INSTYTUT PODSTAW INFORMATYKI
POLSKA AKADEMIA NAUK

STUDIA PODYPLOMOWE

PROGRAMOWANIE NA PLATFORMIE .NET

Łukasz Dejko

Global Repository – aplikacja webowa do komunikacji z repozytorium kont, serwerów i systemów.

Praca wykonana pod kierunkiem:
Pana Wiktora Wandachowicza

Warszawa dnia 20/01/2020 r.

OŚWIADCZENIE

Oświadczam, że złożoną pracę końcową pod tytułem: Global Repository – aplikacja webowa do komunikacji z repozytorium kont, serwerów i systemów napisałem samodzielnie.

Jednocześnie oświadczam, że praca ta:

1. nie narusza praw autorskich osób trzecich w rozumieniu ustawy z dnia 4 lutego 1994 roku o prawie autorskim i prawach pokrewnych (tekst jednolity Dz. U. 2006 nr 90, poz. 631 z późn. zm.);

2. nie zawiera informacji i danych uzyskanych w sposób nielegalny, a w szczególności informacji zastrzeżonych przez inny podmiot albo stanowiących tajemnicę przedsiębiorstwa;

3. nie była wcześniej przedmiotem innych procedur związanych z uzyskaniem dyplomów/świadectw lub tytułów zawodowych wyższych uczelni. Ponadto oświadczam, że treści zawarte w pisemnym egzemplarzu pracy oraz w egzemplarzu tej pracy w formie elektronicznej są jednobrzmiące.

Przyjmuję do wiadomości, że w przypadku stwierdzenia popełnienia przeze mnie czynu polegającego na przypisaniu sobie autorstwa istotnego fragmentu lub innych elementów cudzej pracy lub ustalenia naukowego, właściwy organ stwierdzi nieważność postępowania w sprawie nadania mi tytułu zawodowego (art. 193 ustawy z dnia 27 lipca 2005 r. Prawo o szkolnictwie wyższym, tekst jednolity Dz.U. z 2012 r., poz. 572 z późn. zm.).

……
data i podpis

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1. Vision

Date	Version	Description	Author
18/05/2019	1.0	Creation of the Vision Document	Łukasz Dejko
01/09/2019	1.1	Change of the database environment.	Łukasz Dejko
02/12/2019	1.2	Adding a database schema and updating the vision document.	Łukasz Dejko
17/12/2019	1.3	Final version of web api	Łukasz Dejko
09/01/2020	1.4	Final version of documentation	Łukasz Dejko

1.1. Introduction

The document concerns a project implemented at postgraduate studies at the Polish Academy of Sciences in the field of: "Programming on the .NET platform". This document is used to present the system of web communication with the repository of accounts that stores information about : systems, servers and accesses. This system will be a bridge between other systems and will only manage this information and will be used for statistical and change reporting purposes. In this project I will use the latest technologies available in Microsoft.

1.2. Positioning

1.2.1. Problem Statement

The problem of	The problem with current interfaces is the performance and ease of implementation of changes.
affects	The users of this interface will be business users who want to manage data by transferring and receiving data using json files.
a successful solution would be	The assumption of this project will be to design a very flexible interface in which changes can be made quickly and with a small contribution from the development team.

1.3. Stakeholder Descriptions

1.3.1. Stakeholder Summary

Name	Description	Responsibilities
Programmers	Programmers who have the skills to implement	1. They will read the user documentation before using the system.

Name	Description	Responsibilities
	such systems and data processing.	2. In order to ensure proper functioning of the system, it is necessary to create a login and password that will be used during the authorization of queries. 3. During the implementation of the system, they will test all new solutions on the development environment.

1.3.2. User Environment

The web communication environment is so flexible that it will be possible to use this interface on all platforms, but it will be mainly Microsoft environment. The user will be able to use the application through the mechanisms of web pages. There are no limitations as to the choice of the Internet browser.

The environment in which the web communication interface will be built is .NET Core, and the main programming language to be used on the beckend side will be C# and on the database side TSQL. The user documentation will be available Web Api.

Environment version : ASP.NET Core 2.2

Database environment version : SQL Server 2017

Database model mapping : Entity Framework Core

1.4. Product Overview

1.4.1. Needs and Features

Priority markings:

1 - the minimum that the created application will have

2 - functionalities that are expected to be implemented

3 - functionalities that will be implemented after the production implementation of the application

Need	Priority	Features	Planned Release
Database design (tables, constraints)	1		December 2019
Create triggers that support database events	1		December 2019
Implementation of the database model in the interface project	1		December 2019
Creation of the login and authorization process	1		December 2019

Creating user documentation accessible from the web api	1		December 2019
Saving Web Api errors and user activity to a log file.	1		December 2019
The ability to create accounts from the administrator level.	1		December 2019
Error and exception handling for Web Api	1		December 2019
Multithreaded query processing in web Api	1		December 2019

1.4.2. Other Product Requirements

Requirement	**Priority**	**Planned Release**
User changes in data reconciliation will be saved in audit tables (sql server)	1	December 2019
Simultaneous operation of multiple users at the same time in Web Api	1	December 2019
Possibility of downloading a report on errors in data reconciliation	1	December 2019
Implementation of the Swagger interface for Web Api tests	1	December 2019
Creation of a database design with the possibility of easy implementation of these solutions by the built-in interface Visual Studio 2019	1	December 2019
Web page Global Repository	3	

1.4.3. Requirements not implemented

Requirement
Connection to Active Directory
Sending e-mail correspondence confirming the changes.

