COMPUTING SUBJECT:	JWT Token
TYPE:	Assignment
IDENTIFICATION:	JWT Token Introduction
COPYRIGHT:	*Michael Claudius*
LEVEL:	Easy
TIME CONSUMPTION:	1-2 hours
EXTENT:	1-2 pages answering the questions
OBJECTIVE:	Basic principles of a token based server
PRECONDITIONS:	Rest service theory and practice. CORS. Http concepts Telerik Fiddler / Postman installed
COMMANDS:	**Claim, Signature etc etc.**

IDENTIFICATION: JWT RestTokenService/MICL

Purpose
The purpose of this assignment is to be able to provide and consume restful ASP.Net Core web services using JWT.

Mission
You are to utilize JSON Web Token (JWT) in restful web services based on the ASP.Net Core services by setting up a server (provider), test the services by use of Fiddler/Postman and create a client (consumer) using the services provided.
The service supports the classic POST & GET requests. This we shall do in 8 steps:

1. Create a project a token service
2. Test the services using Browser
3. Get all users
4. Authenticate as a user
5. Get all users as authorized user
6. Use the service on another server than localhost
7. Understanding the program and the token generation
8. Publish in Azure if possible N/A

This assignment holds all steps and the first 6 steps is written as a tutorial done by you.
Very imprtamt is to us time to understand the code in step 7. This is done in discussion groups.
Later in another assignment, JWT RestTokenClient, you will create a console client project.

Domain description
The service provides two simple operations with routes for:

- /users for a list of users
  Accepts GET request if the valid token is given in the Authorization header
  Returns all users

- /users/authenticate for login
  Accepts POST requests containing username and password in the body.
  Returns user details with a JWT token if the user is accepted otherwise error code.

When surfing on the net it is easy to find many descriptions more or less useful, and in more or less updated versions. Here are some of the better:

Useful links for JWT:

JSON Web Token structure
https://en.wikipedia.org/wiki/JSON_Web_Token

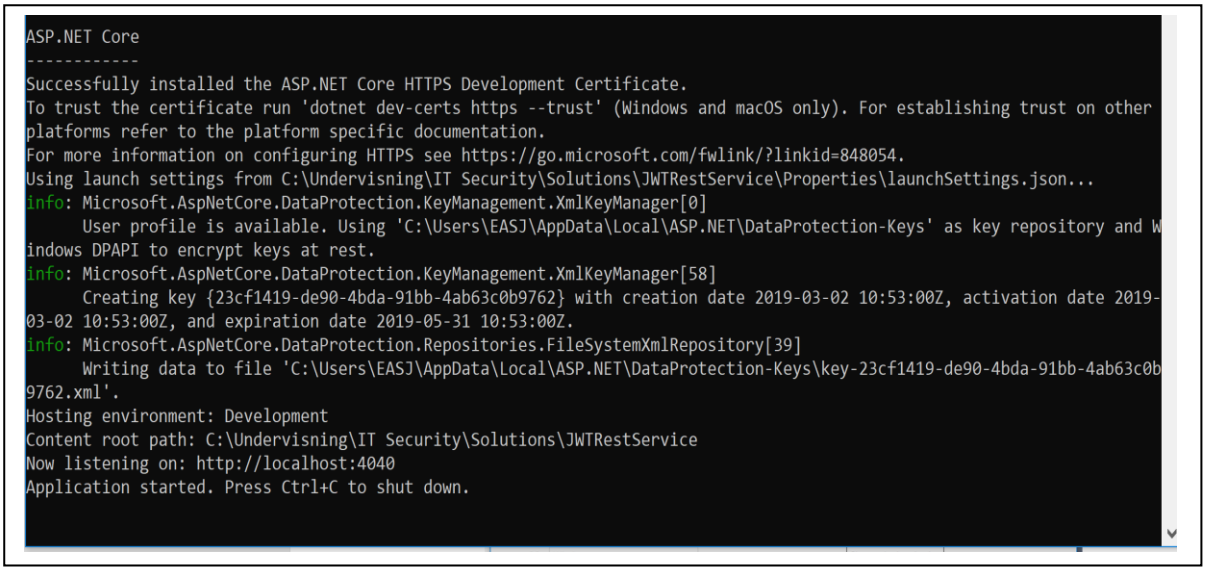
JSON Web Token Introduction
https://medium.com/ag-grid/a-plain-english-introduction-to-json-web-tokens-jwt-what-it-is-and-what-it-isnt-8076ca679843

