Retail Manager Development Manual

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1 Introduction

1.1 Project Summary

The goal of tkhis project is to build a dektop app that runs a cash register, handles inventory and manages an entire retail store. Creating and implementing a **WebAPI layer**, will allow the whole project to grow. This lauyer will be able to serve each kind of application (desktop, mobile, web, ...).

2 Initial Plan

2.1 Outline

The App is going to be build as a MVP (Minimum Viable Product) that can be expanded to cover all of the features, which are needed over time - so it can grow into a full featured application. First step is getting all of the major pieces set up, including:

2.2 Technologies

- Unit Testing
- Dependency Injection
- WPF
- MVVM with Caliburn Micro
- ASP.NET MVC (Web Frontend)
- .NET Framework
- .NET Core 3.0
- SSDT - SQL Server Data Tools
- Git
- Azure DevOps
- Async
- Reporting
- WebAPI
- Logging
- Data Validation
- HTML
- CSS
- JavaScript
- Authentication

3 Initial Setup in Visual Studio

1. Setting up a Git-Repository, including README, GitIgnore (for VS) and License
2. Creating a **Blank Solution**: Other Project Types → Blank Solution
   Such type of sulution isn't language specific.

4 Creating a WebAPI with Authentification

1. Adding new Project to the Solution:

   Web → ASP.NET Web Application (.NET Framework) → WebAPI

   Add folders and references for:

   - MVC
   - Web API

   Change Authentication to

   - Individual User Accounts

2. Upgrading all NuGet-Packages

4.1 Indentity Configuration

App_Start → IdentityConfig.cs

In there are some settings for setting up the WebAPI, especially for authentication:

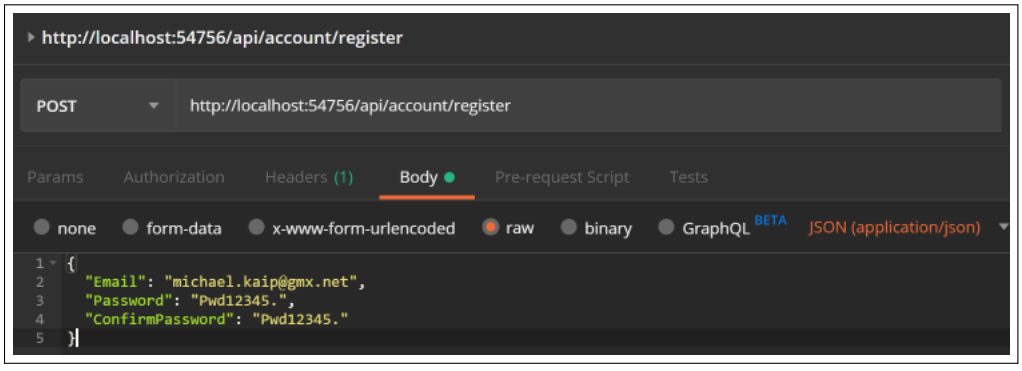
- UserValidator
- PasswordValidator

4.2 Getting authorized for development

4.2.1 Postman

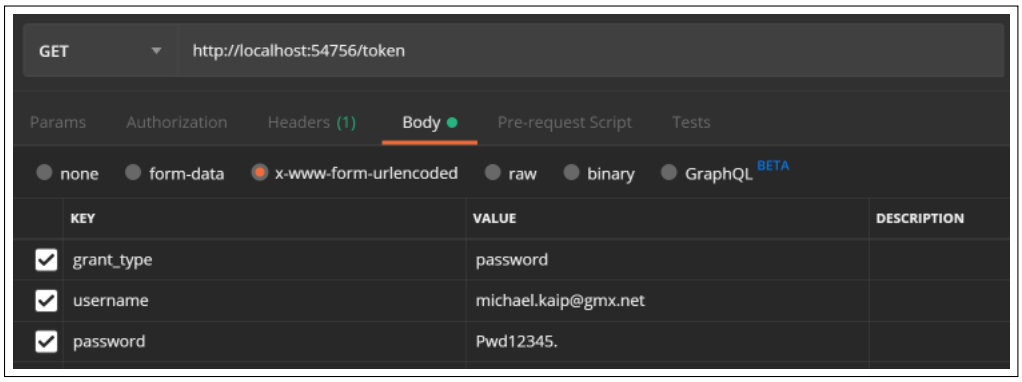
The following calls has to be applied in the given order:

1. **POST**



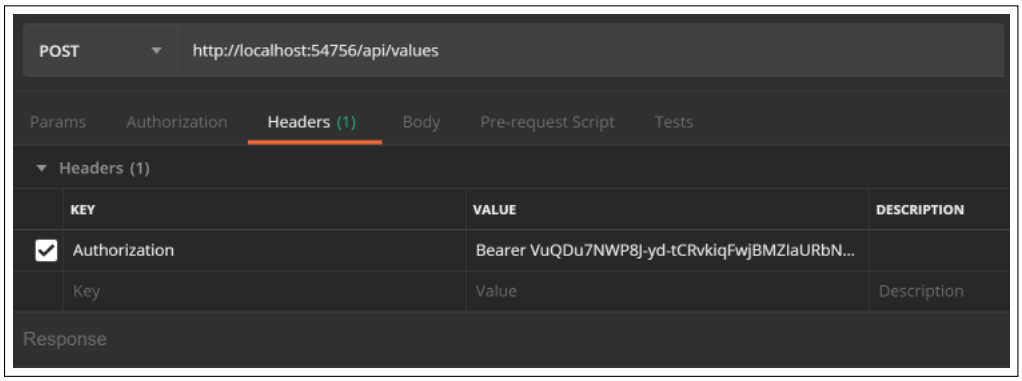
   Creates a new user account and stores this information into the user database.
   If **Status: 200 OK**, username and password has been succesfully created.

2. **GET**



It will return an **access_token** which is, by default, valid for 14 days. Token is needed for all further interaction with the server. Can be also configured for shorter valid periods.

3. **POST**



4.2.2 Getting User Information

In order to get the Identity of users returned, some changes have to be implemented. Through this it's becomes possible to apply different accesibility rules, based on the user-group a certain user is part of.

1. *RMDataManager.Controllers.ValuesController*

```
using System.Web.Http;
using Microsoft.AspNet.Identity; // Needed for getting information about the user

namespace RMDataManager.Controllers
{
    [Authorize]
    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class ValuesController : ApiController
    {
        // GET api/values
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public IEnumerable<string> Get()
        {
            // Stores the ID of each user
            var userId = RequestContext.Principal.Identity.GetUserId();
            return new string[] { "value1", "value2", userId };
        }
```

5 Installing and configuring SWAGGER

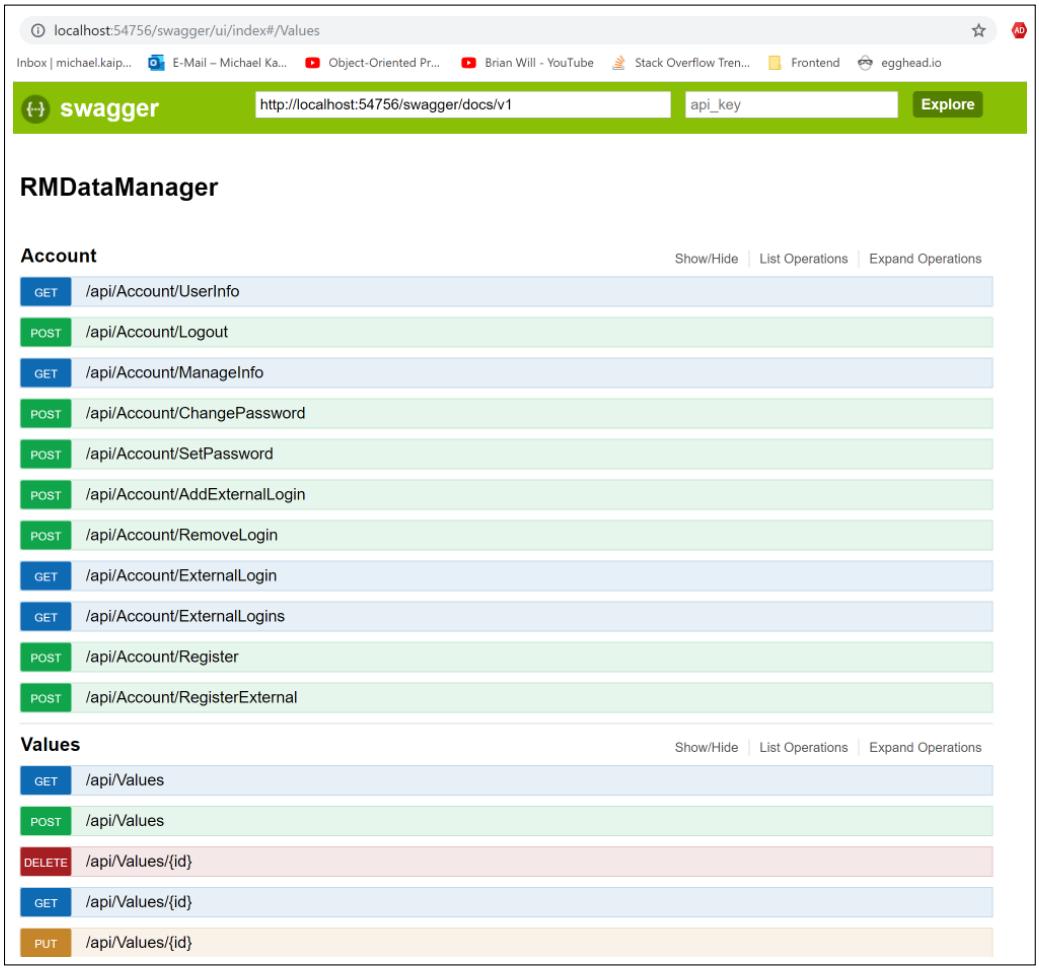
SWAGGER is an API documentation and demonstration tool.

5.1 Installing SWAGGER

1. NuGet-Manager

   Adds a SWAGGER to WebAPI-Projects.

2. Starting SWAGGER



5.2 Channging the configuration of SWAGGER

RMDataManager.App_Start.SwaggerConfig.cs

1. Changing title

```
// Use "SingleApiVersion" to describe a single version API. Swagger 2.0 includes an "Info" object to
// hold additional metadata for an API. Version and title are required but you can also provide
// additional fields by chaining methods off SingleApiVersion.
//
c.SingleApiVersion("v1", title: "Retail Manager API"); // Changed to a propper name
```

2. Enabling propper printing of ducuments

```
// If you want the output Swagger docs to be indented properly, enable the "PrettyPrint" option.
//
c.PrettyPrint(); // enabled
```

3. Treating Enums as Strings

```
// In accordance with the built in JsonSerializer, Swashbuckle will, by default, describe enums as integers.
// You can change the serializer behavior by configuring the StringToEnumConverter globally or for a given
// enum type. Swashbuckle will honor this change out-of-the-box. However, if you use a different
// approach to serialize enums as strings, you can also force Swashbuckle to describe them as strings.
//
c.DescribeAllEnumsAsStrings(); // enabled
```

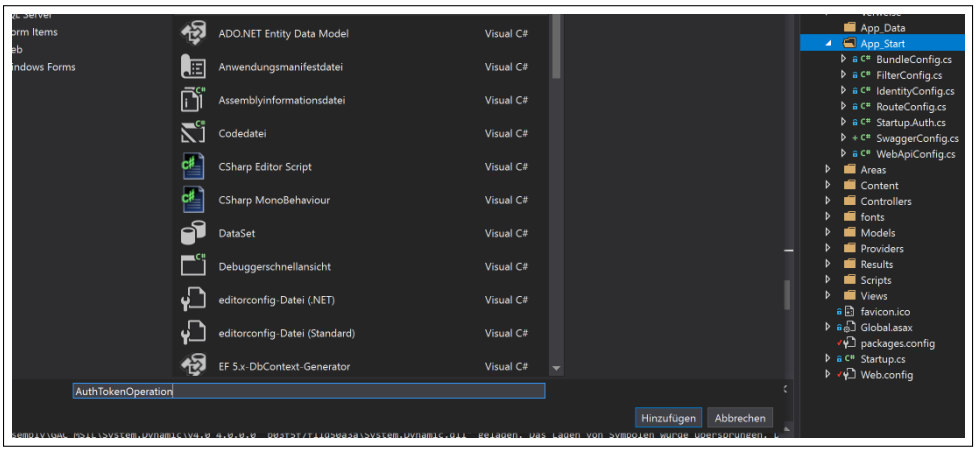
4. Changing document title

```
.EnableSwaggerUi(configure: c =>
    {
        // Use the "DocumentTitle" option to change the Document title.
        // Very helpful when you have multiple Swagger pages open, to tell them apart.
        //
        c.DocumentTitle("RM API"); // changed the name
```

