

Chirp! Project Report

ITU BDSA 2024 Group 5

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1 Design and Architecture of *Chirp!*

1.1 Domain model

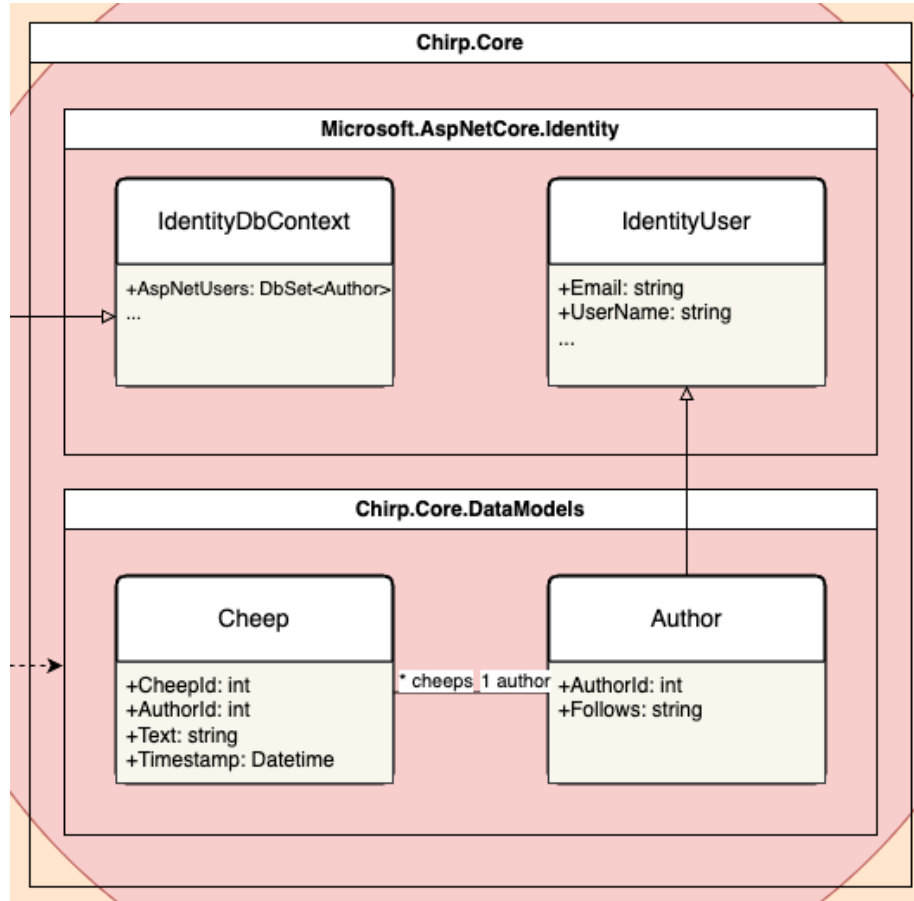


Figure 1: Illustration of the *Chirp!* data model as UML class diagram.

The Chirp application purposely utilizes an onion architecture to promote a clear separation of concern. The “onion” consists of multiple layers with the core being **Chirp.Core**, where the domain model resides. The domain model is relatively simple and represents ‘Authors’ and ‘Cheeps’. The author model extends **IdentityUser** from ASP.NET Core Identity to make it work seamlessly with the rest of the ASP.NET Core ecosystem.

1.2 Architecture — In the small

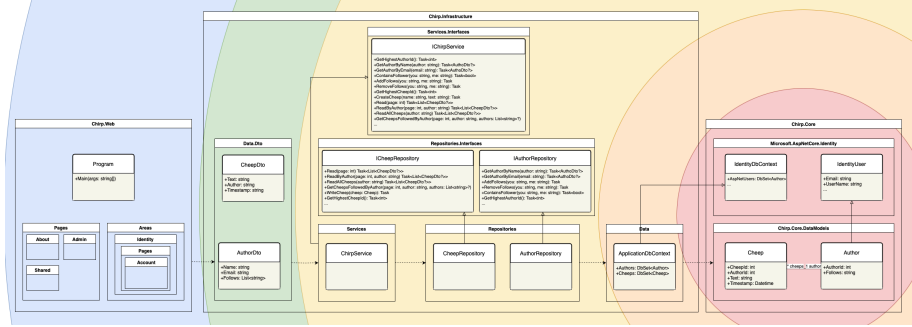


Figure 2: Illustration of onion architecture.

The rest of the layers are categorized as ‘Chirp.Infrastructure’ and ‘Chirp.Web’, with the thickest layer being the infrastructure.

1.2.1 Infrastructure Layer

The infrastructure layer can be further broken down in three sub-layers. Starting from the core and moving out one layer, there is the **ApplicationDbContext** that extends **IdentityDbContext**. This is to provide a way for the application to interact and manipulate the entities in the database.

The next layer is the repository layer that interacts with the **ApplicationDbContext** by implementing methods that extract specific data from the database. To comply with the “Repository Design Pattern”, two repositories are implemented; the **AuthorRepository** and the **CheepRepository**. Both of them interact with their respective entities in the database.

To interact with both **Author** and **Cheep** entities in a simple manner, a service called **ChirpService** is implemented. The service combines the two repositories by implementing identical methods that call the respective repository methods. Another purpose of the service is to make development easier by providing only a single point of access to the database for injection.