JWT project in Visual Studio
https://www.c-sharpcorner.com/article/jwt-json-web-token-authentication-in-asp-net-core/

JWT example with GUI and cookies
https://code.msdn.microsoft.com/How-to-authentication-web-f58efc25

Assignment 1: Restful ASP.Net Framework-service provider
You are to make a ASP.NET Core Web Rest Service provider JWTRestService.
Download and install the project JWTRestService from your teacher´s homepage.
Open the project in Visual Studio and get an overview of the program and the various folders.
Notice you cannot just run it from Visual Studio!

Assignment 2: Execute the web application
Open a command prompt and change directory to the one holding the Webapi.csproj file
Execute the web application by the command : dotnet run.
And you will something like this:



As you can see the application is using http and running on port 4040 on my computer (it will be the same on yours).

Open a browser and give the url:

http://localhost:4040/users

Not very successful right ☺ ! Why ?
Check out error Http 401 !
Read on.

Assignment 3: Get all users from Fiddler/Postman

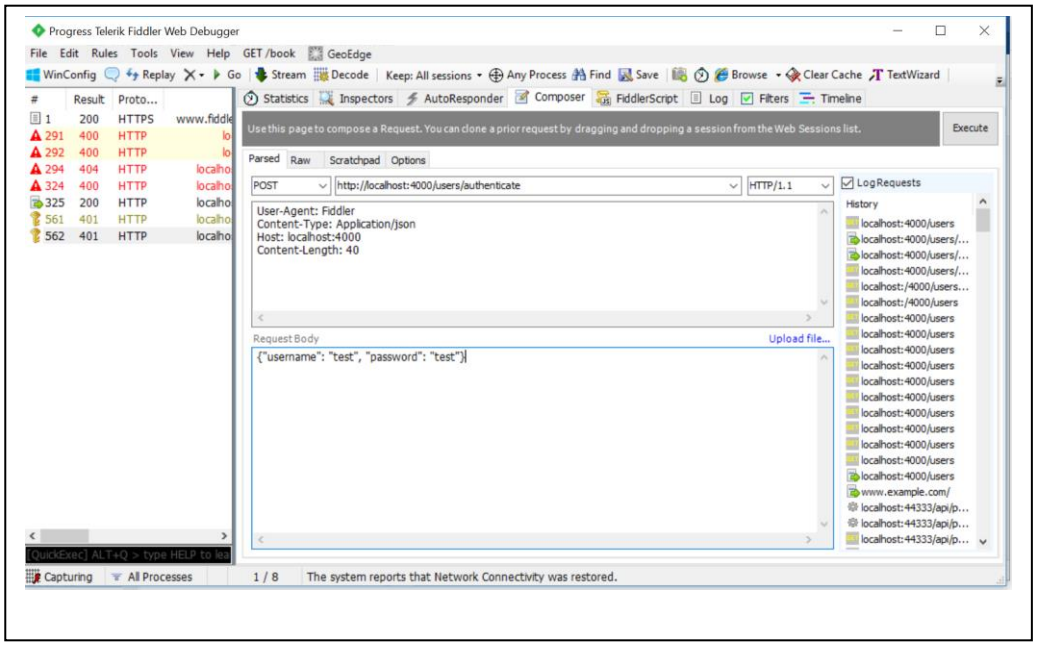
Now we will try to invoke the methods from Fiddler/Postman using the same url as before.
Start Fiddler.
Be aware that you must:

a. Click on Composer,
b. Choose GET
c. Copy and paste the url from Browser (http://localhost:4040/users) into the text field
d. Click Execute
e. Click on Inspector and the Request & Response Headers.