1.4.4. Design restrictions

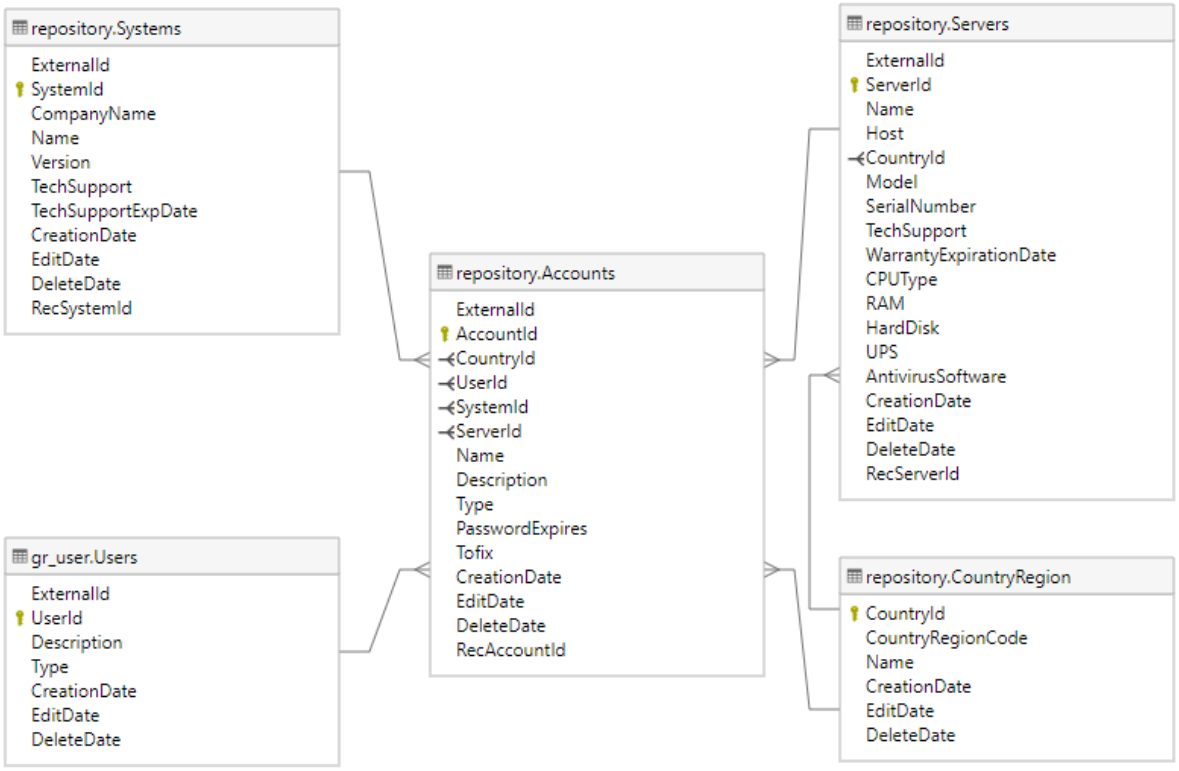
The main obstacle is the time in which the project will be implemented. The implementation of functionalities with priority 3 may not be possible within the set time frame. The second limitation is the small experience of the person who designed and implemented the project. This may cause the work to be incomplete. A significant difficulty may also be the fact that the creator of this document runs several other projects at the same time. This fact may lead to unsystematic reporting on the progress of work and a greater number of errors, especially in the testing phase.

1.4.5. Requirements relating to the working environment

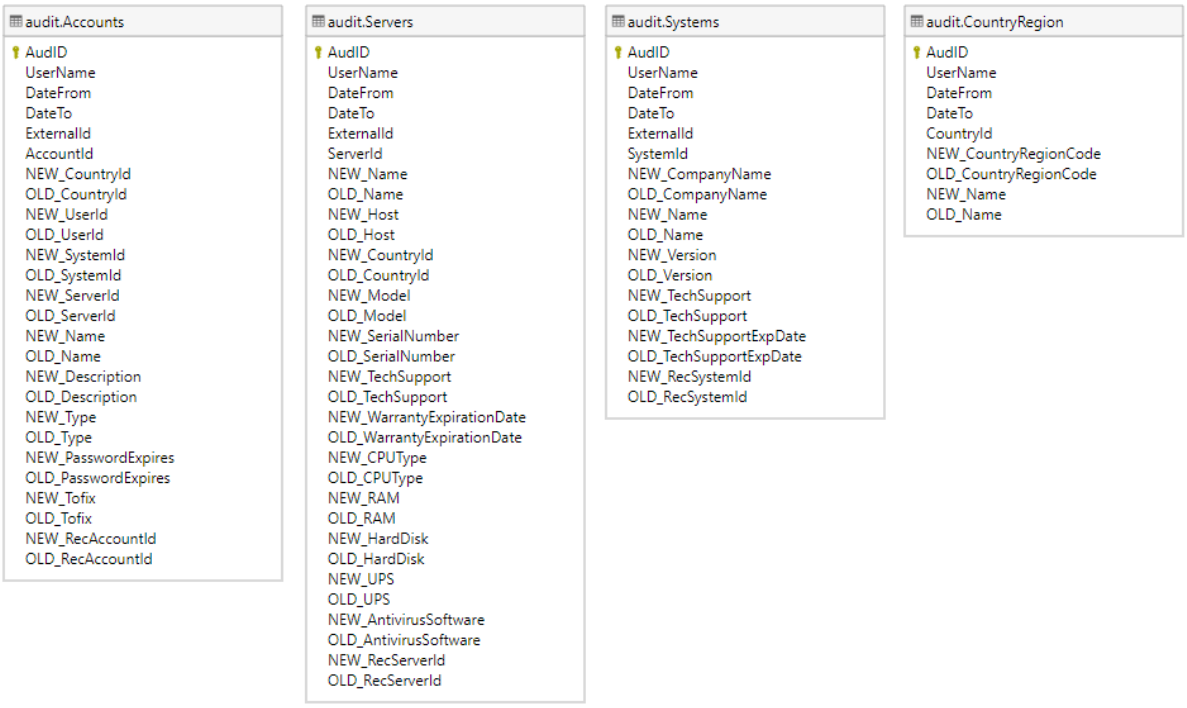
These requirements include software maintenance costs and time costs associated with the need to monitor system operation, view logs from user traffic and solve emerging errors. It will also be necessary to undertake optimization actions in the event of a sudden increase in the number of users.

