

Retail Manager Development Manual

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August 13, 2019

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1 Introduction

1.1 Project Summary

The goal of this project is to build a desktop 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 layer 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:

- Git on Azure DevOps
- SQL Database (SSDT)
- WebAPI with Authentification
- WPF application that can log into the API

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 Authentication

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 Identity Configuration

App_Start → IdentityConfig.cs

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

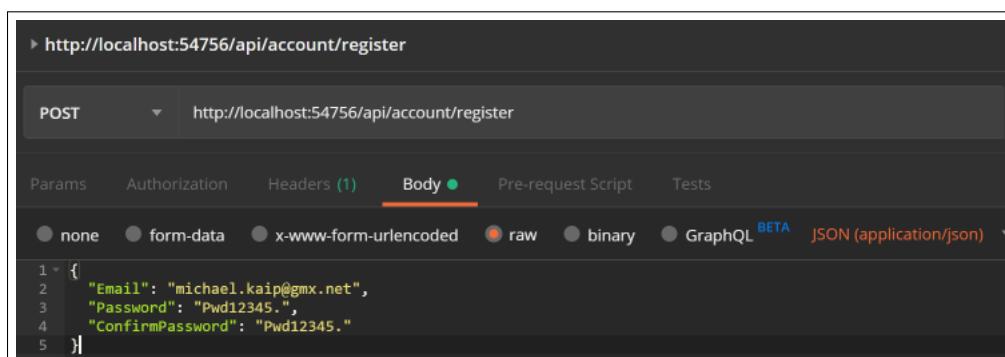
- UserValidator
- PasswordValidator

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 successfully created.

2. GET

The screenshot shows a Postman interface with a GET request to `http://localhost:54756/token`. The **Body** tab is active, set to `x-www-form-urlencoded`. It contains three fields:

KEY	VALUE	DESCRIPTION
<input checked="" type="checkbox"/> grant_type	password	
<input checked="" type="checkbox"/> username	michael.kaip@gmx.net	
<input checked="" type="checkbox"/> password	Pwd12345.	

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

The screenshot shows a Postman interface with a POST request to `http://localhost:54756/api/values`. The **Headers** tab is active, containing one header:

KEY	VALUE	DESCRIPTION
<input checked="" type="checkbox"/> Authorization	Bearer VuQDu7NWP8j-yd-tCRvkiqFwjBMZlaURbN...	
Key	Value	Description

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 accessibility 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

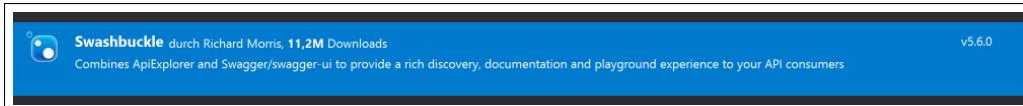
namespace RMDataManager.Controllers
{
    [Authorize]
    public class ValuesController : ApiController
    {
        // GET api/values
        public IEnumerable<string> Get()
        {
            // Stores the ID of each user
            var userId = RequestContext.Principal.Identity.GetUserId();
            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

The screenshot shows a web browser window with the URL 'localhost:54756/swagger/ui/index#/Values'. The page title is 'swagger'. The main content area is titled 'RMDataManager'. It contains two sections: 'Account' and 'Values'. The 'Account' section lists several API operations: GET /api/Account/UserInfo, POST /api/Account/Logout, GET /api/Account/ManageInfo, POST /api/Account/ChangePassword, POST /api/Account/SetPassword, POST /api/Account/AddExternalLogin, POST /api/Account/RemoveLogin, GET /api/Account/ExternalLogin, GET /api/Account/ExternalLogins, POST /api/Account/Register, and POST /api/Account/RegisterExternal. The 'Values' section lists: GET /api/Values, POST /api/Values, DELETE /api/Values/{id}, GET /api/Values/{id}, and PUT /api/Values/{id}. Each operation is represented by a colored button indicating the HTTP method (blue for GET, green for POST, red for DELETE, blue for GET, orange for PUT).