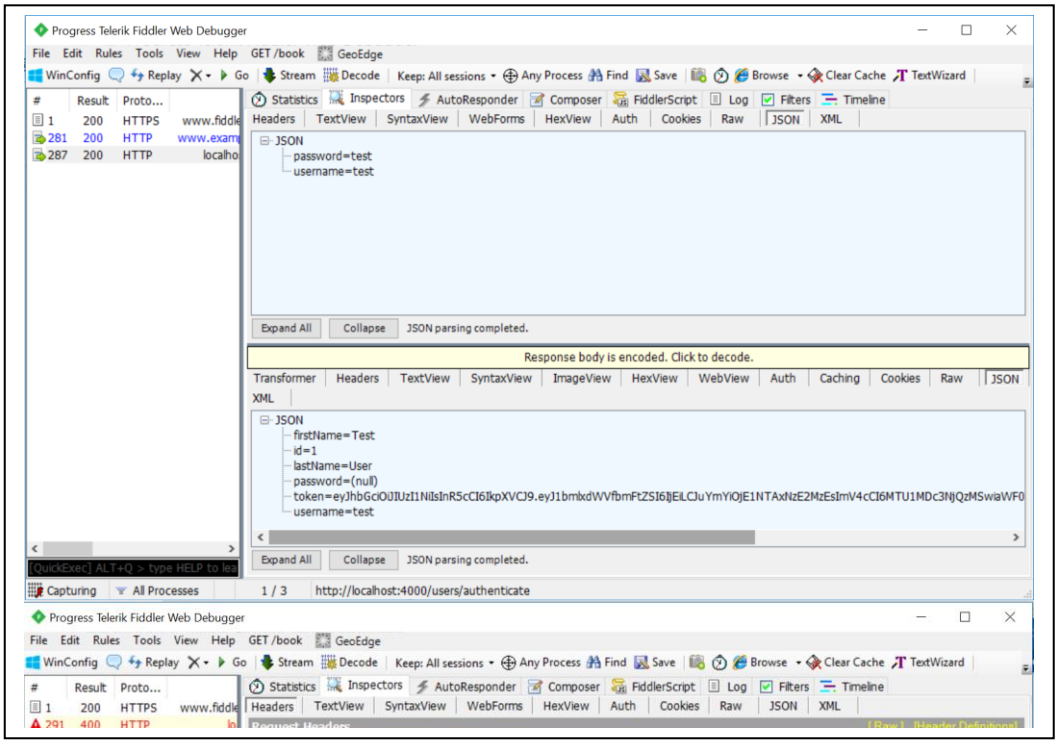
Of course same error, but now we know why and what to do.!!
Missing Autheticate Bearer. I.e. a user must be authenticated by a Bearer Token

Assignment 4: Authenticate the user from Fiddler/Postman

Use POST and the api "users/authenticate" to authenticate a user with correct username and password.
Look in Userservices, UsersController and User classes to find and see the properties the information.
Then Execute a POST request.



Hopefully you will get something like this:



Notice the “Token=” field and the token itself
Finally click on Headers and in Raw you can see the HTTP response.

```
HTTP/1.1 200 OK
Date: Thu, 14 Feb 2019 19:13:50 GMT
Content-Type: application/json; charset=utf-8
Server: Kestrel
Transfer-Encoding: chunked

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{"id":1,"firstName":"Test","lastName":"User","username":"test","password":nu
ll,"token":"eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJ1bmlxdWVfbmFtZSI6IjEiLCJ
uYmYiOjE1NTAxNzE2MzEsImV4cCI6MTU1MDc3NjQzMSwiaWF0IjoxNTUwMTcxNjMxfQ.-
TQRMeH_K15ZWgrPqlfasLETBGlBuBTnR980CdqRuF4"}
0
```
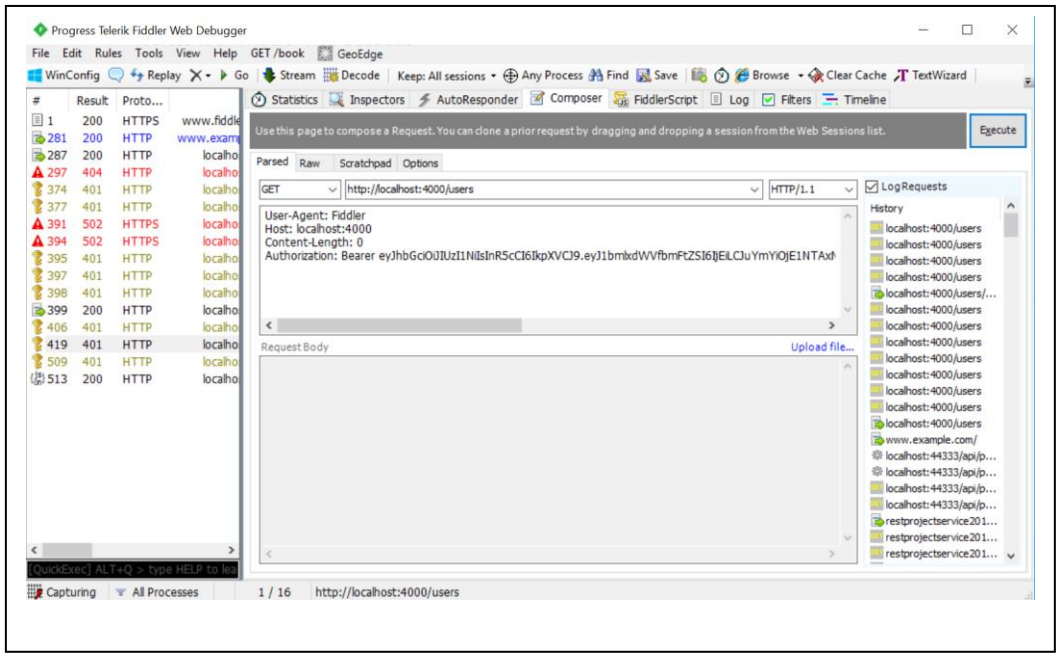

Copy the token -without “ ..” - to be used later.

Assignment 5: Get all users as authorized user
Run GET from Fiddler again like in assignment 3, BUT remember to send over the token.
Can you find out yourself how to do that ?
Otherwise look at next page.

In the header you need to add the Authorization field with a Bearer <token>.
Looks like this:



And the list of users is on the screen

<u>Assignment 6 Two different hosts one consumer one provider</u>
From your client try to consume the service on the other server.
Exchange tokens with another student. Can you use his token ?
Tip: Remember in the server program to use the ip-address of the server; i.e. not localhost.

Assignment 7 Understanding JWT generating and the program

In a group of 3-5 students discuss the following questions and write down the answers:

a. What are the main purpose of each class in the program
b. Program.cs: Explain especially
    1. AddAuthenticateScheme
    2. AddJwtBearer
    3. What is Bearer
c. What are the properties of User ?
d. UsersController: What is the purpose of `[Authorize]` `[AllowAnonymous]`
e. User: What are the properties of User ?
f. Userservice: Explain
    1. Tokenhandler
    2. SecurityTokenDescriptor
    3. The key
    4. Claim
    5. SymmetricSecurityKey
    6. List the token content
    7. Use of HMac and SHA256

And finally an interesting issue:

a. Where is the token saved on the server ?
b. Where is the token saved on the client ?
c. Should the token last for ever ?

Assignment 8 Publish in Azure

Is it possible to publish the service to Azure and use it?
If not why ?

https://help.salesforce.com/s/articleView?id=001116448&type=1