1.5. Database design

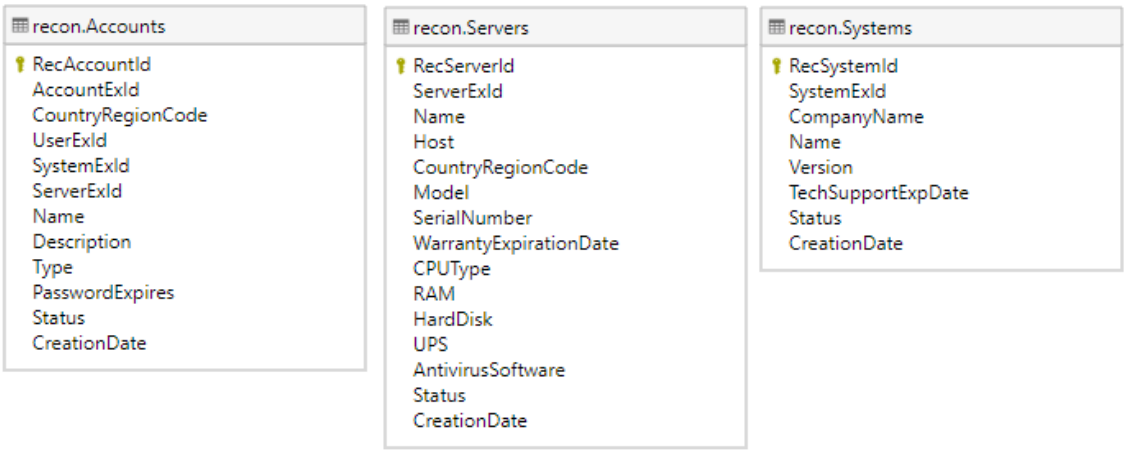
1.5.1. Main tables of the repository



1.5.2. Audit tables



1.5.3. Reconciliation tables for web-based communication data



2. Description of the project assumptions

2.1. Source code - The source code of the project is available at the following links :

a) Database project

https://github.com/lukaszFD/IPI-PAN_WEB_API/tree/master/GlobalRepository/DB_GlobalRepository

b) Database model in Entity Framework

https://github.com/lukaszFD/IPI-PAN_WEB_API/tree/master/GlobalRepository/DB_ModelEFCore

c) Web Api project

https://github.com/lukaszFD/IPI-PAN_WEB_API/tree/master/GlobalRepository/GR_WebApi

2.2. Objective of the project

a) The purpose of the project is to create a system that will be an interface of web communication with the repository of accounts storing information about: systems, servers and access. It will be a bridge between other systems and will manage only this information.

b) The second purpose of this project will be to design a very flexible interface in which changes can be implemented quickly and with little involvement of the development team.

2.3. Identification of market needs

Global repository of accounts is a product available internally in the largest corporations that want to transparently manage user accounts where information about servers and systems is stored. The application is to be used by other programmers as a flexible tool for implementation in their environments. One of such environments is a portal to order access to specific servers or purchase new operating systems installed on these servers. Flexibility and simplicity in using this repository is the key to success in programming your own interfaces, and the main arguments are :

a) The user documentation is available in the web communication and contains a description of all the columns that are available in the global repository.

b) Programmers who will develop a global repository have a simplified task due to the description of all the methods and classes that are included in the EF database project and the WebApi project.

c) Global repository contains reports: data audit, reconciliation of data coming from external sources, errors in data reconciliation.

d) The repository is very flexible, and the implemented mechanism of paging and limiting returned data is executed in multiple threads.

e) Programmers who will analyze errors have a simplified task because every operation performed in web api is logged.

2.4. Technical data and used technologies.

During the design and programming works I used the most popular tools provided by Microsoft, Datadeo and Github.

Installed tools :

a) Microsoft SQL Server Express (64-bit) version 14.0.1000.169
b) Microsoft Visual Studio Community 2019 version Version 16.4.1
c) Datadeo version 7.5.4
d) GitHub Desktop version Version 2.2.4

Technologies used:

a) Programming language C# version 7.3
b) Database : Entity Framework Core 2.2
c) Web Api project made in .Net Core 2.2
d) Database project made on : SQL Server 2017

3. User documentation

3.1. Description of the login proces and create / audit account

For proper operation of Web Api it is necessary to provide the password and login of registered users in the header of the query. The profile of the user who has the ability to create other user accounts is the Global Repository Administrator. Before you start using the repositories, you should apply for such access. Each company has a different interface to process such queries. Data on user types is stored on a global repository database. I prepared WPF applications for the presentation of the login process. The interface of this application presents basic functions of Web Api.

3.1.1. Creating a new account in the repository

Creating a new account in the repository is done by sending a POST request using the Http client (Picture nr 1).