5.2 Channging the configuration of SWAGGER

RMDaDataManager.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 proper name
```

2. Enabling proper printing of documents

```
// 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 StringEnumConverter 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
```

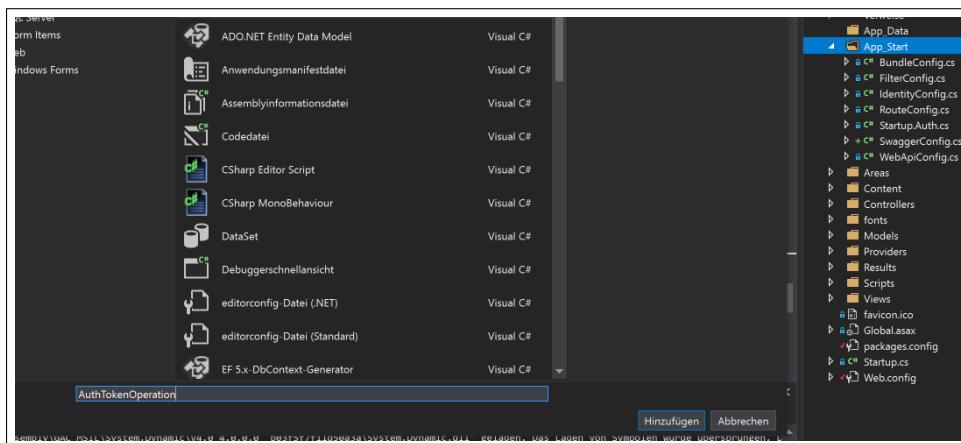
4. Changing document title

```
.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 `RMDaDataManager.App_Start`



(b) Implementing the required Interface

```
public class AuthTokenOperation : IDocumentFilter
{
    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(configureC =>
{
    c.DocumentFilter<AuthTokenOperation>(); // adding the implemented document filter
})
```

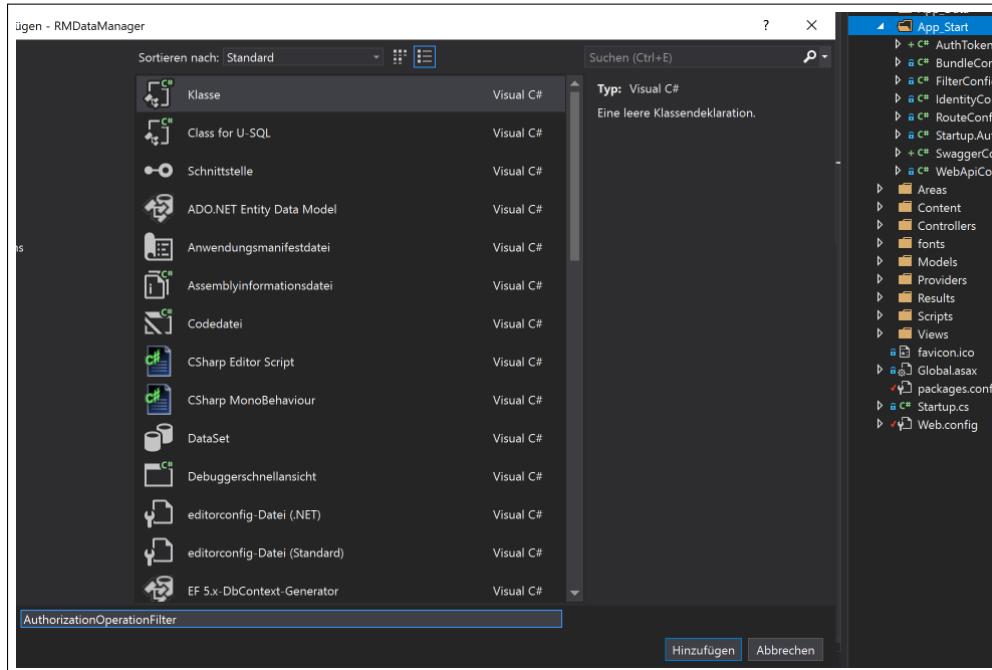
(d) Logging into the application using SWAGGER and get the token

The screenshot shows the Swagger UI for the Retail Manager API. The URL is `http://localhost:54756/swagger`. The `/token` endpoint is selected under the `Auth` section. The `Try it out!` button is highlighted. The response body shows a JSON object representing an access token:

```
{
  "access_token": "WofCgsbIKqtIOwsij4fhp4BuJy3HFLYxtqp-c3G59v01Kzc-tbE92xVP-RcBT9diUjZuHvEQPt1-4dQhKoxKhLQhHeSek8JN25XK-pTr
  "token_type": "bearer",
  "expires_in": 1209599,
  "username": "michael kaip@gmx.net",
  ".issued": "Thu, 08 Aug 2019 12:18:18 GMT",
  ".expires": "Thu, 22 Aug 2019 12:18:18 GMT"
}
```

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

- (a) Adding a new Class to `RMDDataManager.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