5.3 Adding OAuth ability

1. Enabling token endpoint allowance in the SWAGGER documentation

   (a) Adding a new Class to $\boxed{RMDataManager.App_Start}$



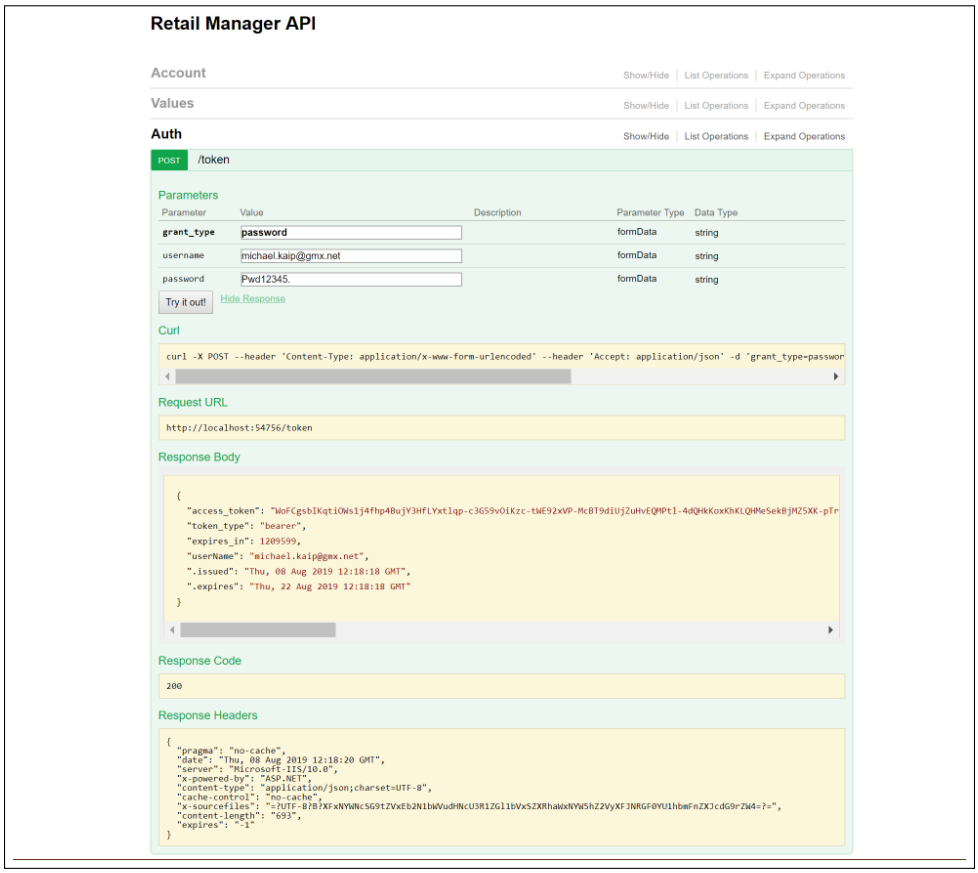
(b) Implementing the required Interface

```
public class AuthTokenOperation : IDocumentFilter
{
    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public void Apply(SwaggerDocument swaggerDoc, SchemaRegistry schemaRegistry, IApiExplorer apiExplorer)
    {
        swaggerDoc.paths.Add("/token", new PathItem
        {
            post = new Operation
            {
                tags = new List<string> { "Auth" },
                consumes = new List<string>
                {
                    "application/x-www-form-urlencoded"
                },
                parameters = new List<Parameter>
                {
                    new Parameter
                    {
                        type = "string",
                        name = "grant_type",
                        required = true,
                        @in = "formData",
                        @default = "password"
                    },
                    new Parameter
                    {
                        type = "string",
                        name = "username",
                        required = false,
                        @in = "formData"
                    },
                    new Parameter
                    {
                        type = "string",
                        name = "password",
                        required = false,
                        @in = "formData"
                    }
                }
            }
        });
    }
}
```

(c) Applying it to SwaggerConfig.cs

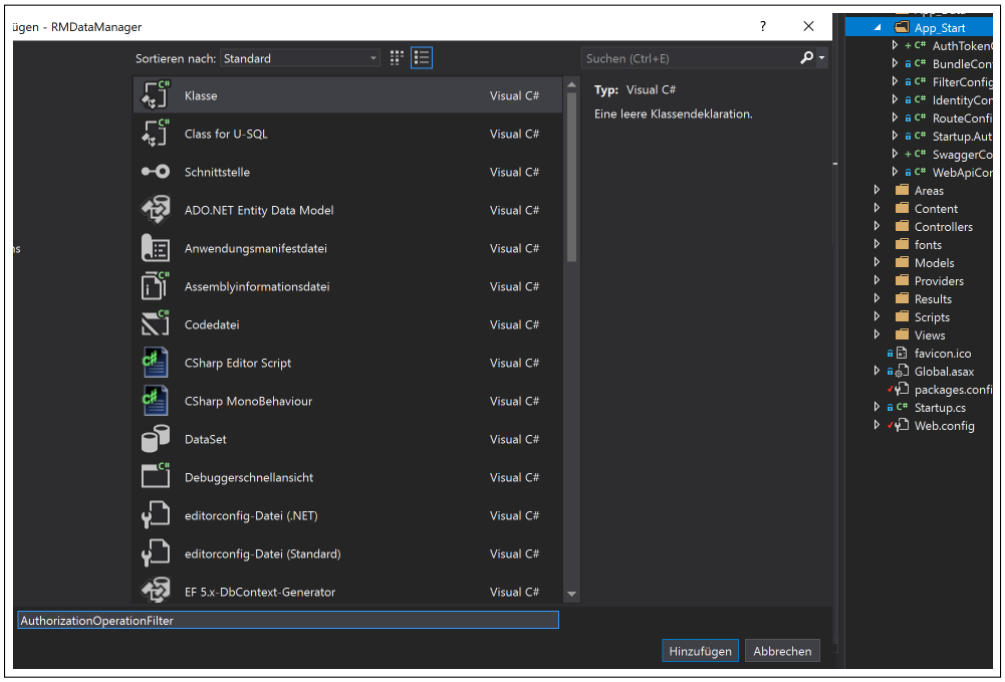
```
GlobalConfiguration.Configuration
    .EnableSwagger(configure: c =>
        {
            c.DocumentFilter<AuthTokenOperation>(); // adding the implemented document filter
```

(d) Logging into the application using SWAGGER and get the token



2. Enabling to paste in the bearer token in order to authorize restricted commands

   (a) Adding a new Class to *RMDataManager.App_Start*



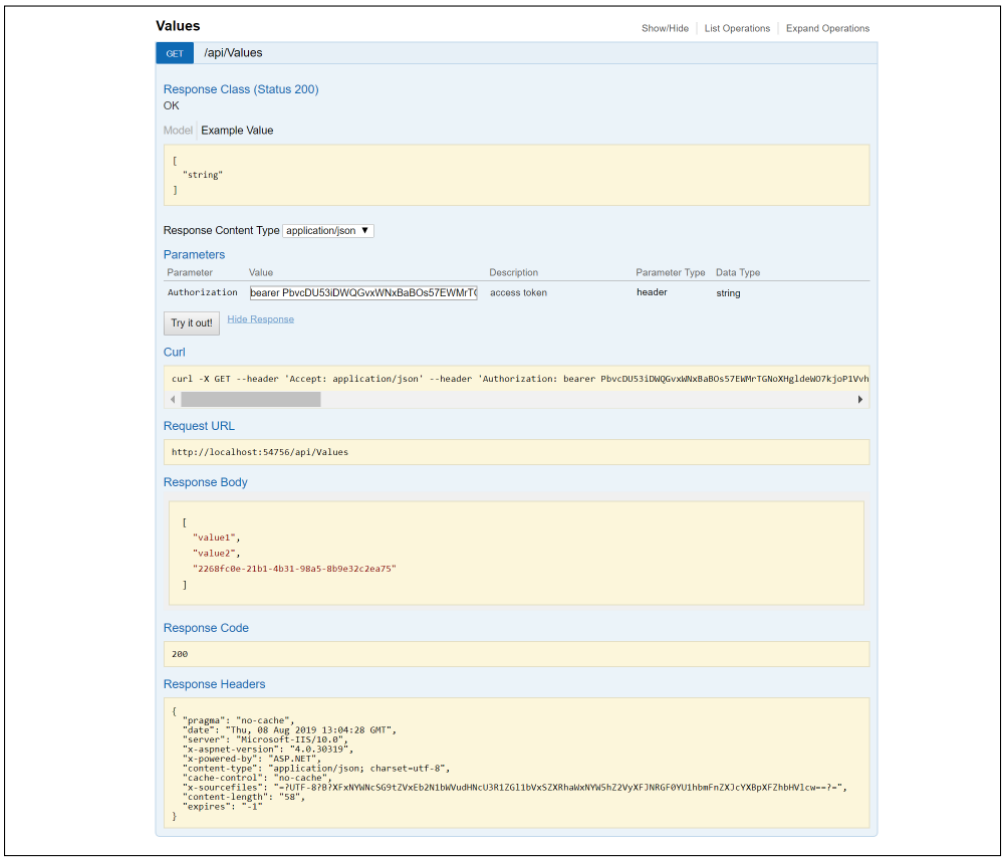
   (b) Implementing the required Interface

```
0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
public class AuthorizationOperationFilter : IOperationFilter
{
    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public void Apply(Operation operation, SchemaRegistry schemaRegistry, ApiDescription apiDescription)
    {
        // Adding a parameter to each operation.
        if (operation.parameters == null)
        {
            operation.parameters = new List<Parameter>();
        }

        operation.parameters.Add(new Parameter
        {
            name = "Authorization",
            @in = "header",
            description = "access token",
            type = "string"
        });
    }
}
```

   (c) Applying it to SwaggerConfig.cs

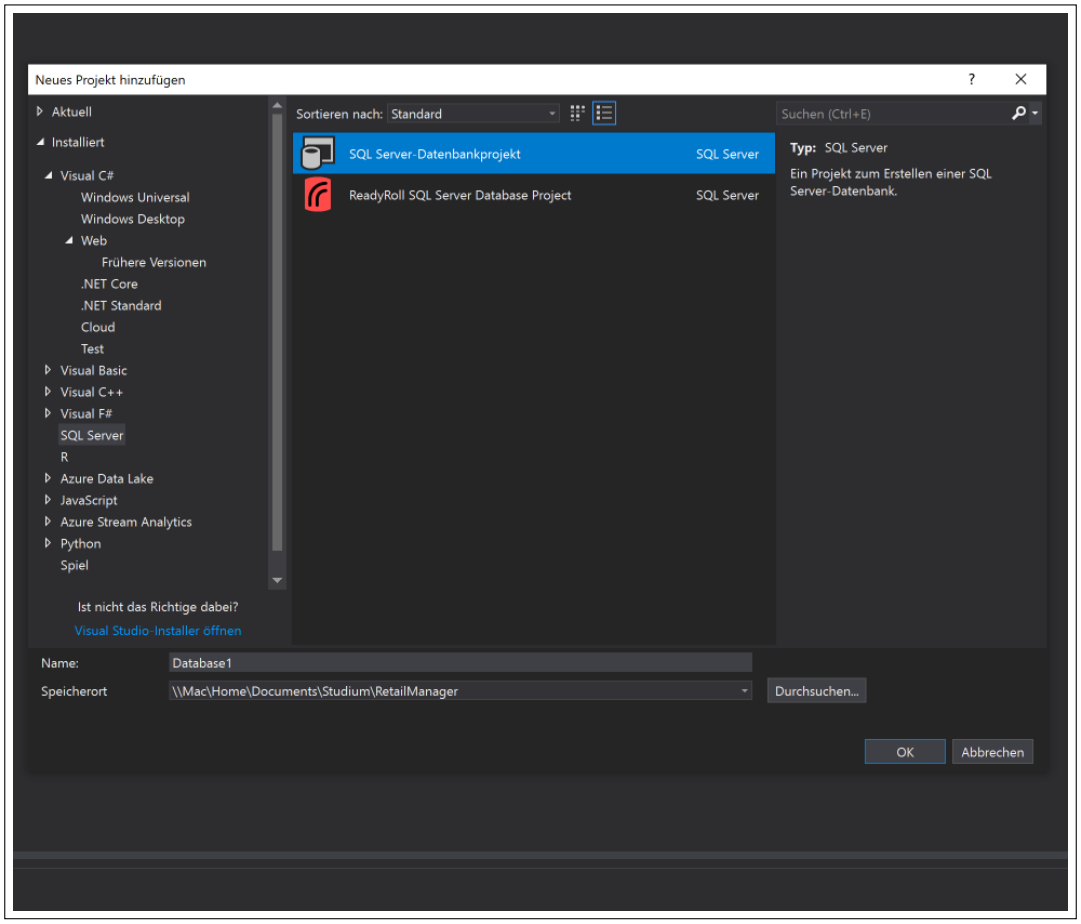
```
.EnableSwagger( configure: c =>
    {
        c.DocumentFilter<AuthTokenOperation>(); // adding the implemented document filter
        c.OperationFilter<AuthorizationOperationFilter>(); // adding the implented operation filter
```

   (d) Get user information from the application via SWAGGER using the token

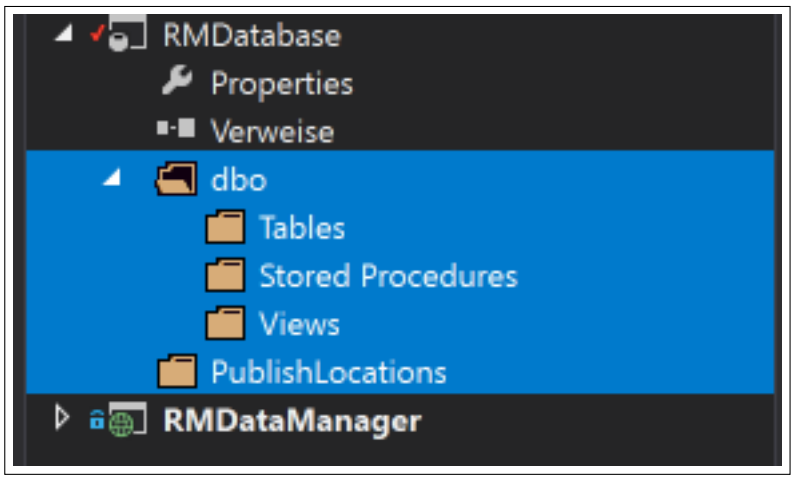

Values
Show/Hide | List Operations | Expand Operations
GET /api/Values
Response Class (Status 200)
OK
Model Example Value
[
"string"
]
Response Content Type application/json
Parameters
Parameter Value Description Parameter Type Data Type
Authorization bearer PbvcDU53iDWQGvxWNxBaBOs57EWMrT(access token header string
Try it out! Hide Response
Curl
curl -X GET --header 'Accept: application/json' --header 'Authorization: bearer PbvcDU53iDWQGvxWNxBaBOs57EWMrTGNoXHgldeWO7kjoP1Vvh
Request URL
http://localhost:54756/api/Values
Response Body
[
"value1",
"value2",
"2268fc0e-21b1-4b31-98a5-8b9e32c2ea75"
]
Response Code
200
Response Headers
{
"pragma": "no-cache",
"date": "Thu, 08 Aug 2019 13:04:28 GMT",
"server": "Microsoft-IIS/10.0",
"x-aspnet-version": "4.0.30319",
"x-powered-by": "ASP.NET",
"content-type": "application/json; charset=utf-8",
"cache-control": "no-cache",
"x-sourcefiles": "=?UTF-8?B?XFxNYWNcSG9tZVxEb2N1bWVudHNcU3R1ZGl1bVxSZXRhaWxNYWShZ2VyXFJNRGF0YU1hbmFnZXJcYXBpXFZhbHV1cw==?=",
"content-length": "58",
"expires": "-1"
}