I. Required fields :
   a) You must enter the correct address to create an account

      https://localhost:44396/GlobalRepositoryData/CreateNewAccount

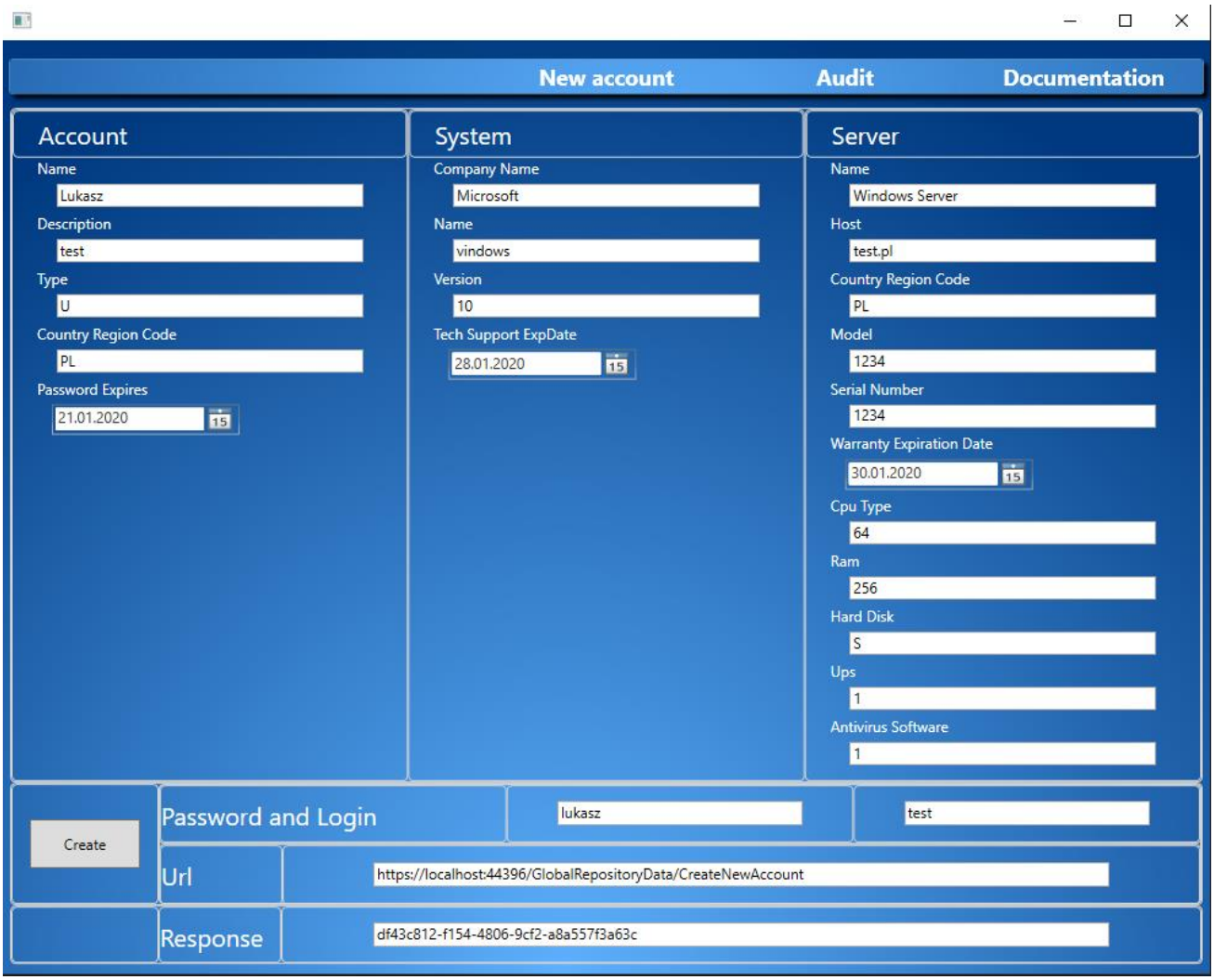
   b) All fields for the section: account, server, system must be completed.
   c) To execute a POST request, the password and login must be entered in the header.
   d) If the data is processed correctly, the new account identifier will be returned.

II. Correctly entered data will be sent in json format.

Example json.

```
{
  "accountCountryRegionCode": "string",
  "accountName": "string",
  "accountDescription": "string",
  "accountType": "string",
  "accountPasswordExpires": "2020-01-09T20:14:33.207Z",
  "serverName": "string",
  "serverHost": "string",
  "serverCountryRegionCode": "string",
  "serverModel": "string",
  "serverSerialNumber": 0,
  "serverWarrantyExpirationDate": "2020-01-09T20:14:33.207Z",
```

```
  "serverCputype": 0,
  "serverRam": 0,
  "serverHardDisk": "string",
  "serverUps": "string",
  "serverAntivirusSoftware": "string",
  "systemCompanyName": "string",
  "systemName": "string",
  "systemVersion": "string",
  "systemTechSupportExpDate": "2020-01-09T20:14:33.207Z"
}
```

Picture nr 1 Creating a new account.

3.1.2. Documentation for Web API Users

After logging in, each user has the possibility to display documentation with a description of all fields in the Global Repository (Picture nr 2).

I. Required fields :

a) To execute a GET request, the password and login must be entered in the header.
b) If the data is processed correctly, documentation will be returned.
c) All GET queries require the size of pages returned and the amount of data on the page.
d) Other GET queries are used to check the number of pages.

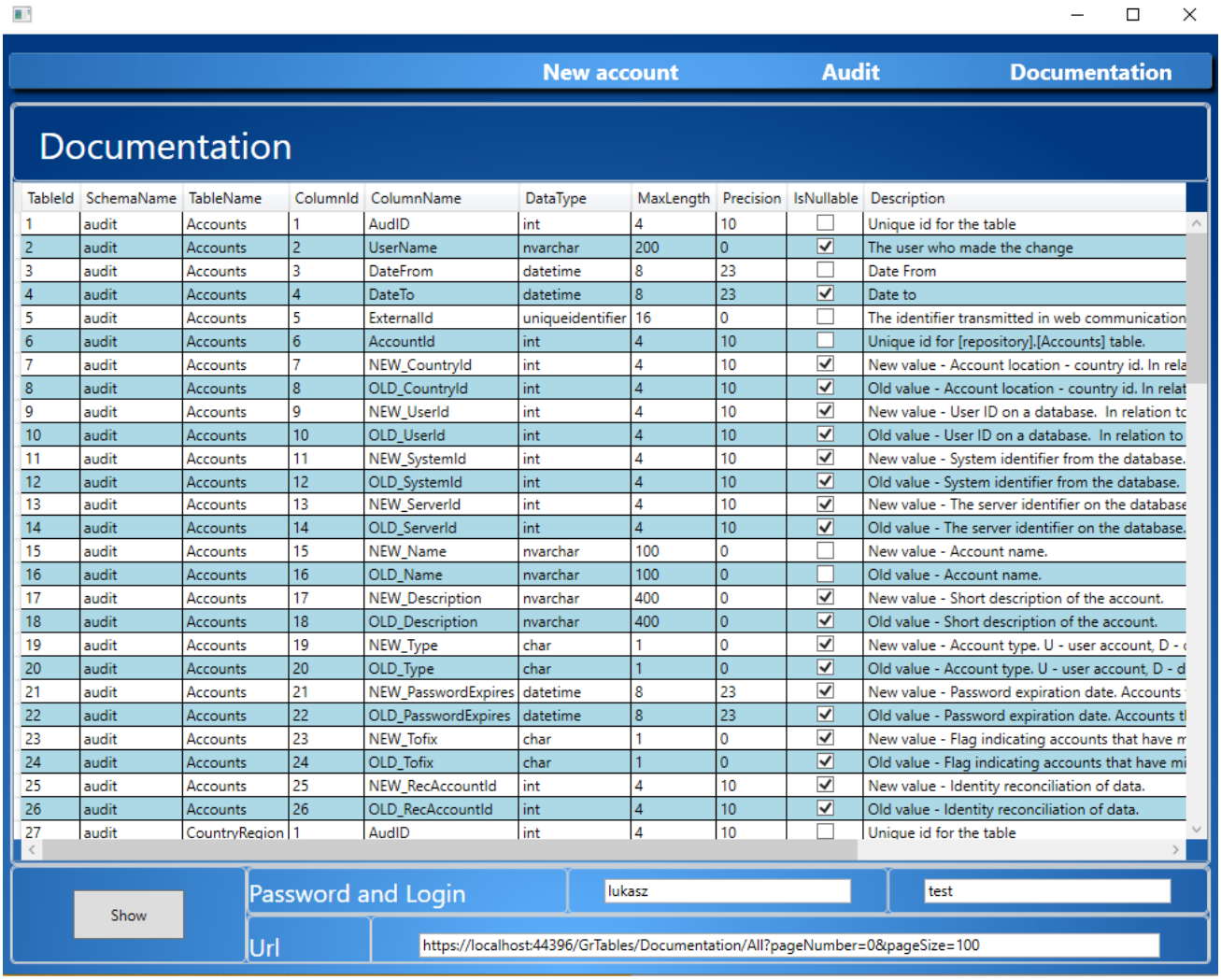
II. The following is an example of an count query