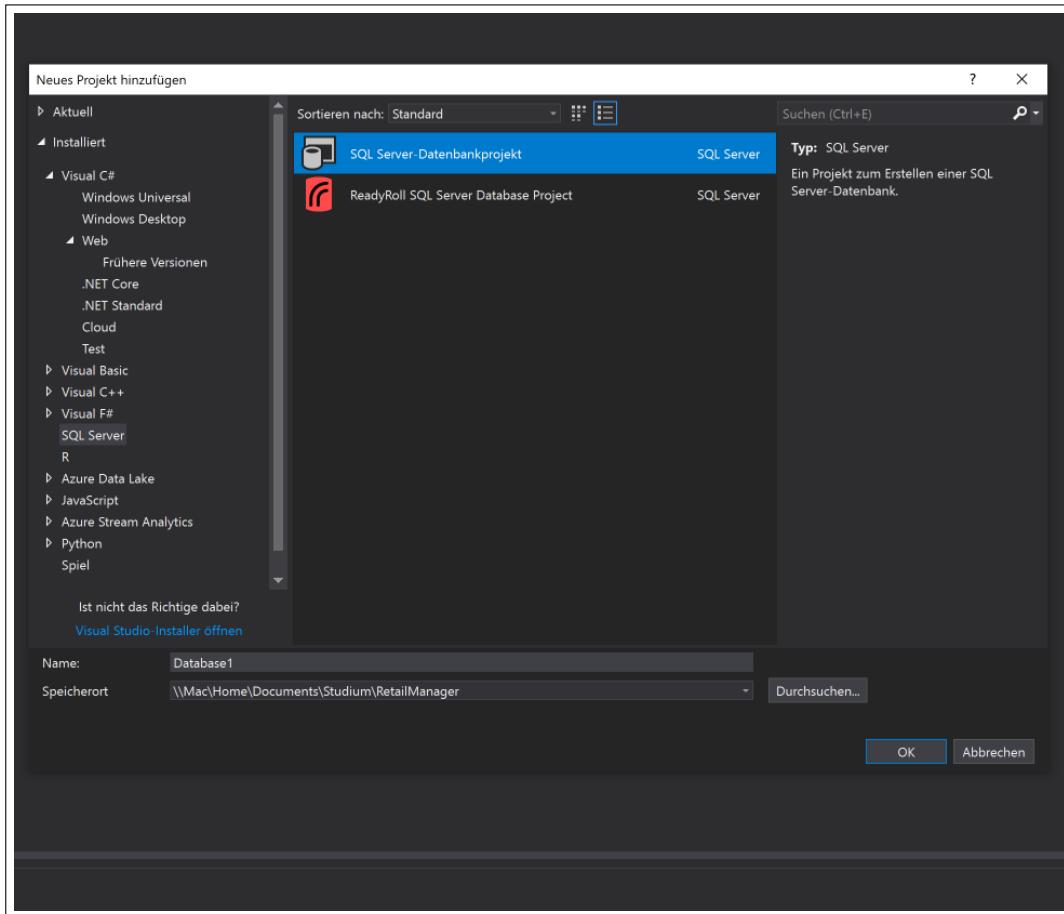
```
.EnableSwagger(configure: c =>
{
    c.DocumentFilter<AuthTokenOperation>(); // adding the implemented document filter
    c.OperationFilter<AuthorizationOperationFilter>(); // adding the implemented operation filter
})
```

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

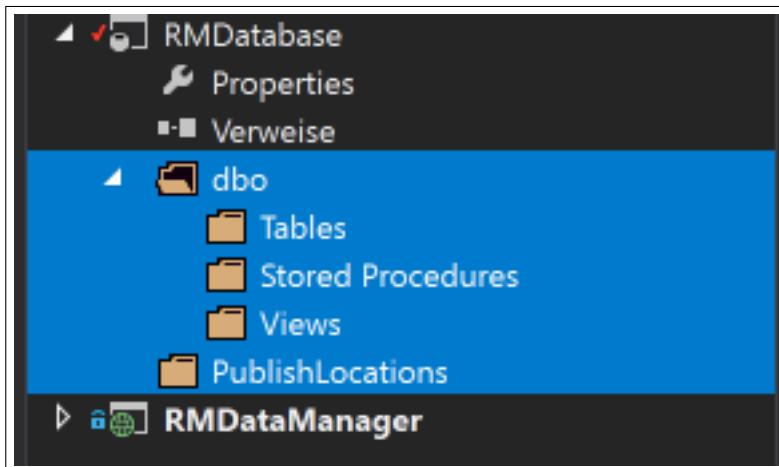
The screenshot shows the Swagger UI interface for the `/api/values` endpoint. At the top, there's a navigation bar with `GET /api/values`, `Show/Hide`, `List Operations`, and `Expand Operations`. Below this, the `Response Class (Status 200)` is listed as `OK`. A `Model` section shows an example value: `["string"]`. The `Response Content Type` is set to `application/json`. Under `Parameters`, there's a table with one entry: `Authorization: bearer PbvcDU53iDWQGvxWNxBaB0s57EWMrT` (access token) as a `header` of type `string`. A `Try it out!` button is available, along with a `Curl` section containing a command-line example. The `Request URL` is `http://localhost:54756/api/Values`. The `Response Body` is shown as a JSON array: `["value1", "value2", "2268fcde-21b1-4b31-98a5-8b9e32c2ea75"]`. The `Response Code` is `200`. The `Response Headers` section displays a large JSON object containing standard HTTP headers such as `pragma`, `date`, `server`, `x-powered-by`, `content-type`, `x-etag`, `x-sourcefiles`, `content-length`, and `expires`.