6 SQL Database Setup

6.1 Adding new Database Project to the solution

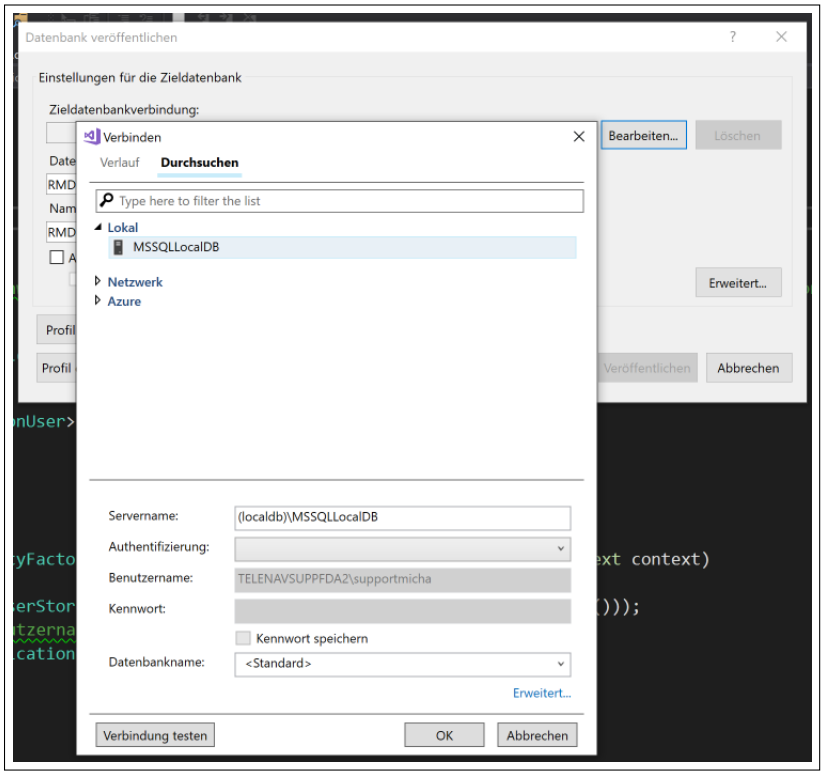


6.2 Adding several folders to the project

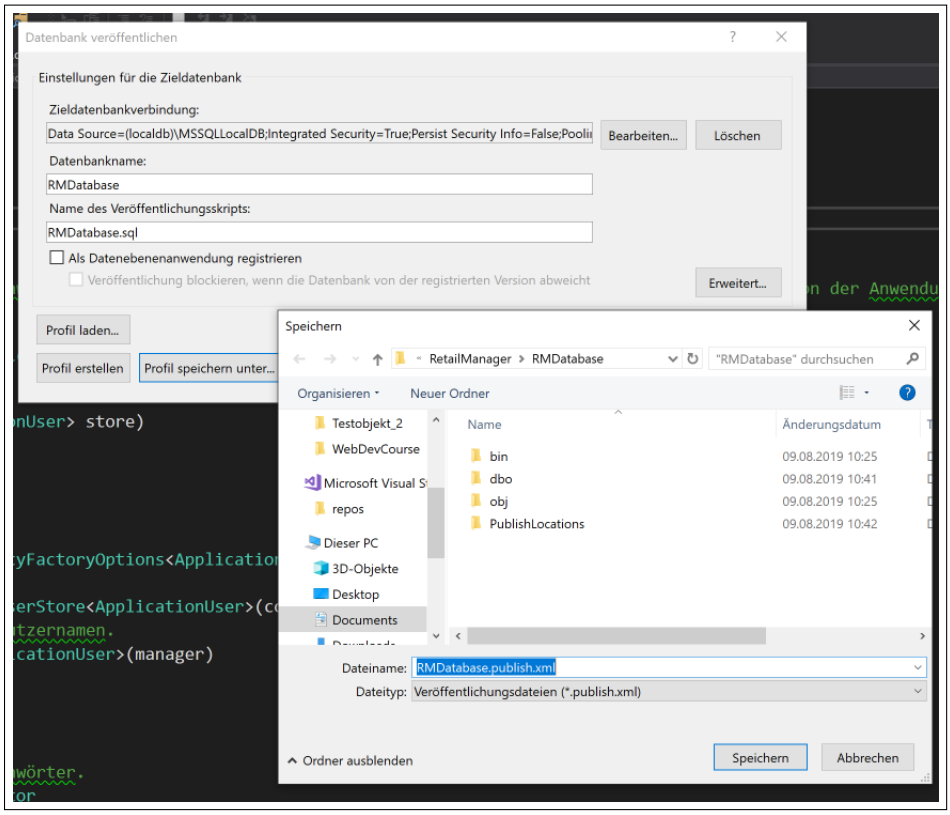


6.3 Creating a profile and publishing the Database

1. *RightClick on RMDatabase → Publish → Edit → Browse*

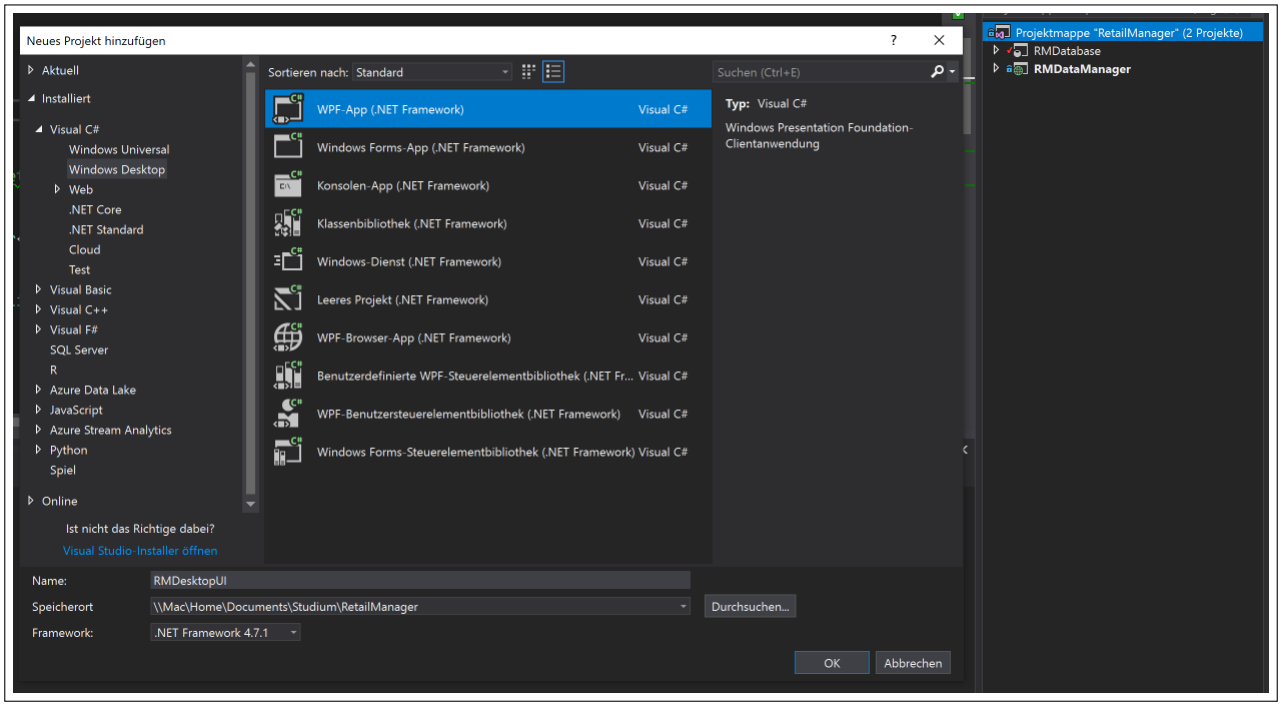


2. Naming and saving profile to PublishLocations

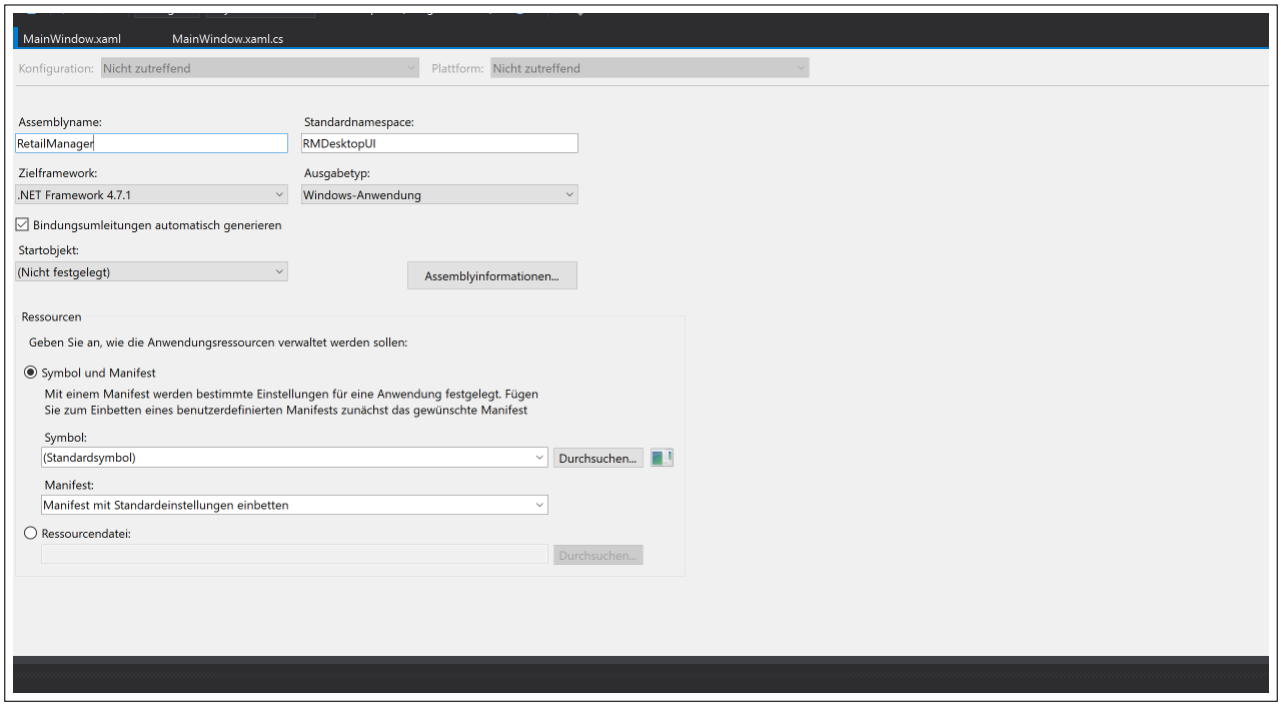


7 WPF with MVVM Project Setup

7.1 Adding the WPF Project to the solution



7.2 Changing the Assambly Name to the name of the solution in Properties

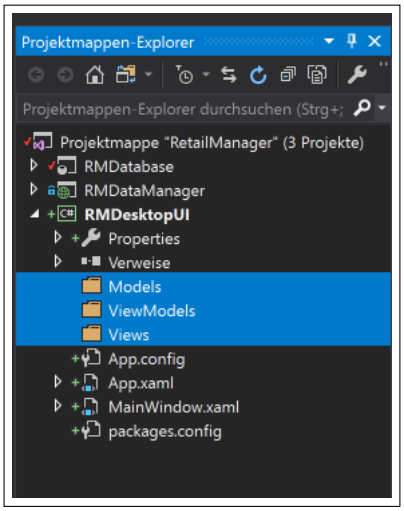


Also set project as the default startup-project.

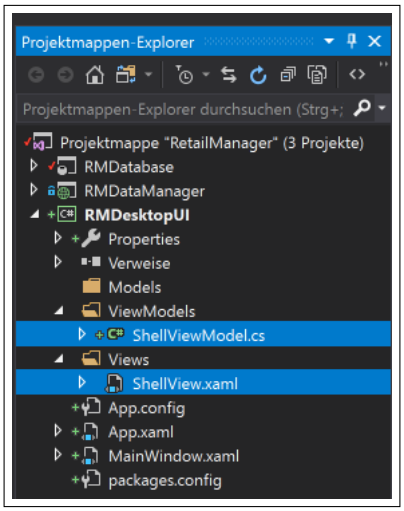
7.3 Adding Caliburn Micro MVVM-Framework

Add NuGet-Package to references.

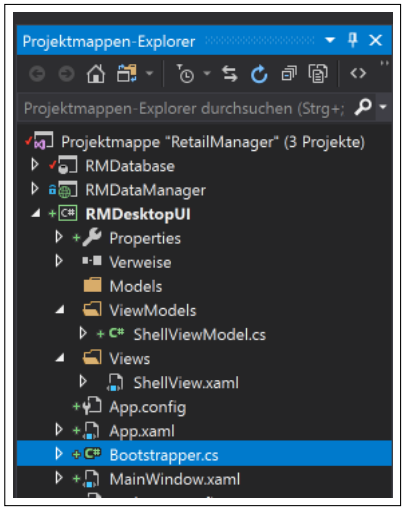
7.3.1 Adding the folder structure for the MVVM-Framework



7.3.2 Adding a new ShellViewModel class and a SchellView window

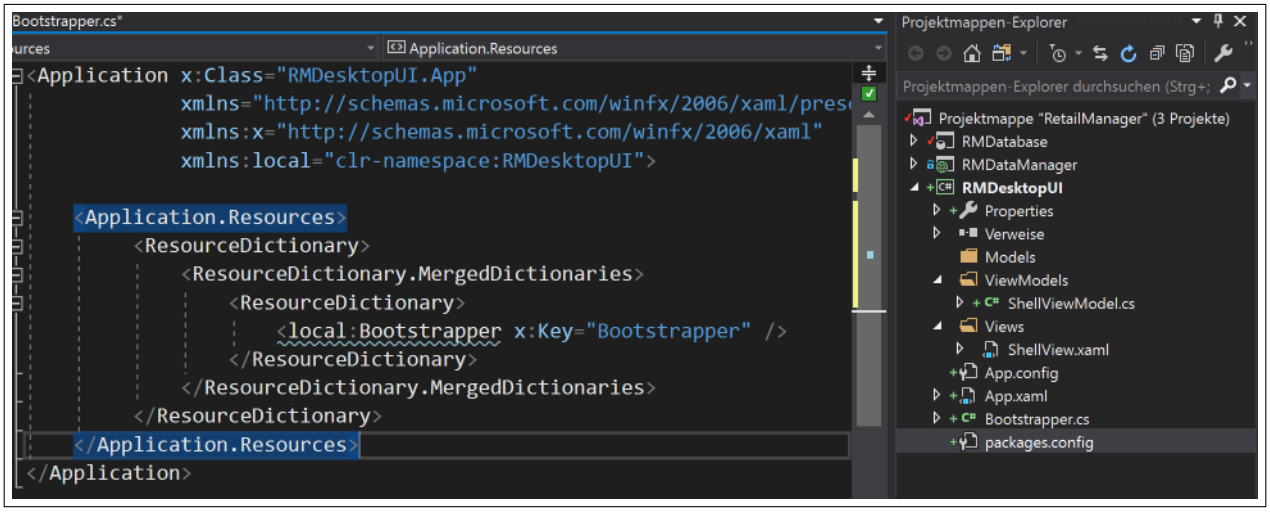


7.3.3 Adding a Bootstrapper class to DesktopUI




```
using System.Windows;
using Caliburn.Micro;
using RMDesktopUI.ViewModels;

namespace RMDesktopUI
{
    1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class Bootstrapper : BootstrapperBase
    {
        // Constructor
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public Bootstrapper()
        {
            Initialize();
        }

        // Enables, that on start up ShellViewModel is getting launched as the base view.
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        protected override void OnStartup(object sender, StartupEventArgs e)
        {
            DisplayRootViewFor<ShellViewModel>();
        }
    }
}
```