https://localhost:44396/GrTables/Documentation/All/Count

III. In response, the user receives.

Example json.

```
{
  "message": "There are 204 elements in the documentation."
}
```



TableId	SchemaName	TableName	ColumnId	ColumnName	DataType	MaxLength	Precision	IsNullable	Description
1	audit	Accounts	1	AudID	int	4	10	☐	Unique id for the table
2	audit	Accounts	2	UserName	nvarchar	200	0	☑	The user who made the change
3	audit	Accounts	3	DateFrom	datetime	8	23	☐	Date From
4	audit	Accounts	4	DateTo	datetime	8	23	☑	Date to
5	audit	Accounts	5	ExternalId	uniqueidentifier	16	0	☐	The identifier transmitted in web communication
6	audit	Accounts	6	AccountId	int	4	10	☐	Unique id for [repository].[Accounts] table.
7	audit	Accounts	7	NEW_CountryId	int	4	10	☑	New value - Account location - country id. In rela
8	audit	Accounts	8	OLD_CountryId	int	4	10	☑	Old value - Account location - country id. In relat
9	audit	Accounts	9	NEW_UserId	int	4	10	☑	New value - User ID on a database. In relation to
10	audit	Accounts	10	OLD_UserId	int	4	10	☑	Old value - User ID on a database. In relation to
11	audit	Accounts	11	NEW_SystemId	int	4	10	☑	New value - System identifier from the database.
12	audit	Accounts	12	OLD_SystemId	int	4	10	☑	Old value - System identifier from the database.
13	audit	Accounts	13	NEW_ServerId	int	4	10	☑	New value - The server identifier on the database
14	audit	Accounts	14	OLD_ServerId	int	4	10	☑	Old value - The server identifier on the database.
15	audit	Accounts	15	NEW_Name	nvarchar	100	0	☐	New value - Account name.
16	audit	Accounts	16	OLD_Name	nvarchar	100	0	☐	Old value - Account name.
17	audit	Accounts	17	NEW_Description	nvarchar	400	0	☑	New value - Short description of the account.
18	audit	Accounts	18	OLD_Description	nvarchar	400	0	☑	Old value - Short description of the account.
19	audit	Accounts	19	NEW_Type	char	1	0	☑	New value - Account type. U - user account, D -
20	audit	Accounts	20	OLD_Type	char	1	0	☑	Old value - Account type. U - user account, D - d
21	audit	Accounts	21	NEW_PasswordExpires	datetime	8	23	☑	New value - Password expiration date. Accounts
22	audit	Accounts	22	OLD_PasswordExpires	datetime	8	23	☑	Old value - Password expiration date. Accounts t
23	audit	Accounts	23	NEW_Tofix	char	1	0	☑	New value - Flag indicating accounts that have m
24	audit	Accounts	24	OLD_Tofix	char	1	0	☑	Old value - Flag indicating accounts that have mi
25	audit	Accounts	25	NEW_RecAccountId	int	4	10	☑	New value - Identity reconciliation of data.
26	audit	Accounts	26	OLD_RecAccountId	int	4	10	☑	Old value - Identity reconciliation of data.
27	audit	CountryRegion	1	AudID	int	4	10	☐	Unique id for the table

Picture nr 2 Documentation Web API.

3.1.3. Audit of all changes in the accounts

All accounts created in the global repository are audited (Picture nr 3).

I. Required fields :
   a) To execute a GET request, the password and login must be entered in the header.
   b) If the data is processed correctly, audit data will be returned.
   c) All GET queries require the size of pages returned and the amount of data on the page.
   d) Other GET queries are used to check the number of pages.