6 SQL Database Setup

6.1 Adding new Database Project to the solution

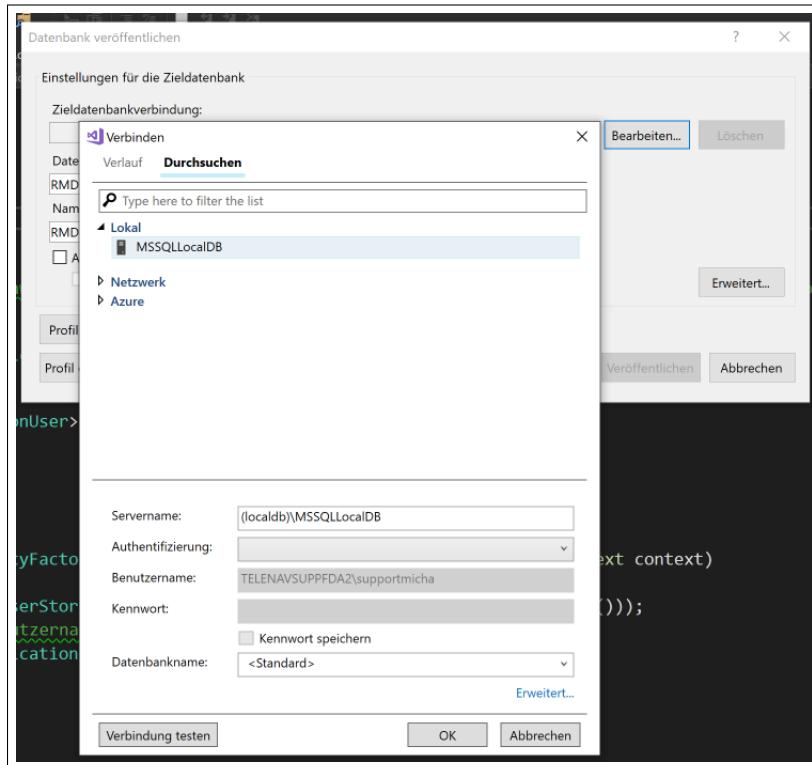


6.2 Adding several folders to the project

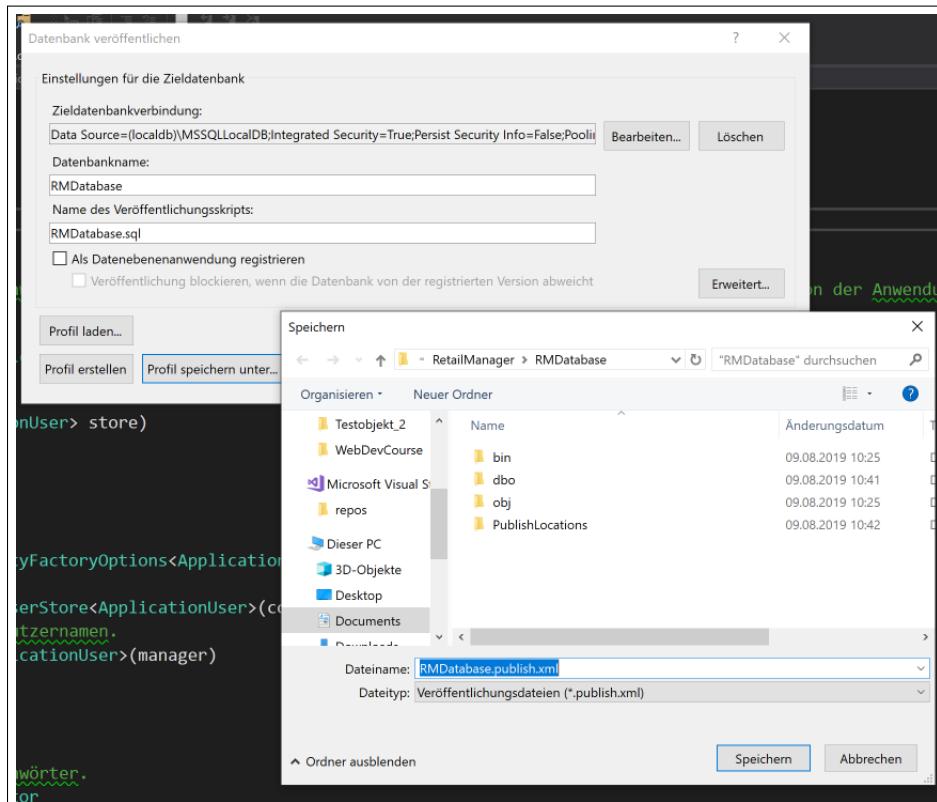


6.3 Creating a profile and publishing the Database

1. RightClick on RMDatabase → Publish → Edit → Browse

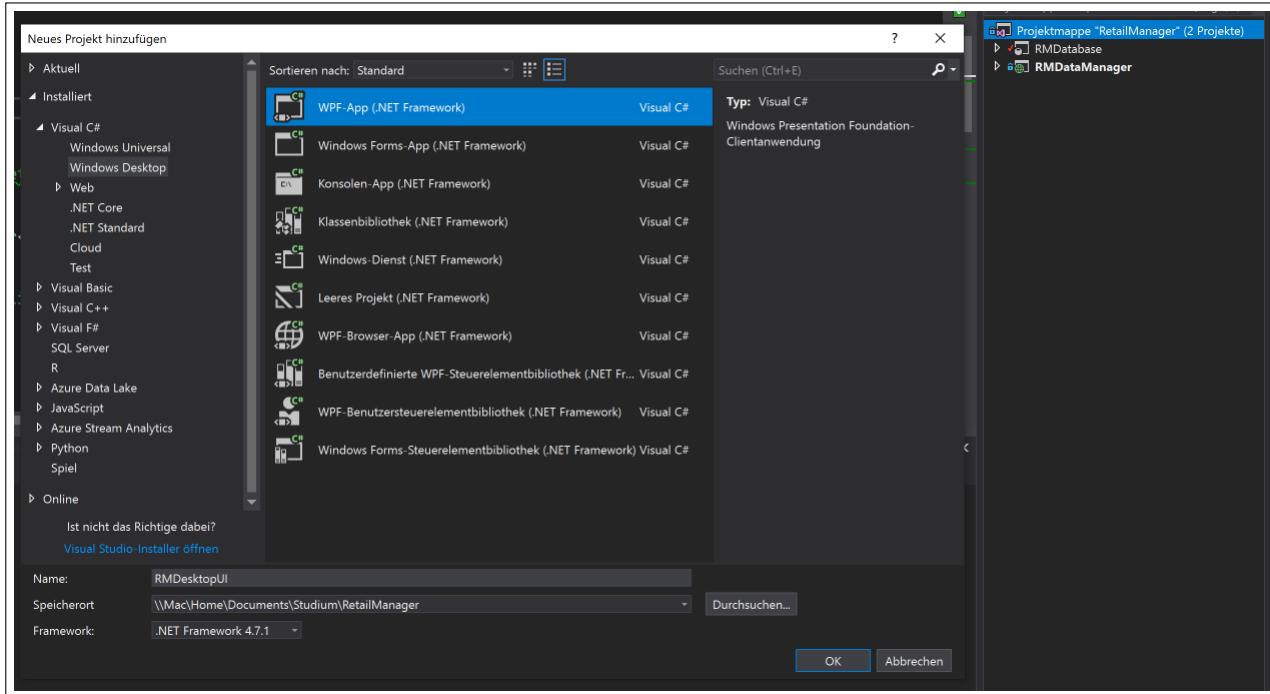


2. Naming and saving profile to PublishLocations

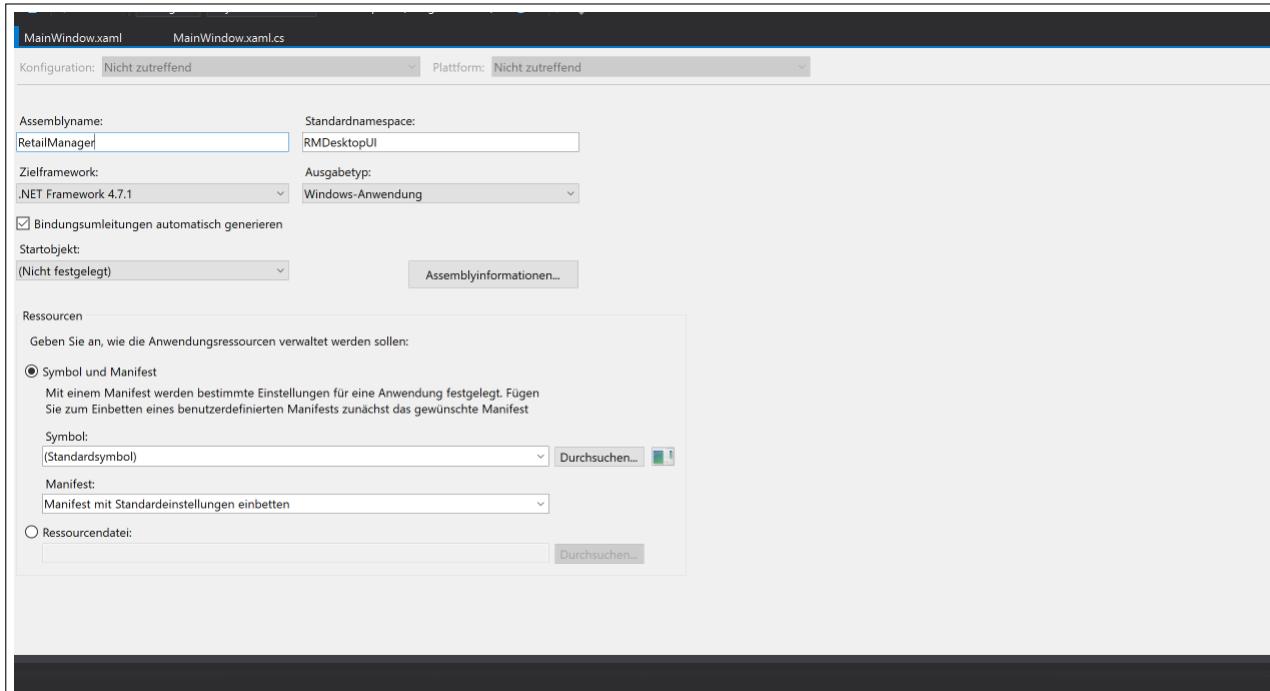


7 WPF with MVVM Project Setup

7.1 Adding the WPF Project to the solution



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

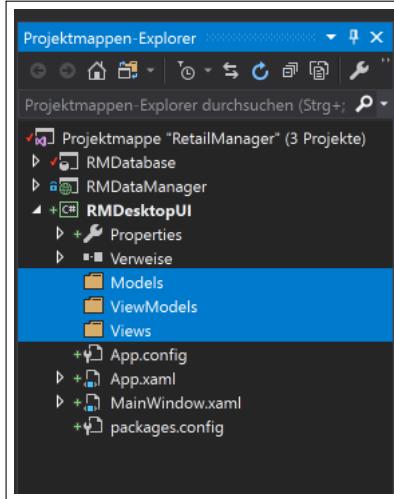


Also set project as the default startup-project.

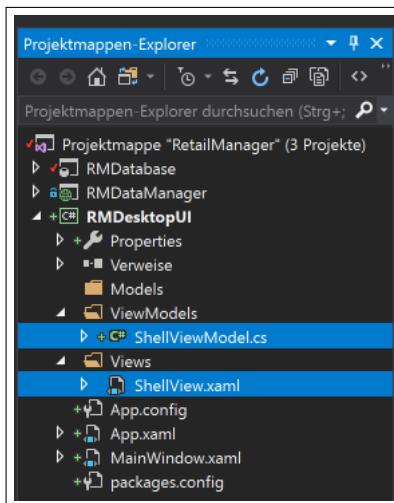
7.3 Adding Caliburn Micro MVVM-Framework

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 ShellView window



7.3.3 Adding a Bootstrapper class to DesktopUI

```

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

namespace RMDesktopUI
{
    public class Bootstrapper : BootstrapperBase