7.3.4 Removing StartUpURI from App.xaml and adding a new Ressource Dictionary



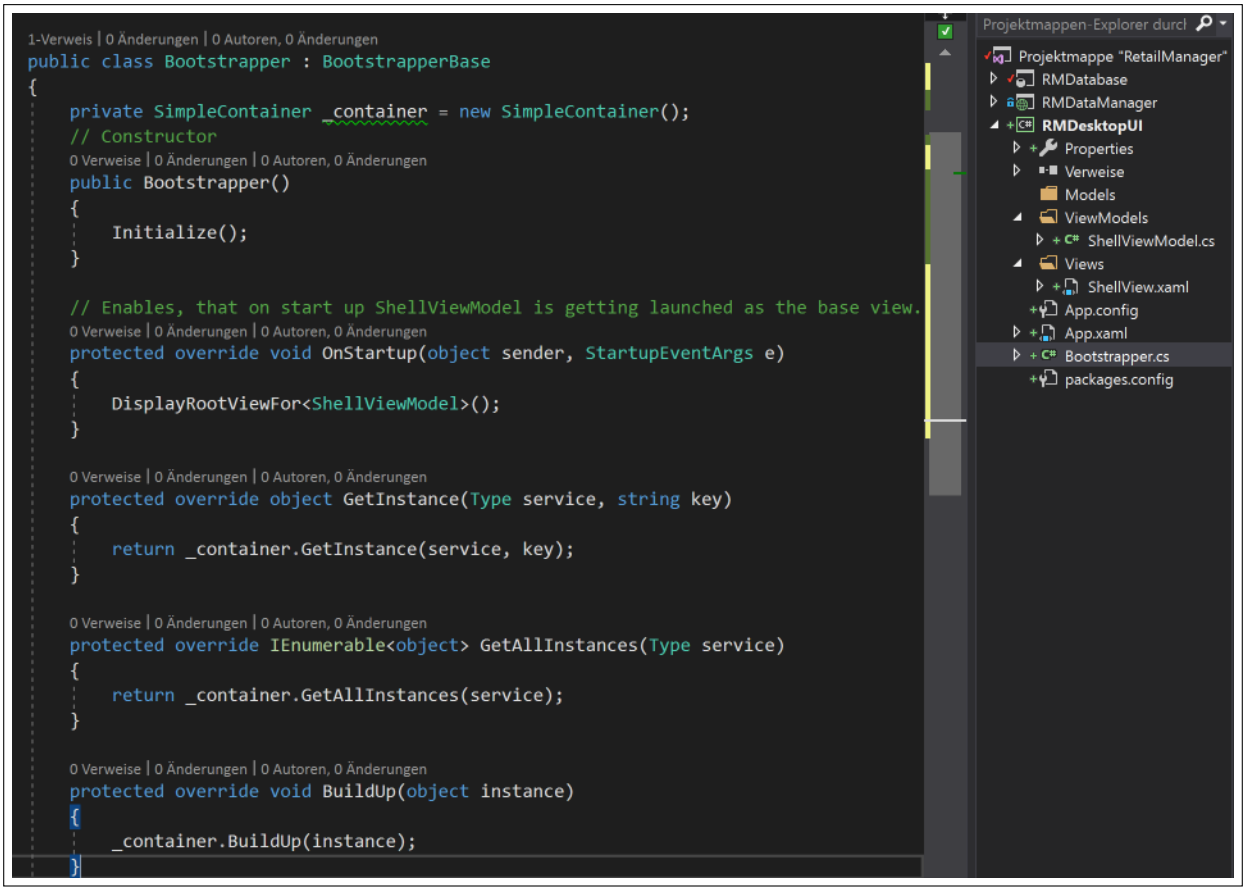
MainWindow.xaml can be deleted afterwards!!!

8 Dependency Injection in WPF

8.1 SimpleContainer in Caliburn Micro

Caliburn.Micro comes pre-bundled with a Dependency Injection container called SimpleContainer. A dependency injection container is an object that is used to hold dependency mappings for use later in an app via Dependency Injection. Dependency Injection is actually a pattern typically using the container element instead of manual service mapping.

8.1.1 Implementing SimpleContainer in Bootstrapper.cs

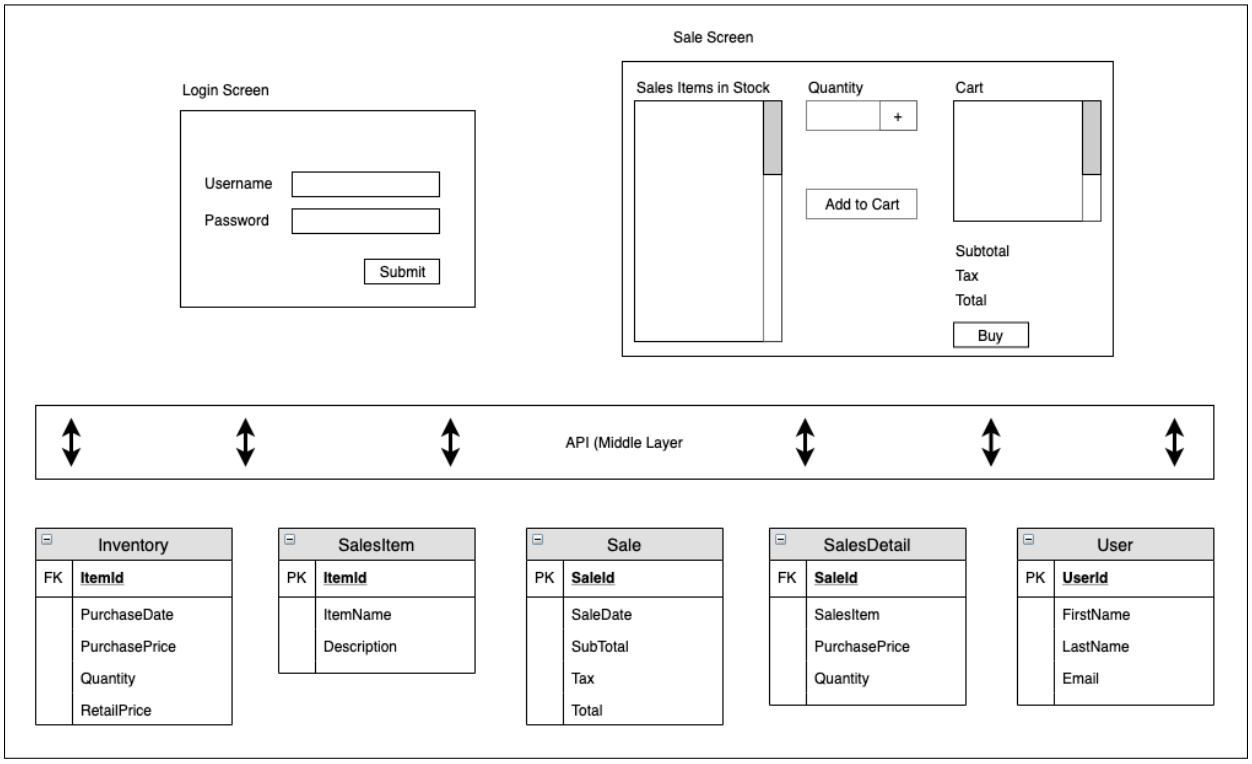


8.2 Overriding Configure() Method for the container

```
1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
public class Bootstrapper : BootstrapperBase
{
    private SimpleContainer _container = new SimpleContainer();
    // Constructor
    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public Bootstrapper()
    {
        Initialize();
    }

    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    protected override void Configure()
    {
        _container.Instance(_container);

        _container
            .Singleton<IWindowManager, WindowManager>()
            .Singleton<EventAggregator, EventAggregator>();

        // Connecting the ViewModel to the Views using reflection
        GetType().Assembly.GetTypes()
            .Where(type => type.IsClass)
            .Where(type => type.Name.EndsWith(value: "ViewModel"))
            .ToList()
            .ForEach(action: viewmodelType => _container.RegisterPerRequest(
                service: viewmodelType, viewmodelType.ToString(), implementation: viewmodelType));
    }
```

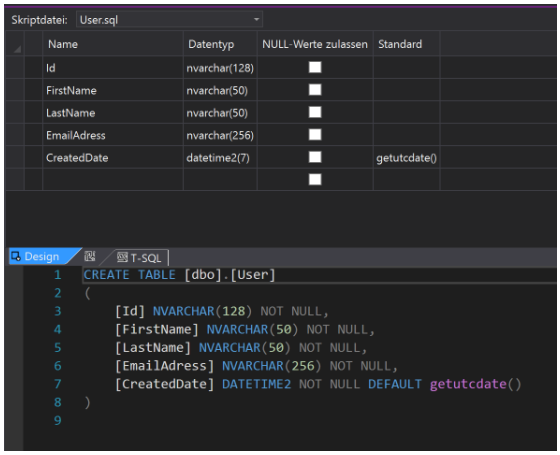
9 Datamodel - planning and setup

9.1 Planning the Register

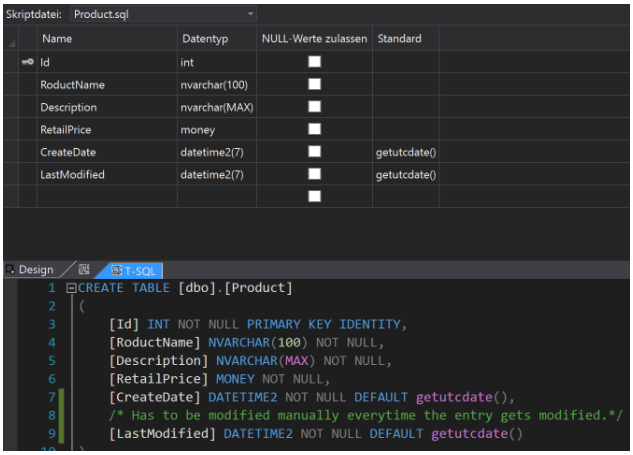


9.2 SQL Database Table Creation

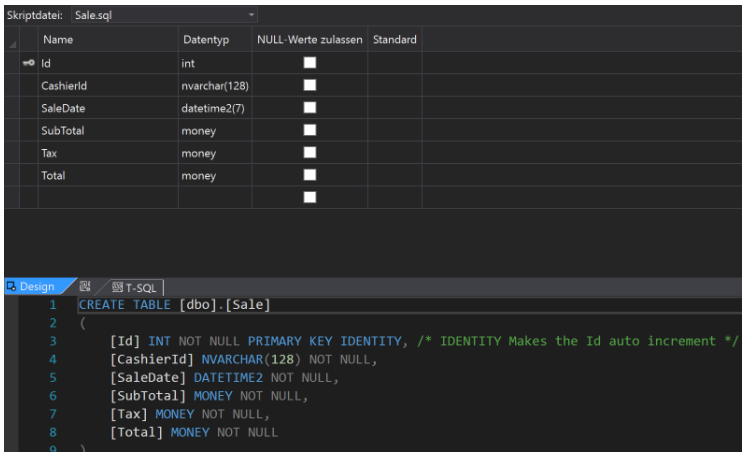
User.sql



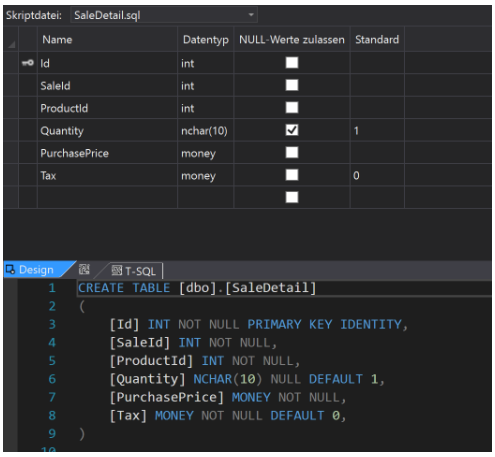
Product.sql



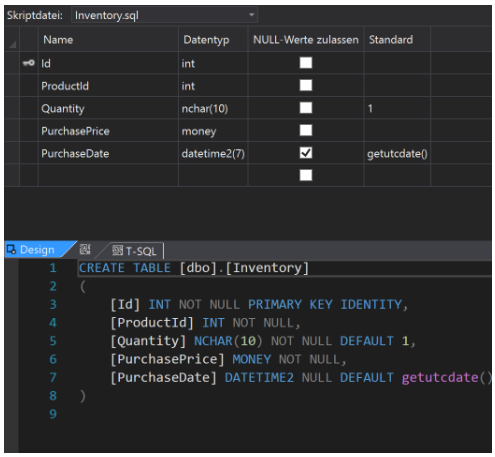
Sale.sql



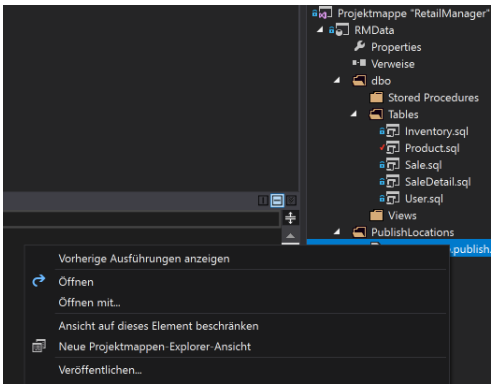
SaleDetail.sql



Inventory.sql



!!! **Publishing Tables** !!!



