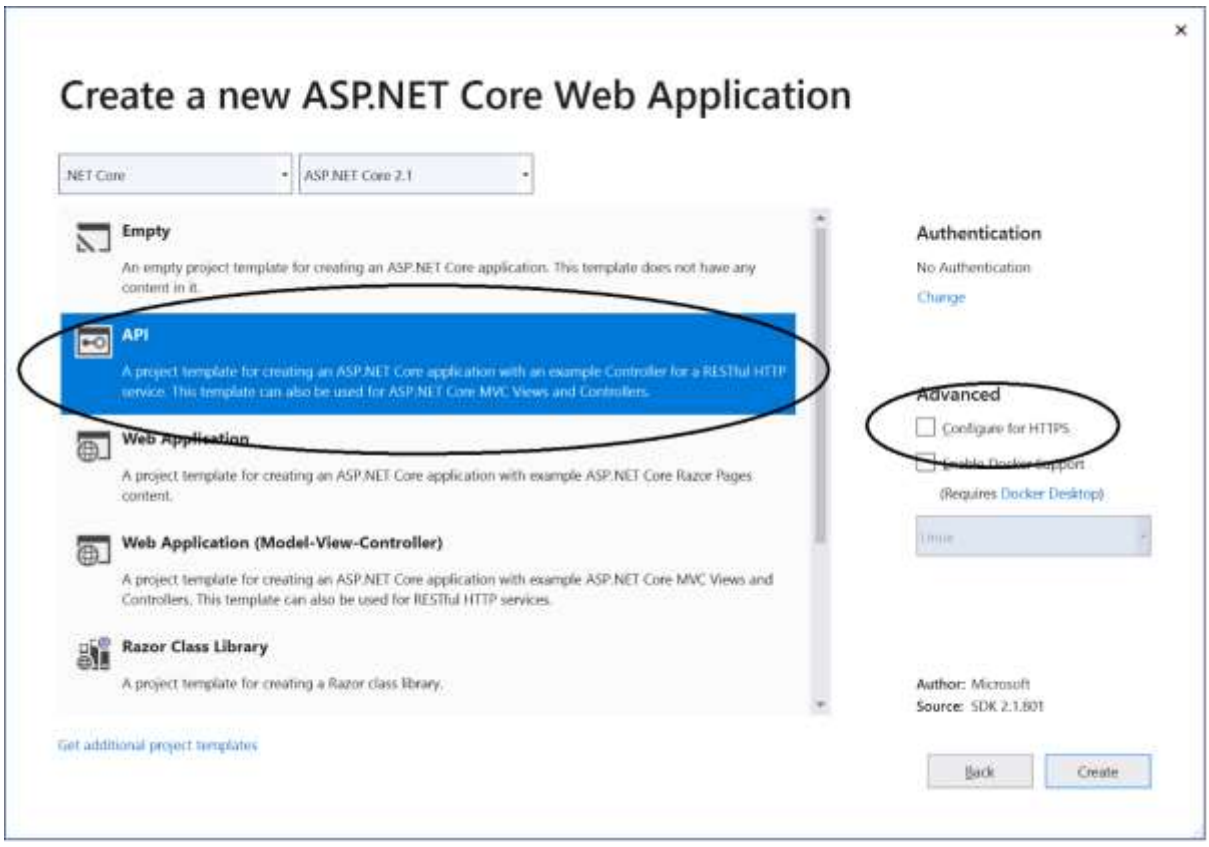
Chose type of project
You can with benefit select language is C# and platform is Windows
Choose asp.net core web application



Give the project And solution a name (here the same)



Configure type of web application
NB untick HTTPS – and choose API



Create a Library
To filter the project write .net core, whereby only these project types are available
Chose class library (.net core)