    {
        // Constructor
        public Bootstrapper()
        {
            Initialize();
        }

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

```

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

```

Bootstrapper.cs*
Application.Resources
<Application x:Class="RMDesktopUI.App"
    xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
    xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
    xmlns:local="clr-namespace:RMDesktopUI">

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

```

The Project Explorer on the right shows the project structure for "RetailManager" with three projects: RMDatabase, RMDataManager, and RMDesktopUI. RMDesktopUI contains files like Properties, Verweise, Models, ViewModels (with ShellViewModel.cs), Views (with ShellView.xaml), App.config, App.xaml, Bootstrapper.cs, and packages.config.

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

```

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();
    }

    // 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>();
    }

    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    protected override object GetInstance(Type service, string key)
    {
        return _container.GetInstance(service, key);
    }

    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    protected override IEnumerable<object> GetAllInstances(Type service)
    {
        return _container.GetAllInstances(service);
    }

    0 Verweise | 0 Änderungen | 0 Autoren, 0 Änderungen
    protected override void BuildUp(object instance)
    {
        _container.BuildUp(instance);
    }
}

```

The Project Explorer on the right shows the project structure for "RetailManager" with three projects: RMDatabase, RMDataManager, and RMDesktopUI. RMDesktopUI contains files like Properties, Verweise, Models, ViewModels (with ShellViewModel.cs), Views (with ShellView.xaml), App.config, App.xaml, Bootstrapper.cs, and packages.config.