10 WPF Login Form Creation

10.1 Inheritance from the conductor class in Caliburn Micro

```
ShellViewModel.cs*
RMDesktopUI.ViewModels.ShellViewModel
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using Caliburn.Micro;

namespace RMDesktopUI.ViewModels
{
    1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class ShellViewModel : Conductor<object> // Could also be set up more specifically
                                                    // for certain types, or even use an interface.
    {
    }
}
```

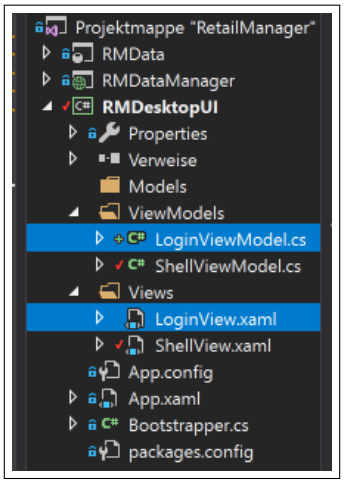
Conductor is a base class which inherits from Screen. Its responsibility is to conduct other objects by managing an active item and maintain a strict lifecycle of this conducted item. The conductor exists in multiple variants such as the one item conductor simple called Conductor, the multiple item conductors such as *Conductor.Collection.OneActiveandConductor.Collection.AllActive*.

10.2 Implementing the menue bar

```
<Window x:Class="RMDesktopUI.Views.ShellView"
        xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
        xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
        xmlns:local="clr-namespace:RMDesktopUI.Views"
        mc:Ignorable="d"
        Title="ShellView" Height="450" Width="800">
    <DockPanel>
        <Menu DockPanel.Dock="Top" FontSize="14">
            <MenuItem Header="_File">

            </MenuItem>
            <MenuItem Header="_Account">
                <MenuItem x:Name="LoginScreen" Header="_Login"/>
            </MenuItem>
        </Menu>
        <Grid>

        </Grid>
    </DockPanel>
</Window>
```

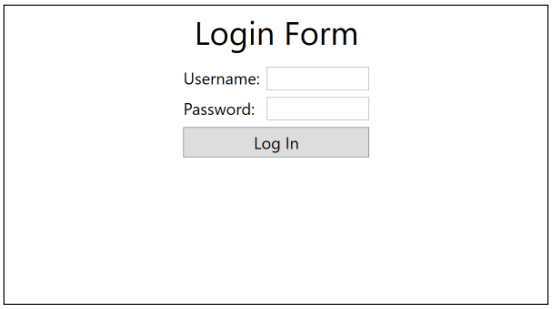
10.3 Adding a UserControl

10.3.1 Adding a class LoginViewModel (public) and UserControl LoginView



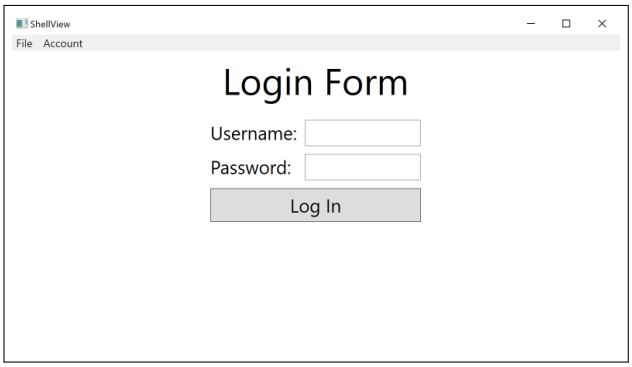
10.3.2 Designing the UserControl

```
<UserControl x:Class="RMDesktopUI.Views.LoginView"
             xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
             xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
             xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
             xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
             xmlns:local="clr-namespace:RMDesktopUI.Views"
             mc:Ignorable="d" Background="White" FontSize="24"
             d:DesignHeight="425" d:DesignWidth="800">
    <Grid>
        <Grid.ColumnDefinitions>
            <ColumnDefinition Width="*"/>
            <ColumnDefinition Width="Auto"/>
            <ColumnDefinition Width="Auto"/>
            <ColumnDefinition Width="*"/>
        </Grid.ColumnDefinitions>
        <Grid.RowDefinitions>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/> <!-- Username -->
            <RowDefinition Height="Auto"/> <!-- Password -->
            <RowDefinition Height="Auto"/> <!-- Button -->
            <RowDefinition Height="*"/>
        </Grid.RowDefinitions>
        <TextBlock Grid.Row="0" Grid.Column="1" Grid.ColumnSpan="2"
                   HorizontalAlignment="Center" FontSize="48" Margin="0 0 0 20">
            Login Form
        </TextBlock>

        <!-- Username Row -->
        <TextBlock Grid.Row="1" Grid.Column="1" Margin="0 0 10 10">
            Username:
        </TextBlock>
        <TextBox x:Name="userName" Grid.Row="1" Grid.Column="2" MinWidth="150"
                 Margin="0 0 0 10"/>

        <!-- Password Row -->
        <TextBlock Grid.Row="2" Grid.Column="1" Margin="0 0 10 10">
            Password:
        </TextBlock>
        <TextBox x:Name="password" Grid.Row="2" Grid.Column="2" MinWidth="150"
                 Margin="0 0 0 10"/>

        <!-- Button Row -->
        <Button Grid.Row="3" Grid.Column="1" Grid.ColumnSpan="2" Padding="10 5"
                HorizontalContentAlignment="Center" x:Name="loginButton">
            Log In
        </Button>
    </Grid>
</UserControl>
```



10.3.3 Activating the LoginView on startup in the ShellView

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using Caliburn.Micro;

namespace RMDesktopUI.ViewModels
{
    public class ShellViewModel : Conductor<object> // Could also be set up more speci
                                                    // for certain types, or even use
    {
        // Using constructor injection to pass in a new instance of loginVm
        private LoginViewModel _loginVm;
        public ShellViewModel(LoginViewModel loginVm)
        {
            _loginVm = loginVm;
            ActivateItem(_loginVm);

        }

        // Preventing from inheritance, because of virtual member call in constructor
        public sealed override void ActivateItem(object item)
        {
            base.ActivateItem(item);
        }
    }
}
```



Sealed is used to restrict the users from inheriting. A class can be sealed by using the sealed keyword or a single method. The keyword tells the compiler that class or method cannot be extended. No class can be derived from a sealed class.

10.3.4 Implementing LoginViewModel.cs

.cs PasswordBoxHelper.cs LoginView.xaml LoginViewModel.cs*

opUI RMI

```
using System;
using Caliburn.Micro;

namespace RMDesktopUI.ViewModels
{
    2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class LoginViewModel : Screen
    {
        /*
         * Backing fields
         */
        private string _userName;
        private string _password;

        /*
         * Public properties
         */
        2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string UserName
        {
            get => _userName;
            set
            {
                _userName = value;
                // It's going to be fired every time we change the user value
                NotifyOfPropertyChange(() => UserName);
            }
        }

        2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string Password
        {
            get => _password;
            set
            {
                _password = value;
                NotifyOfPropertyChange(() => Password);
            }
        }

        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public bool CanLogIn(string userName, string password)
        {
            // Includes checking for null (?)
            var output = UserName?.Length > 0 && Password?.Length > 0;

            return output;
        }

        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public void LogIn(string userName, string password)
        {
            Console.WriteLine(); // Just for now
        }
```

10.3.5 Connecting the LoginViewModel to Caliburn.Micro

1. Adding a helper class (PasswordBoxHelper.cs) to RMDesktopUI

```
using System.Reflection;
using System.Windows;
using System.Windows.Controls;

namespace RMDesktopUI.Helpers
{
    /*
     * The aim of this class is to include a binding convention so that binding in Caliburn.Mic
     * Source: https://stackoverflow.com/questions/30631522/caliburn-micro-support-for-password
     */
    1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
    public static class PasswordBoxHelper
    {
        public static readonly DependencyProperty BoundPasswordProperty =
            DependencyProperty.RegisterAttached(name: "BoundPassword",
                propertyType: typeof(string),
                ownerType: typeof(PasswordBoxHelper),
                new FrameworkPropertyMetadata(defaultValue: string.Empty, OnBoundPasswordChanged));

        2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public static string GetBoundPassword(DependencyObject d)
        {
            if (!(d is PasswordBox box)) return (string) d.GetValue(dp: BoundPasswordProperty);

            // this funny little dance here ensures that we've hooked the
            // PasswordChanged event once, and only once.
            box.PasswordChanged -= PasswordChanged;
            box.PasswordChanged += PasswordChanged;

            return (string)d.GetValue(dp: BoundPasswordProperty);
        }

        1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
        public static void SetBoundPassword(DependencyObject d, string value)
        {...
```

2. Adding some lines to the constructor of Bootstrapper.cs

```
1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
public class Bootstrapper : BootstrapperBase
{
    private readonly SimpleContainer _container = new SimpleContainer();
    // Constructor
    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public Bootstrapper()
    {
        Initialize();

        // Source: https://stackoverflow.com/questions/30631522/caliburn-micro-support-for-passwordbox
        ConventionManager.AddElementConvention<PasswordBox>(
            bindableProperty: PasswordBoxHelper.BoundPasswordProperty,
            parameterProperty: "Password",
            eventName: "PasswordChanged");
    }
```

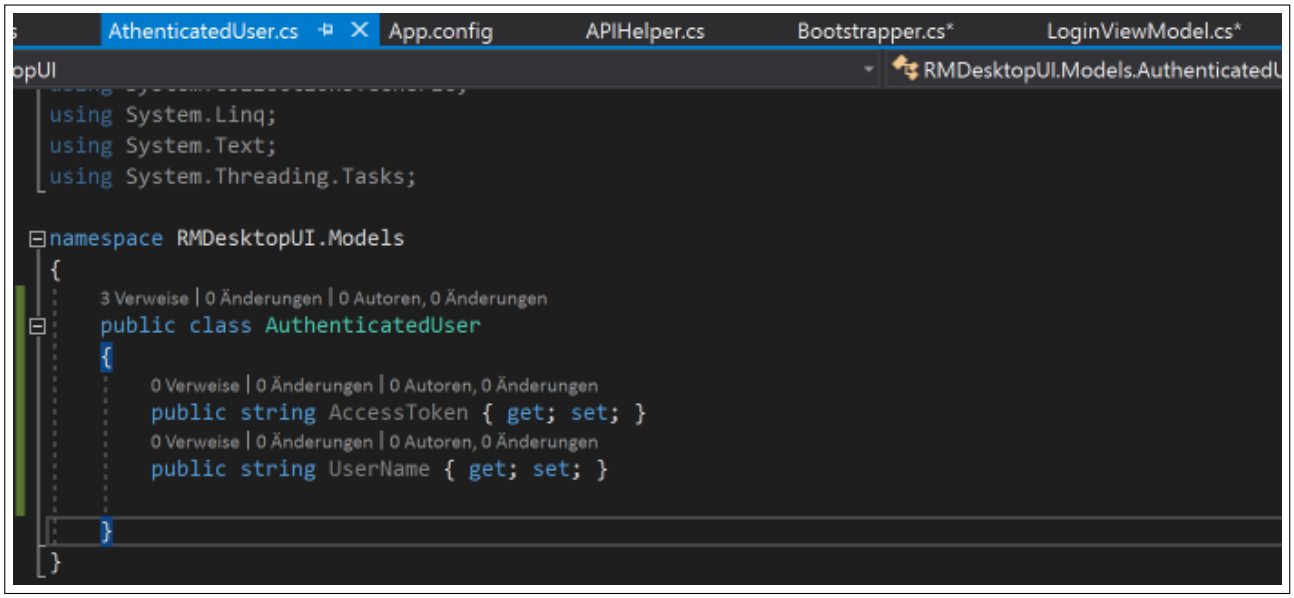
See the example on stackoverflow.com...

11 Wiring up the WPF Login Form

Connecting the login form button to the authentication API endpoint (/token). Gets back the bearer token or an exception if failed.

11.1 Implementing a class AuthenticatedUser.cs

Holds the information for already authenticated users.

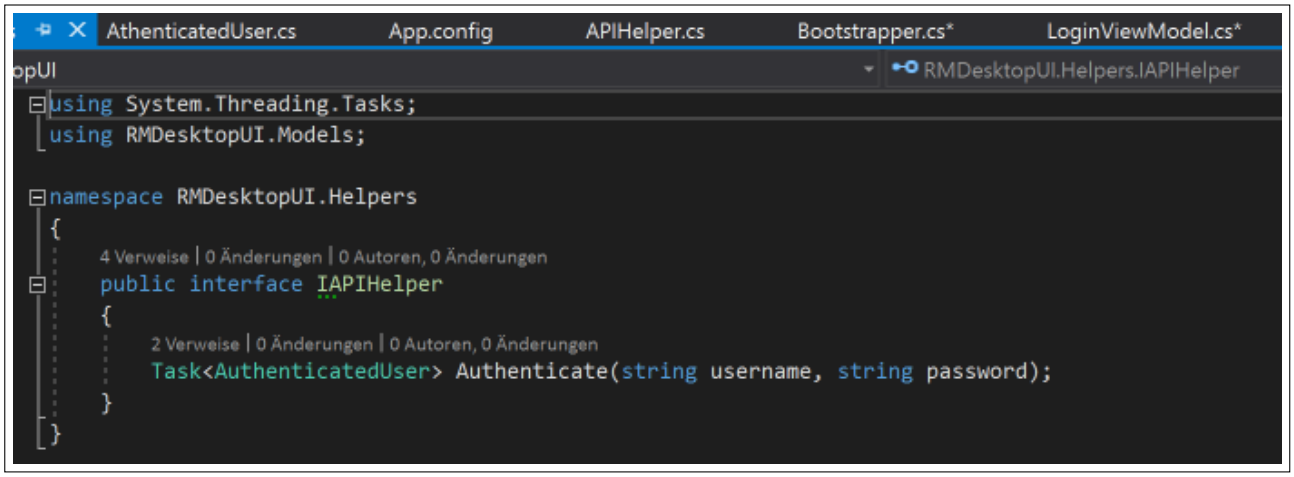


11.2 Implementing a helper class to handle API call interactions

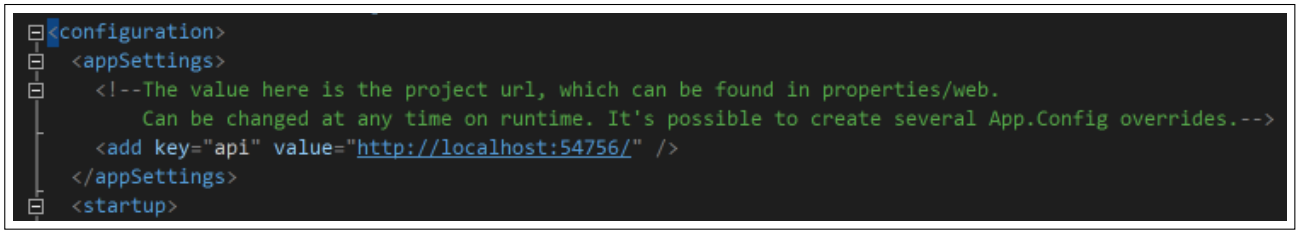
```
User.cs | App.config | APIHelper.cs | Bootstrapper.cs* | LoginViewModel.cs*
opUI | RMDesktopUI.Helpers.APIHelper
namespace RMDesktopUI.Helpers
{
    /*
     * The aim of this class is to handle all API call interactions between the different views and the API.
     */
    2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class APIHelper : IAPIHelper
    {
        4 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        private HttpClient ApiClient { get; set; }