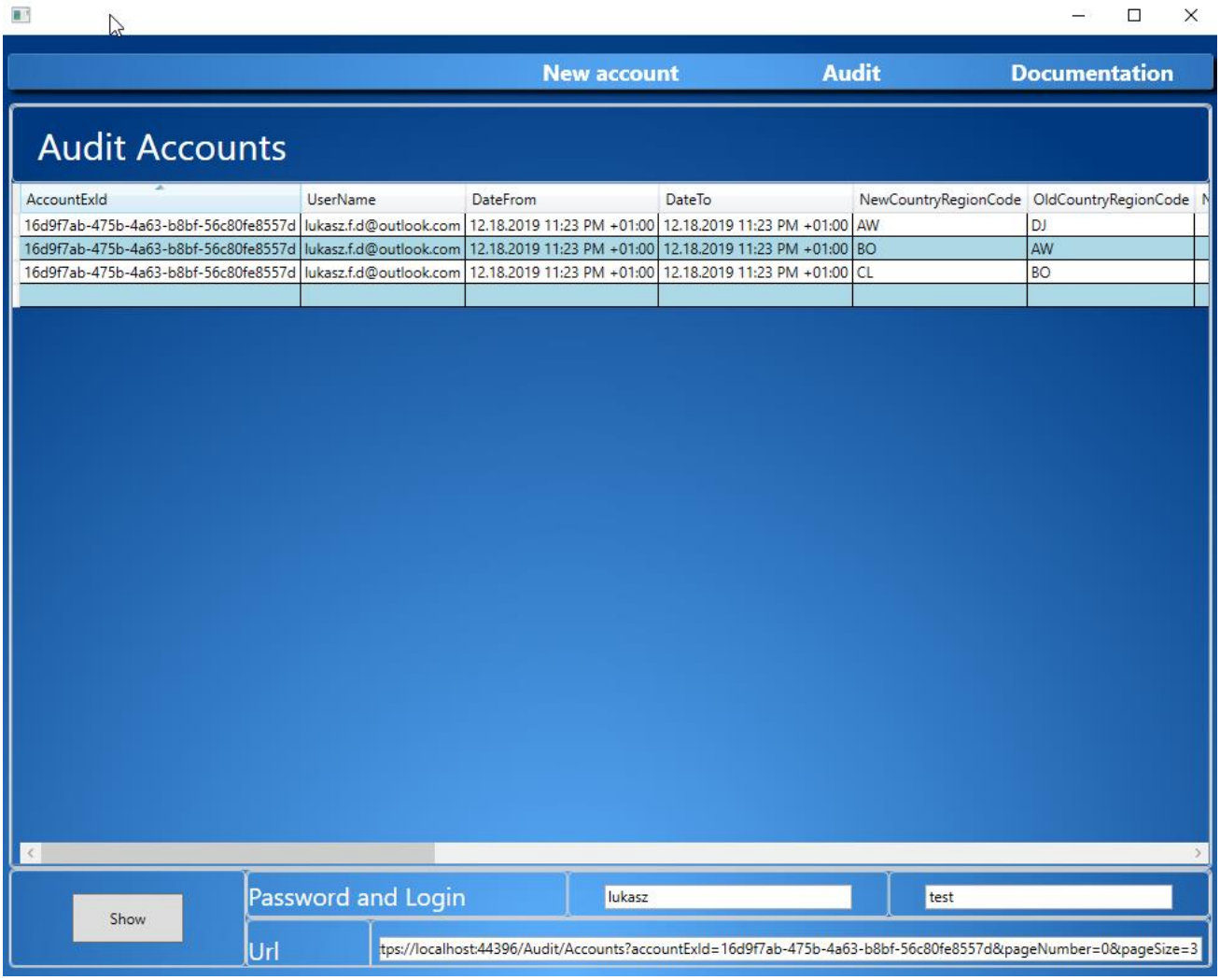
II. The following is an example of an count query

https://localhost:44396/Audit/Accounts/Count?accountExId=16d9f7ab-475b-4a63-b8bf-56c80fe8557d

III. In response, the user receives.

Example json.

```
{
  "message": "For user bb2f882f-f643-4b8a-aa06-3b611d7de44e are assigned 5"
}
```



Picture nr 3 Audit Web API accounts.

3.2. Description of methods used in Web communication.

3.2.1. AdminController

3.2.1.1. CreateNewUser - This method creates a new user of the global repository.

```
/// <summary>
/// Create new user
/// </summary>
/// <param name="account"></param>
/// <returns></returns>
[HttpPost("CreateNewUser")]
public async Task<ActionResult<NewUser>> CreateNewUser(NewUser user)
{
    string data = null;
    foreach (var item in await new GlobalRepositoryData().AdminCheck())
    {
        if (_userEx.ToUpper() == item.ToString().ToUpper())
        {
            try
            {
                data = Convert.ToString(await new
GlobalRepositoryData().CreateNewUser(user));
                _logger.LogInformation($"NewUser : {data}");
                if (data == null)
                {
                    _logger.LogWarning($"No data found for {_userEx}");
                    return NotFound(new { message = $"No data found for
{_userEx}" });
                }
            }
            catch (System.Exception ex)
            {
                _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
                return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
            }
        }
        else
        {
            return StatusCode(500, $"You don't have the privilege to perform this
operation.");
        }
    }
    return Ok(data);
}
```

3.2.2. AuditController

3.2.2.1. GetAuditAccountsCount - This method returns the number of pages for a given account.

```
/// <summary>
/// Return the number of accounts in the audit.
/// </summary>
/// <param name="accountExId"></param>
/// <returns></returns>
[HttpGet("Accounts/Count")]
public async Task<ActionResult<int>> GetAuditAccountsCount(string
accountExId)
{
    int data;
    try
    {
        _logger.LogInformation($"Count for GetAuditAccountsCount by user
: {_userEx}");
        data = await new AuditData().AuditAccountsCount(accountExId);

        if (data == 0)
        {
            return NotFound(new { message = $"No account is assigned to
the user : {_userEx}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(new { message = $"For user {_userEx} are assigned {data}"
});
}
```

3.2.2.2. GetAuditServersCount - This method returns the number of pages for a given server.

```
/// <summary>
/// Return the number of servers in the audit.
/// </summary>
/// <param name="serverExId"></param>
/// <returns></returns>
[HttpGet("Servers/Count")]
public async Task<ActionResult<int>> GetAuditServersCount(string
serverExId)
{
    int data;
    try
    {
        _logger.LogInformation($"Count for GetAuditServersCount by user :
{_userEx}");
        data = await new AuditData().AuditServersCount(serverExId);

        if (data == 0)
        {
            return NotFound(new { message = $"No servers is assigned to
the user : {_userEx}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(new { message = $"For user {_userEx} are assigned {data}"
});
}
```

3.2.2.3. GetAuditSystemsCount - This method returns the number of pages for a given system.

```
/// <summary>
/// Return the number of systems in the audit.
/// </summary>
/// <param name="systemExId"></param>
/// <returns></returns>
[HttpGet("Systems/Count")]
public async Task<ActionResult<int>> GetAuditSystemsCount(string
systemExId)
{
    int data;
    try
    {
```

```
        _logger.LogInformation($"Count for GetAuditSystemsCount by user :
{_userEx}");
        data = await new AuditData().AuditSystemsCount(systemExId);

        if (data == 0)
        {
            return NotFound(new { message = $"No systems is assigned to
the user : {_userEx}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(new { message = $"For user {_userEx} are assigned {data}"
});
}
```