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);

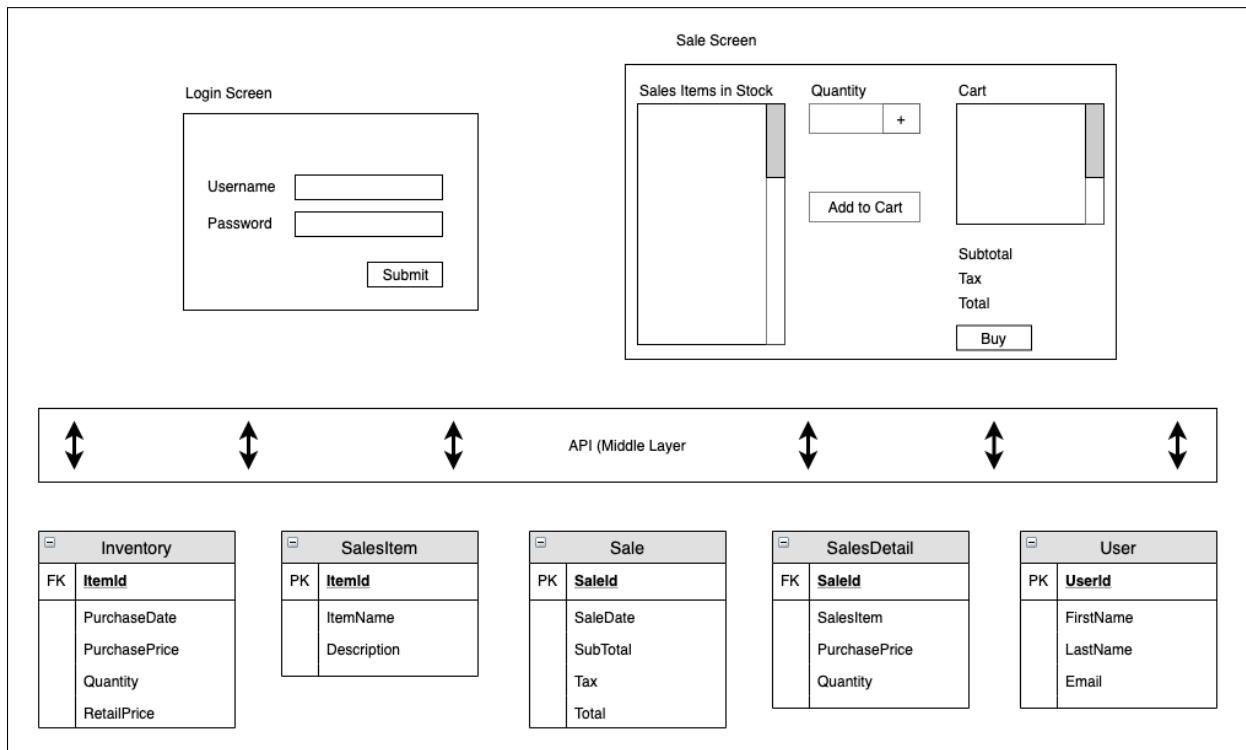
        _container
            .Singleton<IWindowManager, WindowManager>()
            .Singleton<EventAggregator, EventAggregator>();

        // Connecting the ViewModel to the Views using reflection
        GetType().Assembly.GetTypes()
            .Where(type => type.IsClass)
            .Where(type => type.Name.EndsWith("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

Skriptdatei: User.sql

Name	Datentyp	NULL-Werte zulassen	Standard
Id	nvarchar(128)	<input checked="" type="checkbox"/>	
FirstName	nvarchar(50)	<input checked="" type="checkbox"/>	
LastName	nvarchar(50)	<input checked="" type="checkbox"/>	
EmailAddress	nvarchar(256)	<input checked="" type="checkbox"/>	
CreatedDate	datetime2(7)	<input checked="" type="checkbox"/>	getutcdate()

```
Design T-SQL
1 CREATE TABLE [dbo].[User]
2 (
3     [Id] NVARCHAR(128) NOT NULL,
4     [FirstName] NVARCHAR(50) NOT NULL,
5     [LastName] NVARCHAR(50) NOT NULL,
6     [EmailAddress] NVARCHAR(256) NOT NULL,
7     [CreatedDate] DATETIME2 NOT NULL DEFAULT getutcdate()
8 )
9
```