        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public APIHelper()
        {
            InitializeClient();
        }

        1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
        private void InitializeClient()
        {
            var api = ConfigurationManager.AppSettings["api"];

            ApiClient = new HttpClient {BaseAddress = new Uri(uriString: "")};
            ApiClient.DefaultRequestHeaders.Accept.Clear();
            ApiClient.DefaultRequestHeaders.Accept.Add(new MediaTypeWithQualityHeaderValue(mediaType: "application/json"));
        }

        2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public async Task<AuthenticatedUser> Authenticate(string username, string password)
        {
            var data = new FormUrlEncodedContent(nameValueCollection: new []
            {
                new KeyValuePair<string, string>("grant_type", "password"),
                new KeyValuePair<string, string>("username", username),
                new KeyValuePair<string, string>("password", password),
            });

            // Getting the token
            using (HttpResponseMessage response = await ApiClient.PostAsync(requestUri: "/Token", data))
            {
                if (response.IsSuccessStatusCode)
                {
                    // ReadAsAsync needs Microsoft.AspNet.WebApi.Client (NuGet-Package)
                    var result = await response.Content.ReadAsAsync<AuthenticatedUser>();
                    return result;
                }
                else
                {
                    throw new Exception(response.ReasonPhrase);
                }
            }
        }
```

11.3 Implementing a Interface IAPIHelper.cs

Needed for dependency injection, in order to add it to the Configure() method in Bootstrapper.cs



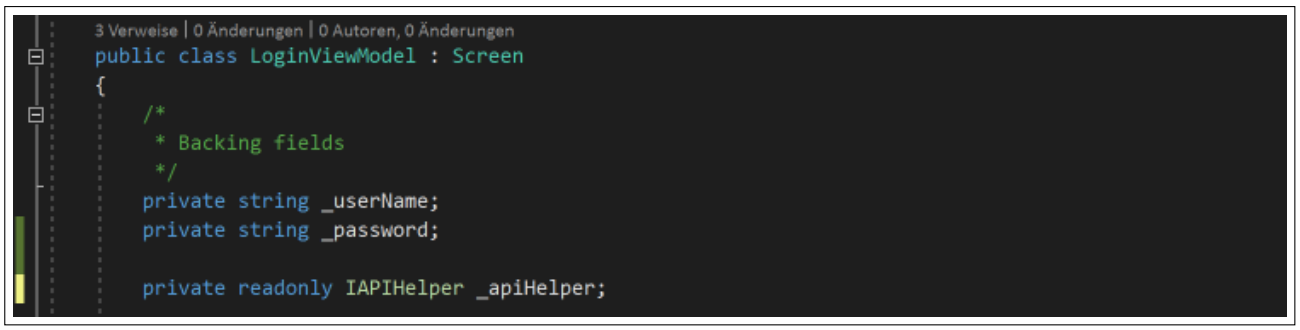
11.4 Adding <appsettings> to App.Config



11.5 Adding APIHelper and IAPIHelper to the container in Bootstrapper.cs

11.6 Applying some changings to LoginViewModel.cs

11.6.1 Adding a new private property as a backing field



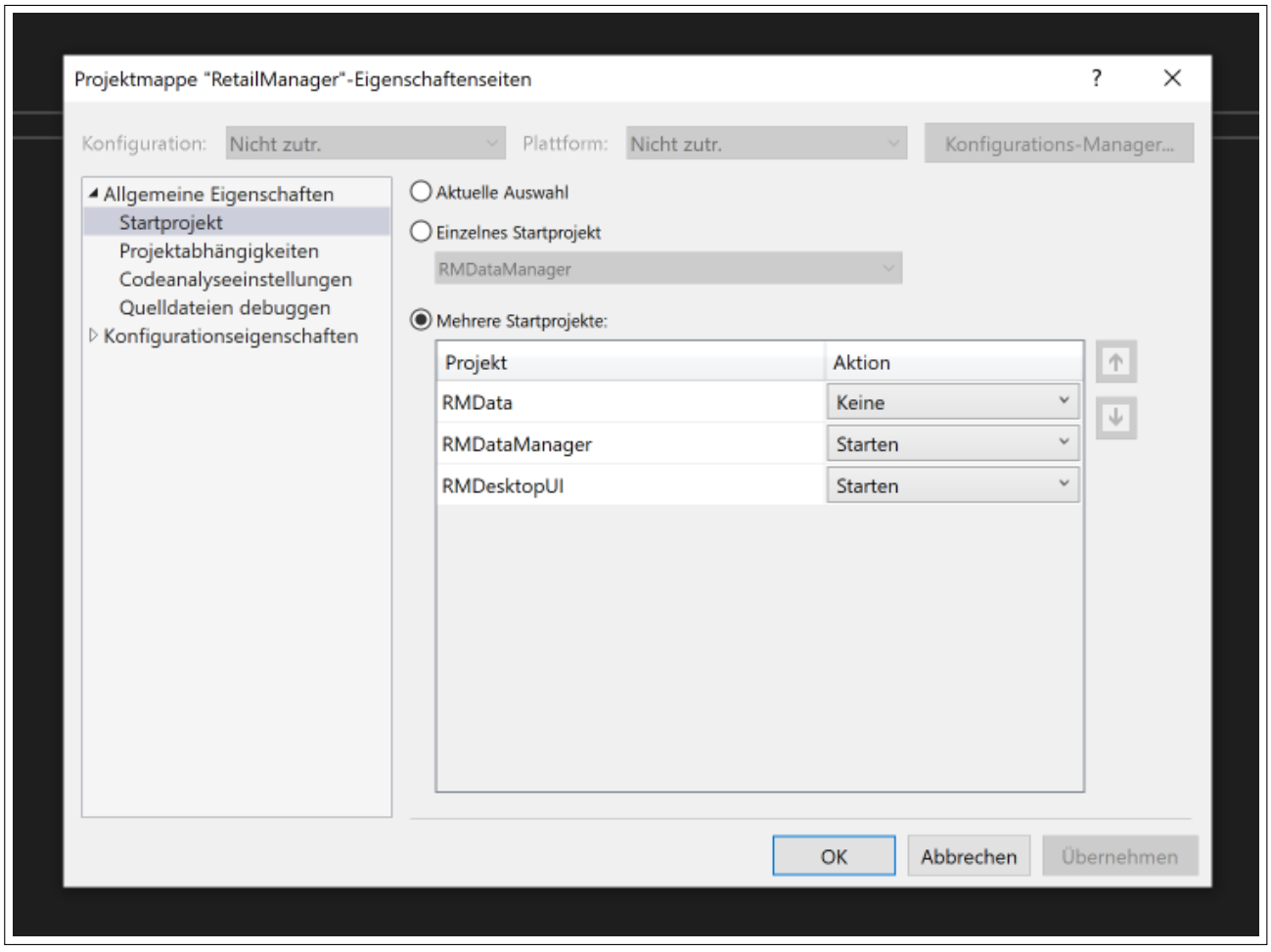
11.6.2 Adding a constructor and initializing the property from within

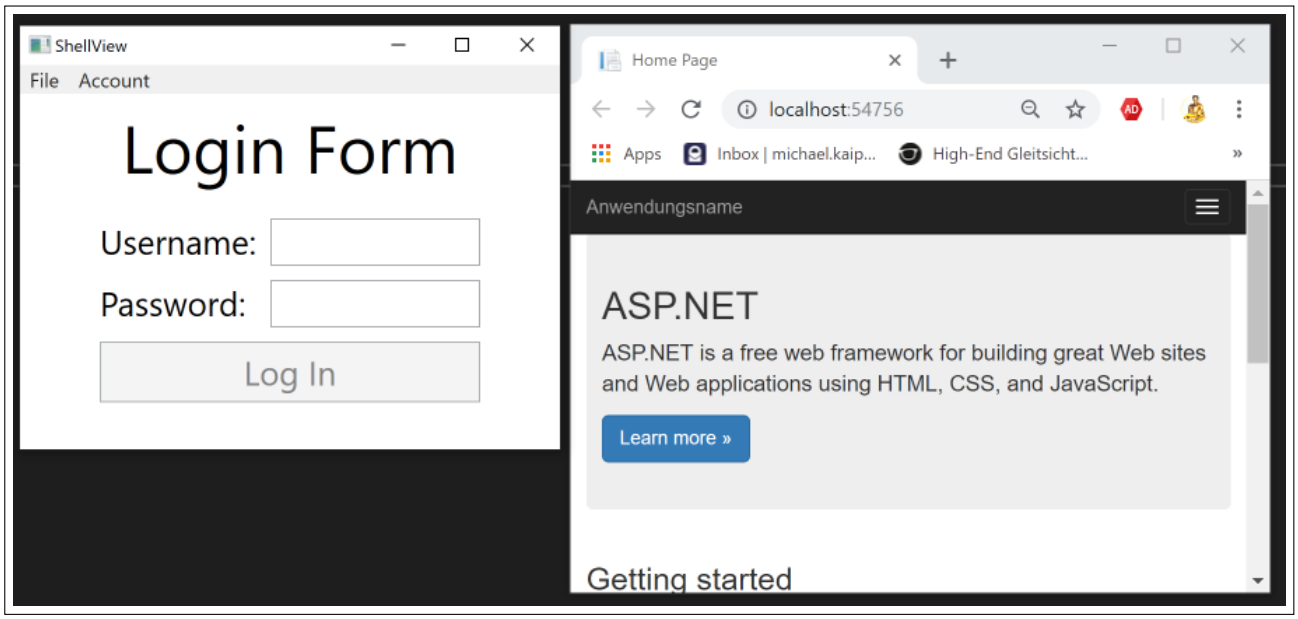
```
/*
 * Constructor
 */
0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
public LoginViewModel(IAPIHelper apiHelper)
{
    _apiHelper = apiHelper;
}
```

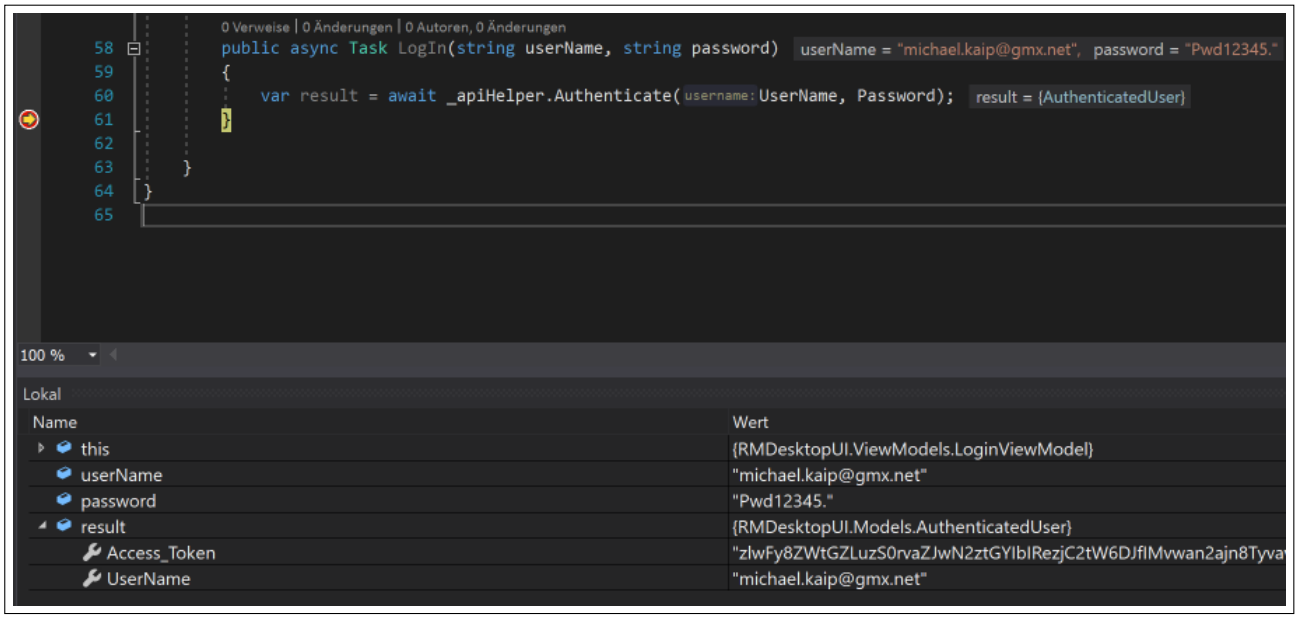
11.6.3 Implementig the Login() method

```
0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
public async Task LogIn(string userName, string password)
{
    try
    {
        var result = await _apiHelper.Authenticate(username:UserName, Password);
    }
    catch (Exception ex)
    {

        Console.WriteLine(ex.Message);
    }
}
```

11.7 Enabling the solution to start multiple projects




ShellView
File Account
Login Form
Username:
Password:
Log In
Home Page
localhost:54756
Apps
Inbox | michael.kaip...
High-End Gleitsicht...
Anwendungsname
ASP.NET
ASP.NET is a free web framework for building great Web sites and Web applications using HTML, CSS, and JavaScript.
Learn more »
Getting started


0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
public async Task LogIn(string userName, string password) userName = "michael.kaip@gmx.net", password = "Pwd12345."
{
var result = await _apiHelper.Authenticate(username: UserName, Password); result = {AuthenticatedUser}
}
}
}
100 %
Lokal
Name
Wert
this
{RMDesktopUI.ViewModels.LoginViewModel}
userName
"michael.kaip@gmx.net"
password
"Pwd12345."
result
{RMDesktopUI.Models.AuthenticatedUser}
Access_Token
UserName
"michael.kaip@gmx.net"

12 Login Form Error Handling

12.1 Displaying an login error message within the login form