3.2.2.4. GetAuditAccounts - This method returns the audit for the account given in the query. The page number and page size are required.

```
/// <summary>
/// Return accounts saved in the audit.
/// </summary>
/// <param name="accountExId"></param>
/// <param name="pageNumber"></param>
/// <param name="pageSize"></param>
/// <returns></returns>
[HttpGet("Accounts")]
public async Task <ActionResult<IEnumerable<AuditAccounts>>>
GetAuditAccounts(string accountExId, [FromQuery] int pageNumber,
[FromQuery] int pageSize)
{
    IEnumerable<AuditAccounts> data;
    try
    {
        _logger.LogInformation($"Data downloading for account :
{accountExId} by user : {_userEx} (GetAuditServers)");
        data = await new AuditData().AuditAccounts(accountExId, pageSize,
pageNumber);

        if (data == null)
        {
            _logger.LogWarning($"No data found for user : {_userEx} and
account : {accountExId}");
            return NotFound(new { message = $"No data found for user :
{_userEx} and account : {accountExId}" });
        }
    }
```

```
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(data);
}
```

3.2.2.5. GetAuditServers - This method returns the audit for the servers given in the query. The page number and page size are required.

```
/// <summary>
/// Return servers saved in the audit.
/// </summary>
/// <param name="serverExId"></param>
/// <param name="pageNumber"></param>
/// <param name="pageSize"></param>
/// <returns></returns>
[HttpGet("Servers")]
public async Task<ActionResult<IEnumerable<AuditServers>>>
GetAuditServers(string serverExId, [FromQuery] int pageNumber,
[FromQuery] int pageSize)
{
    IEnumerable<AuditServers> data;
    try
    {
        _logger.LogInformation($"Data downloading for server :
{serverExId} by user : {_userEx} (GetAuditServers)");
        data = await new AuditData().AuditServers(serverExId, pageSize,
pageNumber);

        if (data == null)
        {
            _logger.LogWarning($"No data found for user : {_userEx} and
server : {serverExId}");
            return NotFound(new { message = $"No data found for user :
{_userEx} and server : {serverExId}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(data);
}
```

3.2.2.6. GetAuditSystems - This method returns the audit for the systems given in the query. The page number and page size are required.

```
/// <summary>
/// Return systems saved in the audit.
/// </summary>
/// <param name="systemrExId"></param>
/// <param name="pageNumber"></param>
/// <param name="pageSize"></param>
/// <returns></returns>
[HttpGet("Systems")]
public async Task<ActionResult<IEnumerable<AuditSystems>>>
GetAuditSystems(string systemrExId, [FromQuery] int pageNumber,
[FromQuery] int pageSize)
{
    IEnumerable<AuditSystems> data;
    try
    {
        _logger.LogInformation($"Data downloading for system :
{systemrExId} by user : {_userEx} (GetAuditSystems)");
        data = await new AuditData().AuditSystems(systemrExId, pageSize,
pageNumber);

        if (data == null)
        {
            _logger.LogWarning($"No data found for user : {_userEx} and
system : {systemrExId}");
            return NotFound(new { message = $"No data found for user :
{_userEx} and system : {systemrExId}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(data);
}
```

3.2.3. GlobalRepositoryDataController

3.2.3.1. CreateNewAccount - This method creates a new account.

```
/// <summary>
/// Create a new account with information about servers and systems.
/// </summary>
/// <param name="account"></param>
/// <returns></returns>
[HttpPost("CreateNewAccount")]
public async Task<ActionResult<NewAccount>> CreateNewAccount(NewAccount
account)
{
    string data;
    try
    {
        data = Convert.ToString(await new
GlobalRepositoryData().CreateNewAccount(account, _userEx));
        _logger.LogInformation($"CreateNewAccount {data} for {_userEx}");
        if (data == null)
        {
            _logger.LogWarning($"No data found for {_userEx}");
            return NotFound(new { message = $"No data found for user :
{_userEx} and account : {account}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
   return Ok(data);
}
```

3.2.3.2. GetGlobalRespositoryData - This method displays data for the account specified in the query. The page number and page size are required.

```
/// <summary>
/// Collect all data about existing accounts.
/// </summary>
/// <param name="pageNumber"></param>
/// <param name="pageSize"></param>
/// <returns></returns>
[HttpGet("/AllAccounts")]
public async Task<ActionResult<IEnumerable<GrAccount>>>
GetGlobalRespositoryData([FromQuery] int pageNumber, [FromQuery] int
pageSize)
{
```

```
    IEnumerable<GrAccount> data;
    try
    {
        _logger.LogInformation($"Data downloading for GrAccount by user :
{_userEx}");
        data = await new GlobalRepositoryData().GrData(_userEx, pageSize,
pageNumber);

        if (data == null)
        {
            _logger.LogWarning($"No data found for {_userEx}");
            return NotFound(new { message = $"No data found for user
{_userEx}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(data);
}
```

3.2.3.3. GetGlobalRespositoryDatCount - This method displays how many pages there are for the account.

```
/// <summary>
/// Checking how many accounts are assigned to a user.
/// </summary>
/// <returns></returns>
[HttpGet("/AllAccounts/Count")]
public async Task<ActionResult<int>> GetGlobalRespositoryDatCount()
{
    int data;
    try
    {
        _logger.LogInformation($"Count for GrAccount by user :
{_userEx}");
        data = await new GlobalRepositoryData().GrDataCount(_userEx);
        if (data == 0)
        {
            return NotFound(new { message = $"No account is assigned to
the user : {_userEx}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
```

```
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(new { message = $"For user {_userEx} are assigned {data}."
});
}
```

3.2.3.4. DeleteAccount - This method deletes the account specified in the query.

```
/// <summary>
/// DEelte account
/// </summary>
/// <param name="accountExId"></param>
/// <returns></returns>
[HttpDelete("DeleteAccount")]
public async Task<ActionResult<bool>> DeleteAccount(string accountExId)
{
    try
    {
        await new GlobalRepositoryData().DeleteAccount(accountExId);
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(true);
}
```