Product.sql

Skriptdatei: Product.sql

Name	Datentyp	NULL-Werte zulassen	Standard
Id	int	<input checked="" type="checkbox"/>	
ProductName	nvarchar(100)	<input checked="" type="checkbox"/>	
Description	nvarchar(MAX)	<input checked="" type="checkbox"/>	
RetailPrice	money	<input checked="" type="checkbox"/>	
CreateDate	datetime2(7)	<input checked="" type="checkbox"/>	getutcdate()
LastModified	datetime2(7)	<input checked="" type="checkbox"/>	getutcdate()

```
Design T-SQL
1 CREATE TABLE [dbo].[Product]
2 (
3     [Id] INT NOT NULL PRIMARY KEY IDENTITY,
4     [ProductName] NVARCHAR(100) NOT NULL,
5     [Description] NVARCHAR(MAX) NOT NULL,
6     [RetailPrice] MONEY NOT NULL,
7     [CreateDate] DATETIME2 NOT NULL DEFAULT getutcdate(),
8     /* Has to be modified manually everytime the entry gets modified.*/
9     [LastModified] DATETIME2 NOT NULL DEFAULT getutcdate()
10 )
```

Sale.sql

Skriptdatei: Sale.sql

Name	Datentyp	NULL-Werte zulassen	Standard
Id	int	<input checked="" type="checkbox"/>	
CashierId	nvarchar(128)	<input checked="" type="checkbox"/>	
SaleDate	datetime2(7)	<input checked="" type="checkbox"/>	
SubTotal	money	<input checked="" type="checkbox"/>	
Tax	money	<input checked="" type="checkbox"/>	
Total	money	<input checked="" type="checkbox"/>	

```
Design T-SQL
1 CREATE TABLE [dbo].[Sale]
2 (
3     [Id] INT NOT NULL PRIMARY KEY IDENTITY, /* IDENTITY Makes the Id auto increment */
4     [CashierId] NVARCHAR(128) NOT NULL,
5     [SaleDate] DATETIME2 NOT NULL,
6     [SubTotal] MONEY NOT NULL,
7     [Tax] MONEY NOT NULL,
8     [Total] MONEY NOT NULL
9 )
```

SaleDetail.sql

Skriptdatei: SaleDetail.sql

Name	Datentyp	NULL-Werte zulassen	Standard
Id	int	<input checked="" type="checkbox"/>	
SaleId	int	<input checked="" type="checkbox"/>	
ProductId	int	<input checked="" type="checkbox"/>	
Quantity	nchar(10)	<input checked="" type="checkbox"/>	1
PurchasePrice	money	<input checked="" type="checkbox"/>	
Tax	money	<input checked="" type="checkbox"/>	0

```
Design T-SQL
1 CREATE TABLE [dbo].[SaleDetail]
2 (
3     [Id] INT NOT NULL PRIMARY KEY IDENTITY,
4     [SaleId] INT NOT NULL,
5     [ProductId] INT NOT NULL,
6     [Quantity] NCHAR(10) NULL DEFAULT 1,
7     [PurchasePrice] MONEY NOT NULL,
8     [Tax] MONEY NOT NULL DEFAULT 0,
9 )
```

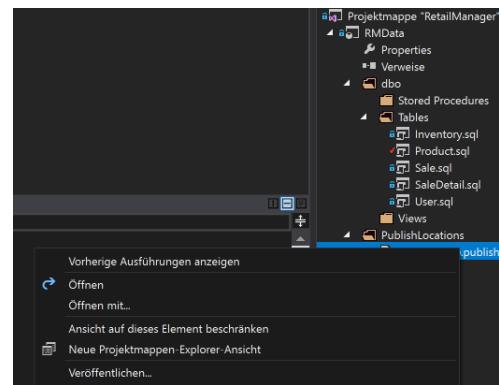
Inventory.sql

Skriptdatei: Inventory.sql

Name	Datentyp	NULL-Werte zulassen	Standard
Id	int	<input checked="" type="checkbox"/>	
ProductId	int	<input checked="" type="checkbox"/>	
Quantity	nchar(10)	<input checked="" type="checkbox"/>	1
PurchasePrice	money	<input checked="" type="checkbox"/>	
PurchaseDate	datetime2(7)	<input checked="" type="checkbox"/>	getutcdate()

```
Design T-SQL
1 CREATE TABLE [dbo].[Inventory]
2 (
3     [Id] INT NOT NULL PRIMARY KEY IDENTITY,
4     [ProductId] INT NOT NULL,
5     [Quantity] NCHAR(10) NOT NULL DEFAULT 1,
6     [PurchasePrice] MONEY NOT NULL,
7     [PurchaseDate] DATETIME2 NULL DEFAULT getutcdate()
8 )
9
```

!!! Publishing Tables !!!



10 WPF Login Form Creation

11 Wiring up the WPF Login Form to the API

12 Login Form Error Handling