```
<Grid.RowDefinitions>
    <RowDefinition Height="Auto"/>
    <RowDefinition Height="Auto"/> <!-- Error Message -->
    <RowDefinition Height="Auto"/> <!-- Username -->
    <RowDefinition Height="Auto"/> <!-- Password -->
    <RowDefinition Height="Auto"/> <!-- Button -->
    <RowDefinition Height="*"/>
</Grid.RowDefinitions>
<TextBlock Grid.Row="0" Grid.Column="1" Grid.ColumnSpan="2"
           HorizontalAlignment="Center" FontSize="48" Margin="0 0 0 20">
    Login
</TextBlock>

<!-- Error Message Row -->
<TextBlock x:Name="ErrorMessage"
           Grid.Row="1" Grid.Column="1" Grid.ColumnSpan="2"
           Margin="0 0 0 20" Foreground="Red" MaxWidth="270"
           Visibility="{Binding IsErrorVisible, Converter={StaticResource BooleanToVisibilityConverter}}"
           FontSize="12" TextWrapping="Wrap"/>

<!-- Username Row -->
```

Through $\boxed{Visibility}$ the funktionality of collapsing the error message space in case of no error is going to be displayed is added. In case of an error the field expands and the error is going to be displayed. To make it work, first the $\boxed{BooleanToVisibilityConverter}$ has to be added to the RessourceDictionary in App.xaml:

```
                <local:Bootstrapper x:Key="Bootstrapper" />
            </ResourceDictionary>
        </ResourceDictionary.MergedDictionaries>
        <BooleanToVisibilityConverter x:Key="BooleanToVisibilityConverter"/>
    </ResourceDictionary>
</Application.Resources>
</Application>
```

Afterwards properties for $\boxed{ErrorMessage}$ and $\boxed{IsErrorVisible}$ has to be implemented in LoginViewModel.cs:

```
private string _errorMessage;

3 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
public string ErrorMessage
{
    get => _errorMessage;
    set
    {
        NotifyOfPropertyChange(() => IsErrorVisible);
        NotifyOfPropertyChange(() => ErrorMessage);
        _errorMessage = value;
    }
}



/*
 * Properties
 */
1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
public bool IsErrorVisible
{
    get
    {
        var output = ErrorMessage?.Length > 0;

        return output;
    }
}
```

And finally the Login() method has to be changed in the way, that in case of an exception, the exception message is stored into the $\boxed{ErrorMessage}$ property:

```
0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
public async Task LogIn(string userName, string password)
{
    try
    {
        ErrorMessage = "";

        var result = await _apiHelper.Authenticate(username:UserName, Password);
    }
    catch (Exception ex)
    {

        ErrorMessage = ex.Message;
    }
}
```

13 Getting User Data

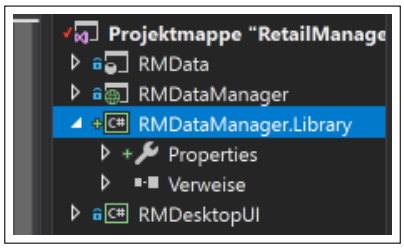
Getting all information about a logged in user from the database. This information is going to be stored in an singleton object and therefore can be used as long as the user is logged in. Once he's logged out, the corresponding object which holds the user information is going to be destroyed.

In order to make it work, following things has to be done:

- implementing a stored procedure
- implementing a model to store the data in the API
- creating an API endpoint
- implementing a method that calls the endpoint from the WPF application
- implementing a model that hold data in the WPF application

13.1 Adding a class library for the API

The aim of this library is to provide data access. It is seperate from the WPF application an so it knows nothing about the databse, nor have access to it. Putting code not directly into the API enables re-usability.



13.1.1 Installing Dapper

Dapper is an object-relational mapping (ORM) product for the Microsoft .NET platform: it provides a framework for mapping an object-oriented domain model to a traditional relational database. Its purpose is to relieve the developer from a significant portion of relational data persistence-related programming tasks.

Add NuGet-Package to references...

13.1.2 The SqlDataAccess class

```
namespace RMDataManager.Library.Internal.DataAccess
{
    /*
     * "Internal" makes sure that the database can't be accessed directly from outside this class library.
     *
     * The aim of this class is to provide the necessary data for the methods in UserData.cs, which talks
     * to the database in order to get back the information about users.
     */
    2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    internal class SqlDataAccess
    {
        // Gets the connection string with the matching name from WebConfig
        // (DefaultConnection) and returns it back.
        2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string GetConnectionString(string name)
        {
            return ConfigurationManager.ConnectionStrings[name].ConnectionString;
        }

        // Loading data from the database using GetConnectionString().
        1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
        public List<T> LoadData<T, U>(string storedProcedure, U parameters, string connectionStringName)
        {
            var connectionString = GetConnectionString(connectionStringName);

            using (IDbConnection connection = new SqlConnection(connectionString))
            {
                // Connects the database, makes a query and returns back a set of rows.
                var rows = connection
                    .Query<T>(storedProcedure, parameters, commandType: CommandType.StoredProcedure).ToList();

                return rows;
            }
        }

        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public void SaveData<T>(string storedProcedure, T parameters, string connectionStringName)
        {
            var connectionString = GetConnectionString(connectionStringName);

            using (IDbConnection connection = new SqlConnection(connectionString))
            {
                // Stores data into the database
                connection.Execute(storedProcedure, parameters, commandType: CommandType.StoredProcedure);

            }
        }
    }
}
```

13.1.3 The UserData class

This class contains methods and the logic on **how** to get data.

1. Adding a stored Prodecure to *RMData.dbo.StoredProcedures*

```
CREATE PROCEDURE [dbo].[spUserLookup]
    @Id NVARCHAR(128)
AS
BEGIN
    SET NOCOUNT ON;

    SELECT Id, FirstName, LastName, EmailAdress, CreatedDate
    FROM [dbo].[User]
    WHERE Id = @Id;
end
```

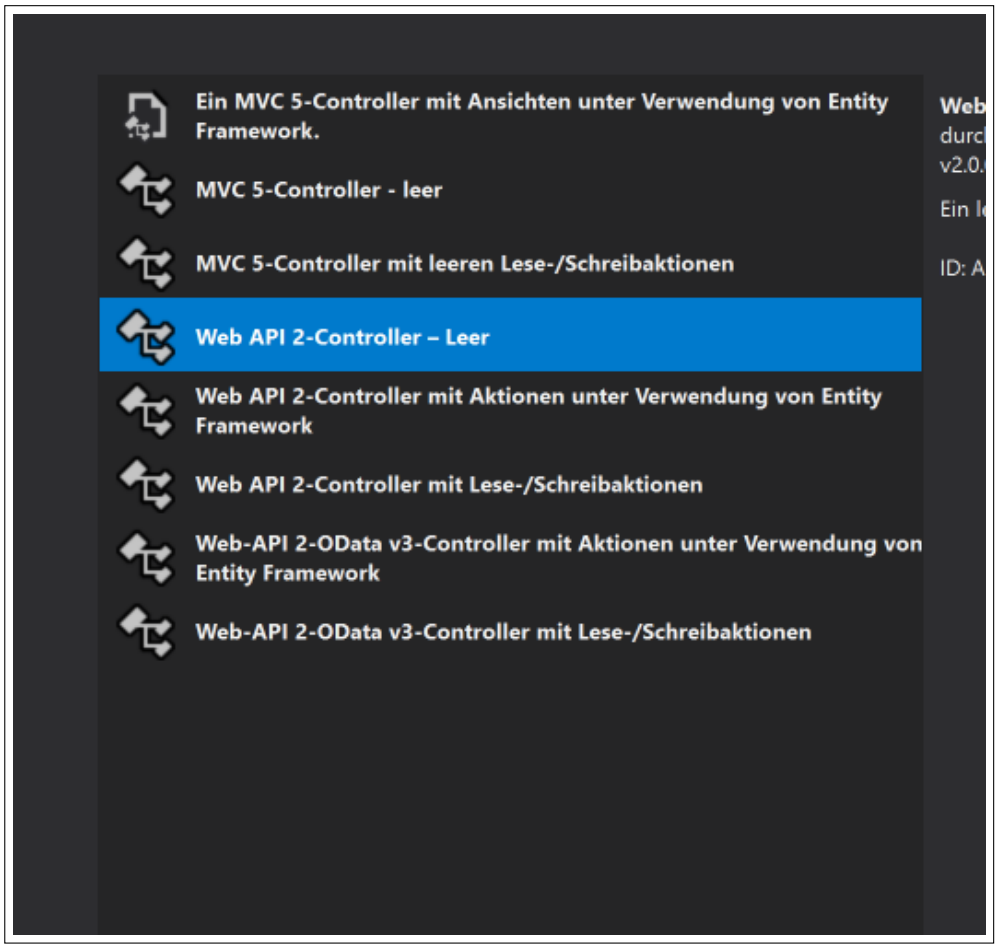
2. Adding a UserModel class

```
using System.Threading.Tasks;

namespace RMDataManager.Library.Models
{
    3 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class UserModel
    {
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string Id { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string FirstName { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string LastName { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string EmailAddress { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public DateTime CreatedDate { get; set; }
    }
}
```

3. Adding the UserData class

```
namespace RMDataManager.Library.DataAccess
{
    2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class UserData
    {
        1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
        public List<UserModel> GetUserById(string Id)
        {
            SqlDataAccess sql = new SqlDataAccess();

            var p = new {Id};

            var output = sql.LoadData<UserModel, dynamic>(storedProcedure: "dbo.spUserLookup",
                p, connectionStringName: "DefaultConnection");

            return output;
        }
    }
}
```

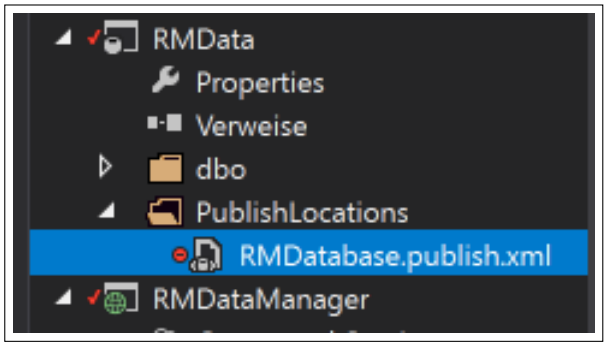
13.1.4 Adding a UserController.cs to RMDataManager.Controllers



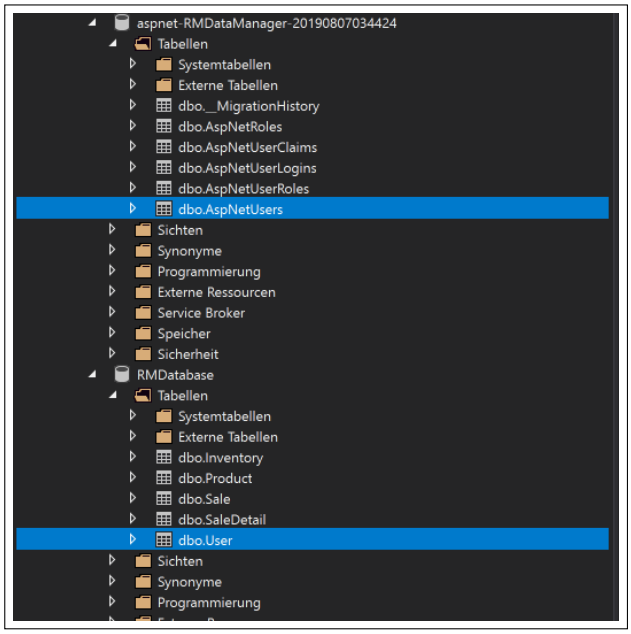
Implementing the UserController:

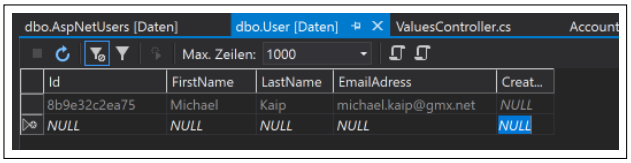
```
namespace RMDataManager.Controllers
{
    [Authorize]
    [RoutePrefix("api/User")]
    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class UserController : ApiController
    {
        [HttpGet]
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public UserModel GetById()
        {
            var userId = RequestContext.Principal.Identity.GetUserId();
            var data = new UserData();

            return data.GetUserById(userId).First();
        }
    }
}
```

Publishing the stored procedure to the database:

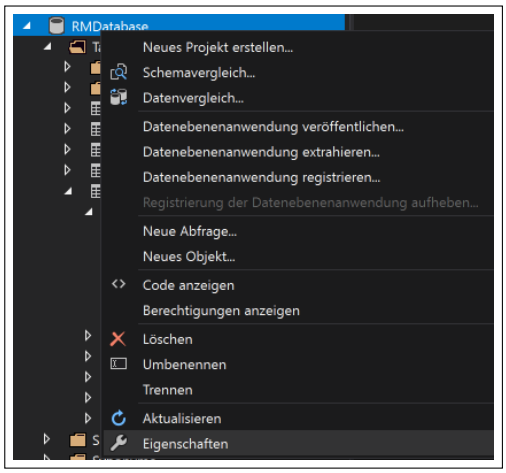


Adding a user for testing:





Getting the connection string from the database and adding it to Web.config:




```
<configSections>
  <!-- For more information on Entity Framework configuration, visit http://go.microsoft.com/fwlink/?LinkID=237468 -->
  <section name="entityFramework" type="System.Data.Entity.Internal.ConfigFile.EntityFrameworkSection, EntityFramework
</configSections>
<connectionStrings>
  <add name="DefaultConnection" connectionString="Data Source=(LocalDb)\MSSQLLocalDB;AttachDbFilename=|DataDirectory|
  <add name="RMDatabase" connectionString=
      "Data Source=(localdb)\MSSQLLocalDB;Initial Catalog=RMDatabase;Integrated Security=True;Connect
      Timeout=60;Encrypt=False;TrustServerCertificate=True;ApplicationIntent=ReadWrite;MultiSubnetFailover=False"/>
</connectionStrings>
<appSettings></appSettings>
```

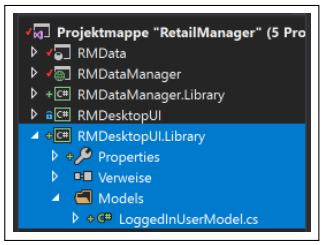
Now that there's an entry in the user database, the application can be started and use SWAGGER to run and test the GET command in $\boxed{Values/GET}$

Next step is to implement the functionality to get back the information about the user automatically, once he logged in successfully.

13.2 Implementing data capturing from the UI side

13.2.1 Adding a new class library

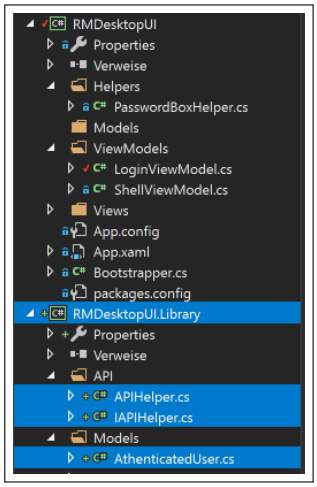
The aim of this library is for user inface support.



13.2.2 The LoggedInUserModel class