3.2.4. GrTablesController

3.2.4.1. GetGlobalRespositoryDocumentationCount - This method displays how many pages there are for the documentation.

```
/// <summary>
/// Checking how many objects are available for download from the
documentation.
/// </summary>
/// <returns></returns>
[HttpGet("Documentation/All/Count")]
public async Task<ActionResult<int>>
GetGlobalRespositoryDocumentationCount()
{
    int data;
    try
    {
```

```
        _logger.LogInformation($"GetGlobalRespositoryDocumentationCount
for user : {_userEx}");
        data = await new Documentation().DBDocumentationCount();
        if (data == 0)
        {
            return NotFound(new { message = $"Not found documentation."
});
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(new { message = $"There are {data} elements in the
documentation." });
}
```

3.2.4.2. GetGlobalRespositoryDocumentation - This method displays documentation. The page number and page size are required.

```
/// <summary>
/// Getting all the objects from the documentation.
/// </summary>
/// <param name="pageNumber"></param>
/// <param name="pageSize"></param>
/// <returns></returns>
[HttpGet("Documentation/All")]
public async Task<ActionResult<IEnumerable<GrTables>>>
GetGlobalRespositoryDocumentation([FromQuery] int pageNumber, [FromQuery]
int pageSize)
{
    IEnumerable<GrTables> data;
    try
    {
        _logger.LogInformation($"GetGlobalRespositoryDocumentation for
user : {_userEx}");
        data = await new Documentation().DBDocumentation(pageNumber,
pageSize);

        if (data == null)
        {
            _logger.LogWarning("No data found for
GetGlobalRespositoryDocumentation/Documentation/All");
            return NotFound(new { message = $"No data found in
documentation." });
        }
    }
    catch (System.Exception ex)
    {
```

```
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(data);
}
```

3.2.4.3. GetSpecyficInformationDocumentation - This method displays documentation for selected schemes and tables. The page number and page size are required.

```
/// <summary>
/// To retrieve objects from the documentation with table and schema
names.
/// </summary>
/// <param name="schema_name"></param>
/// <param name="table_name"></param>
/// <param name="pageNumber"></param>
/// <param name="pageSize"></param>
/// <returns></returns>
[HttpGet("Documentation/{schema_name}/{table_name}")]
public async Task<ActionResult<IEnumerable<GrTables>>>
GetSpecyfikInformationDocumentation(string schema_name, string
table_name, [FromQuery] int pageNumber, [FromQuery] int pageSize)
{
    IEnumerable<GrTables> data;
    try
    {
        _logger.LogInformation($"GetSpecyfikInformationDocumentation for
user : {_userEx}");
        data = await new Documentation().DBDocumentation(schema_name,
table_name, pageNumber, pageSize);

        if (data == null)
        {
            _logger.LogWarning($"No data found for
GetGlobalRespositoryDocumentation/Documentation/{schema_name}/{table_name
}");
            return NotFound(new { message = $"No data found for
GetGlobalRespositoryDocumentation/Documentation/{schema_name}/{table_name
}" });
        }
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(data);
}
```

3.2.5. ReconciliationController

3.2.5.1. ReconAccounts - This method is used to reconcile data for accounts.

```
/// <summary>
/// Accounts reconciliations.
/// </summary>
/// <param name="recon"></param>
/// <returns></returns>
[HttpPost("Accounts")]
public async Task<ActionResult<ReconAccounts>>
ReconAccounts(ReconAccounts recon)
{
    try
    {
        await new ReconciliationData().ReconciliationAccounts(recon);
        _logger.LogInformation($"The data have been accepted for user:
{_userEx} (ReconAccounts).");
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(new { message = "The data have been accepted" });
}
```

3.2.5.2. ReconServers - This method is used to reconcile data for servers.

```
/// <summary>
/// Servers reconciliations.
/// </summary>
/// <param name="recon"></param>
/// <returns></returns>
[HttpPost("Servers")]
public async Task<ActionResult<ReconServers>> ReconServers(ReconServers
recon)
{
    try
    {
        await new ReconciliationData().ReconciliationServers(recon);
        _logger.LogInformation($"The data have been accepted for user:
{_userEx} (ReconServers).");
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
```

```
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(new { message = "The data have been accepted" });
}
```

3.2.5.3. ReconSystems - This method is used to reconcile data for systems.

```
/// <summary>
///  System reconciliations.
/// </summary>
/// <param name="recon"></param>
/// <returns></returns>
[HttpPost("Systems")]
public async Task<ActionResult<ReconSystems>> ReconSystems(ReconSystems
recon)
{
    try
    {
        await new ReconciliationData().ReconciliationSystems(recon);
        _logger.LogInformation($"The data have been accepted for user:
{_userEx} (ReconSystems).");
    }
    catch (System.Exception ex)
    {
        _logger.LogError($"An error has occurred during data processing.
For : {_userEx}. Error : {ex.Message}");
        return StatusCode(500, $"An error has occurred during data
processing. For : {_userEx}. Error : {ex.Message}");
    }
    return Ok(new { message = "The data have been accepted" });
}
```

4. Conclusions

Training material which I received during the postgraduate studies "Programming on the .Net platform" and workshops with specialists in object-oriented programming allowed me to create a web application "Global Repositories" of accounts, servers and systems. One of the biggest advantages of such projects is to learn the basic principles of object-oriented programming on the .net platform, project management and source code management. Currently, the level of my advancement in the design and development of web applications has definitely increased.

Web application which I created is a simple but comprehensive solution for every company that in its portfolio manages data and information about the infrastructure. With simplicity in access to data and the ability to easily check the documentation on how to use Web Api "Global Repository" is a very easy tool to implement in any system.

While working on the application I encountered many problems, especially related to the lack of experience in using the capabilities offered by the .Net Core platform. I encountered many optimization and functional difficulties. Therefore, I used Microsoft documentation, online courses and actively used the "Stackoverflow" platform. However, not all the plans and assumptions contained in the Vision document were implemented.

Despite minor complications, I managed to create a very good web application. I can certainly say that the design of the database, the entity framework database model and the application itself is at a high level of code advancement.

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