```
/*
 * The aim of this class is to catch the data, which the API sends out.
 */
namespace RMDesktopUI.Library.Models
{
    1-Verweis | 0 Änderungen | 0 Autoren, 0 Änderungen
    public class LoggedInUserModel
    {
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string Token { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string Id { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string FirstName { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string LastName { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public string EmailAdress { get; set; }
        0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        public DateTime CreatedDate { get; set; }
    }
}
```

13.2.3 Moving helpers and Models



Namespaces has to be ajusted and missing references added afterwards.

13.2.4 Extracting an Interface and adding to simpleContainer

```
namespace RMDesktopUI.Library.Models
{
    4 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public interface ILoggedInUserModel
    {
        2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        string Token { get; set; }
        3 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        string Id { get; set; }
        3 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        string FirstName { get; set; }
        3 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        string LastName { get; set; }
        3 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        string EmailAdress { get; set; }
        3 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
        DateTime CreatedDate { get; set; }
    }
}
```

```
.Singleton<ILoggedInUserModel, LoggedInUserModel>()
```

13.2.5 Implementing a Method GetLoggedInUserInfo in APIHelper.cs

```
public async Task<LoggedInUserModel> GetLoggedInUserInfo(string token)
{
    ApiClient.DefaultRequestHeaders.Clear();
    ApiClient.DefaultRequestHeaders.Accept.Clear();
    ApiClient.DefaultRequestHeaders.Accept.Add(new MediaTypeWithQualityHeaderValue(mediaType: "application/json"));
    // Adding the "Authorization Bearer Token" to the DefaultRequestHeader for every call.
    ApiClient.DefaultRequestHeaders.Add(name: "Authorization", value: $"Bearer { token }");

    using (HttpResponseMessage response = await ApiClient.GetAsync(requestUri: "/user"))
    {
        if (response.IsSuccessStatusCode)
        {
            var result = await response.Content.ReadAsAsync<LoggedInUserModel>();

            // data mapping
            _loggedInUser.CreatedDate = result.CreatedDate;
            _loggedInUser.EmailAdress = result.EmailAdress;
            _loggedInUser.FirstName = result.FirstName;
            _loggedInUser.Id = result.Id;
            _loggedInUser.LastName = result.LastName;
            _loggedInUser.Token = token;

            return result;
        }
        else
        {
            throw new Exception(response.ReasonPhrase);
        }
    }
}
```

In order to make it work, some more changes has to be done in the same class:

```
2 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
public class APIHelper : IAPIHelper
{
    9 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    private HttpClient ApiClient { get; set; }
    private readonly ILoggedInUserModel _loggedInUser;

    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    public APIHelper(ILoggedInUserModel loggedInUser)
    {
        InitializeClient();
        _loggedInUser = loggedInUser;
    }
```

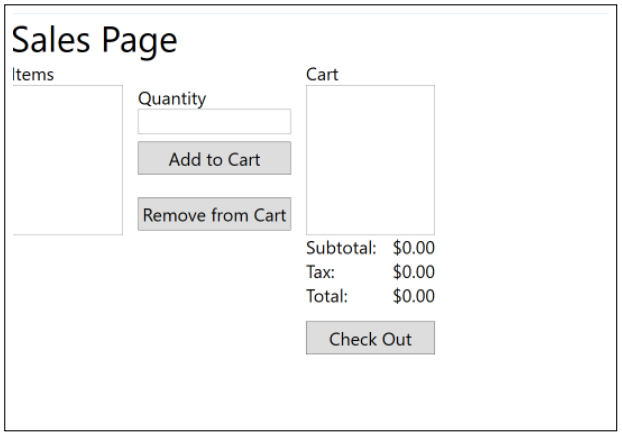
Finally the LogIn() method in the LoginViewModel has to be extended:

```
public async Task LogIn(string userName, string password)
{
    try
    {
        ErrorMessage = "";
        var result = await _apiHelper.Authenticate(username: UserName, Password);

        // Capture more information about the user
        await _apiHelper.GetLoggedInUserInfo(result.Access_Token);

    }
    catch (Exception ex)
    {

        ErrorMessage = ex.Message;
    }
}
```

14 Sales Page Creation

1. Adding a SalesViewModel.cs and SalesView.xaml (UserControl) to RMDesktopUI
2. Designing the sales page

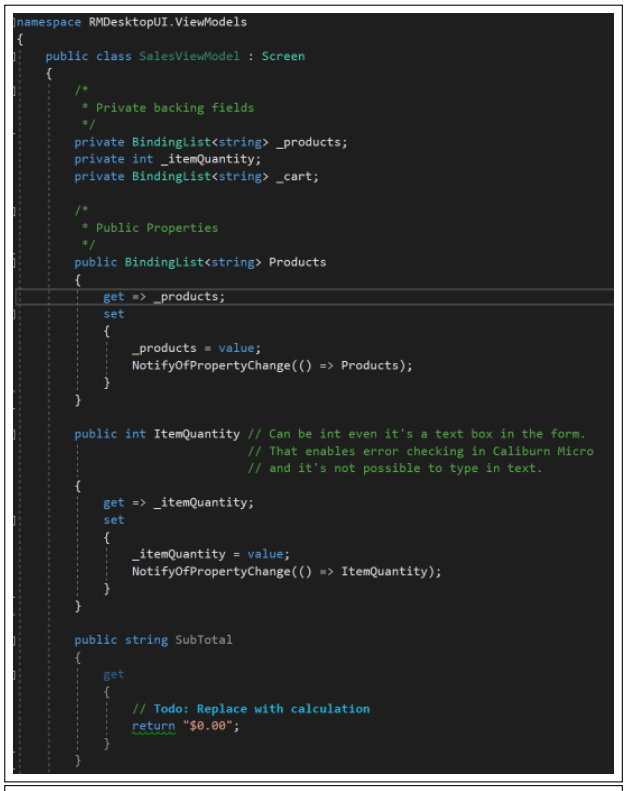
14.1 Designing the Sales Page




```
<UserControl x:Class="RMDesktopUI.Views.SalesView"
             xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
             xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
             xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
             xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
             xmlns:local="clr-namespace:RMDesktopUI.Views"
             mc:Ignorable="d" Background="White" FontSize="24"
             d:DesignWidth="800" Height="550">
    <Grid>
        <Grid.RowDefinitions>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="*"/>
        </Grid.RowDefinitions>
        <Grid.ColumnDefinitions>
            <ColumnDefinition Width="Auto"/>
            <ColumnDefinition Width="Auto"/>
            <ColumnDefinition Width="Auto"/>
            <ColumnDefinition Width="Auto"/>
            <ColumnDefinition Width="*"/>
        </Grid.ColumnDefinitions>

        <!-- Header -->
        <TextBlock Text="Sales Page" FontSize="48" Grid.Row="0" Grid.Column="0"
                   Grid.ColumnSpan="3" />

        <!-- Column 0 -->
        <TextBlock Text="Items" Grid.Row="1" Grid.Column="0" />
        <ListBox x:Name="Products" Grid.Row="2" Grid.Column="0"
                 MinHeight="200" MinWidth="150" />

        <!-- Column 1 -->
        <StackPanel Orientation="Vertical" Grid.Column="1" Grid.Row="2"
                    Margin="20 0">
            <TextBlock Text="Quantity"/>
            <TextBox x:Name="ItemQuantity" MinWidth="100" Margin="0 0 0 10"/>
            <Button x:Name="AddToCart" Content="Add to Cart" Margin="0 0 0 30"
                    Padding="5"/>
            <Button x:Name="RemoveFromCart" Content="Remove from Cart"
                    Padding="5"/>

        </StackPanel>
```

```
        <!-- Column 2 -->
        <TextBlock Text="Cart" Grid.Row="1" Grid.Column="2"/>
        <ListBox x:Name="Cart" Grid.Row="2" Grid.Column="2"
                 MinHeight="200" MinWidth="150"/>

        <DockPanel Grid.Row="3" Grid.Column="2">
            <TextBlock Text="Subtotal: " Margin="0 0 15 0"/>
            <TextBlock x:Name="SubTotal" Text="$0.00" Grid.Row="2" Grid.Column="2"
                       TextAlignment="Right"/>
        </DockPanel>

        <DockPanel Grid.Row="4" Grid.Column="2" >
            <TextBlock Text="Tax: "/>
            <TextBlock x:Name="Tax" Text="$0.00" Grid.Row="3" Grid.Column="2"
                       TextAlignment="Right"/>
        </DockPanel>

        <DockPanel Grid.Row="5" Grid.Column="2">
            <TextBlock Text="Total: "/>
            <TextBlock x:Name="Total" Text="$0.00" Grid.Row="4" Grid.Column="2"
                       TextAlignment="Right"/>
        </DockPanel>

        <Button x:Name="CheckOut" Grid.Row="6" Grid.Column="2" Content="Check Out"
                Margin="0 20 0 0" Padding="5"/>
    </Grid>
</UserControl>
```

14.2 Implementing SalesViewModel.cs



```
namespace RMDesktopUI.ViewModels
{
    public class SalesViewModel : Screen
    {
        /*
         * Private backing fields
         */
        private BindingList<string> _products;
        private int _itemQuantity;
        private BindingList<string> _cart;

        /*
         * Public Properties
         */
        public BindingList<string> Products
        {
            get => _products;
            set
            {
                _products = value;
                NotifyOfPropertyChange(() => Products);
            }
        }

        public int ItemQuantity // Can be int even it's a text box in the form.
                                // That enables error checking in Caliburn Micro
                                // and it's not possible to type in text.
        {
            get => _itemQuantity;
            set
            {
                _itemQuantity = value;
                NotifyOfPropertyChange(() => ItemQuantity);
            }
        }

        public string SubTotal
        {
            get
            {
                // Todo: Replace with calculation
                return "$0.00";
            }
        }
```

```
        public bool CanRemoveFromCart
        {
            get
            {
                bool output = false;

                // Make sure something is selected

                return output;
            }
        }

        public void RemoveFromCart()
        {

        }

        public bool CanCheckOut
        {
            get
            {
                bool output = false;

                // Make sure there is something in the cart

                return output;
            }
        }

        public void CheckOut()
        {

        }

    }
}
```

```
        public string Tax
        {
            get
            {
                // Todo: Replace with calculation
                return "$0.00";
            }
        }

        public string Total
        {
            get
            {
                // Todo: Replace with calculation
                return "$0.00";
            }
        }


        public BindingList<string> Cart
        {
            get => _cart;
            set
            {
                _cart = value;
                NotifyOfPropertyChange(() => Cart);
            }
        }


        public bool CanAddToCart
        {
            get
            {
                bool output = false;

                // Make sure something is selected and an item quantity is given.

                return output;
            }
        }

        public void AddToCart()
        {

        }
```

Just scaffolds out the methods needed in this class. Will be implemented later...

15 Event Aggregation in WPF

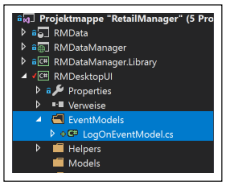
Wiring up an event aggregator to enable **inter-form communication**.

```
/*
 * Properties with Backing Fields
 */
private string _userName;
private string _password;
private string _errorMessage;
private IEventAggregator _events;
```

```
/*
 * Constructor
 */
public LoginViewModel(IAPIHelper apiHelper, IEventAggregator events)
{
    _apiHelper = apiHelper;
    _events = events;
}
```

That's an example of the usefullness of DI. It doesn't have to be instatiated or set up. Because it's assigned in simpleContainer, everthing is going to be done behind the scenes in the framework and then it can be used everywhere in that class.

```
/*
 * Constructor
 */
public LoginViewModel(IAPIHelper apiHelper, IEventAggregator events)
{
    _apiHelper = apiHelper;
    _events = events;
}


public async Task LogIn(string userName, string password)
{
    try
    {
        ErrorMessage = "";
        var result = await _apiHelper.Authenticate(username:UserName, Pa

        // Capture more information about the user
        await _apiHelper.GetLoggedInUserInfo(result.Access_Token);

        _events.PublishOnUIThread(new LogOnEventModel());

    }
    catch (Exception ex)
    {

        ErrorMessage = ex.Message;
    }
}
```




```
namespace RMDesktopUI.EventModels
{
    /*
     * Class is empty, because it's only needed to pass an instance of into
     * _event.PublishOnUIThread(new LogOnEventModel()).
     *
     * So, therefore it can be differentiated from other calls very easily.
     */
    public class LogOnEventModel
    {
    }
}
```

Next step, is to listen for the event on the other side (ShellViewModel.cs).

```
namespace RMDesktopUI.ViewModels
{
    public class ShellViewModel : Conductor<object>, IHandle<LogOnEventModel>
    {
        // Using constructor injection to pass in a new instance of
        // loginVm and activating it immediately after storing it.
        private IEventAggregator _events;
        private SalesViewModel _salesVM;
        private SimpleContainer _container;

        public ShellViewModel(IEventAggregator events, SalesViewModel salesVM, SimpleContainer container)
        {
            _events = events;
            _salesVM = salesVM;
            _container = container;

            _events.Subscribe(subscriber:this);

            ActivateItem(_container.GetInstance<LoginViewModel>());

        }

        // Preventing from inheritance, because of virtual member call in constructor
        public sealed override void ActivateItem(object item)
        {
            base.ActivateItem(item);
        }

        public void Handle(LogOnEventModel message)
        {
            ActivateItem(_salesVM);
        }
    }
}
```

16 Displaying Product data

17 Wiring up WPF Shopping Cart

18 Modifying SQL, the API and WPF to add Taxes