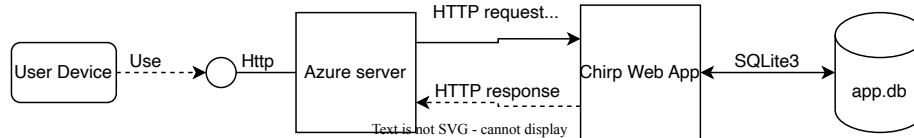
Both repositories and the service implement respective interfaces to enable dependency injection, which makes it easier to test for functionality and coverage.

The last layer of the infrastructure layer is the ‘Data Transfer Object’ layer, DTO for short. The DTOs serve the purpose of only providing the necessary data in order to not expose the entire domain model to the user, as there can be sensitive and/or unnecessary data.

1.2.2 Web Layer

The ‘Web’ layer is the outermost layer and is responsible for handling the front-end portion of the *Chirp!* application i.e. the user interface of the website.

1.3 Architecture of deployed application

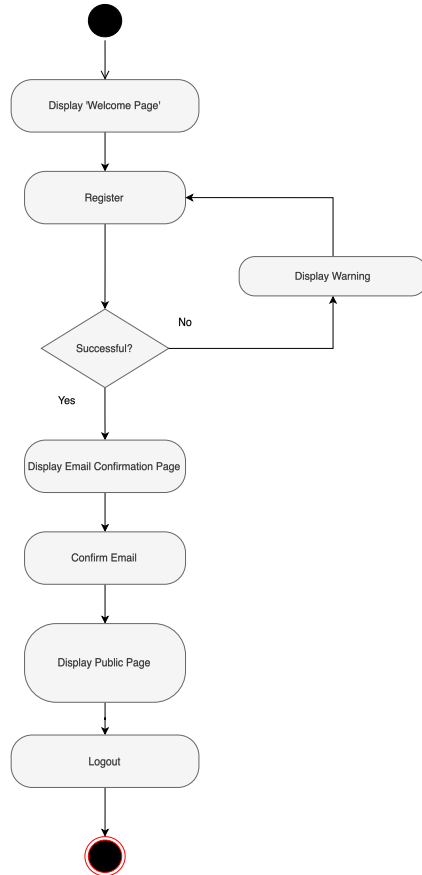


As illustrated above, the user sends requests to the Azure server and receives responses from it through the HTTP-protocol. Multiple clients can connect to the Azure server simultaneously. The Azure server sends an HTTP-request to the *Chirp!* application with a required cookie for the user session. The *Chirp!* web-application communicates with the database itself with SQLite3. The production deployment uses the HTTPS-protocol, which ensures vulnerable user data in the responses are encrypted with a TLS-certificate.

1.4 User activities

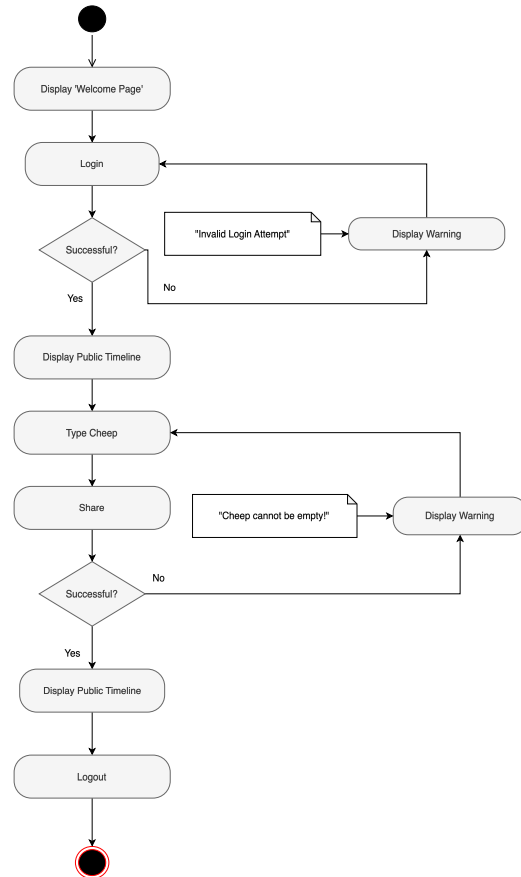
This section illustrates typical scenarios that the user may go through when using our *Chirp!* application. This includes cases for both unauthenticated and authenticated users. The illustrations are shown as sequences of activities in the format of UML Activity Diagrams.

1.4.1 Register Account



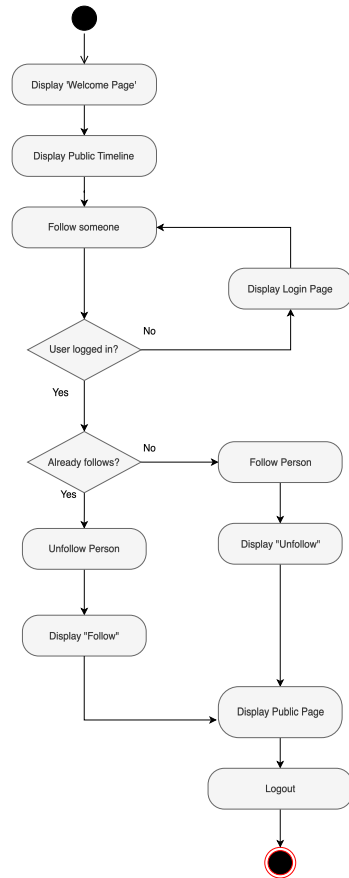
This diagram illustrates the registration of a user. When a user registers, if all criteria are fulfilled, they will be led to the e-mail confirmation page. In the case of a missing criteria, e.g. the user has typed an invalid e-mail address, a warning will be displayed informing the user about the missing criteria.

1.4.2 Submit cheep



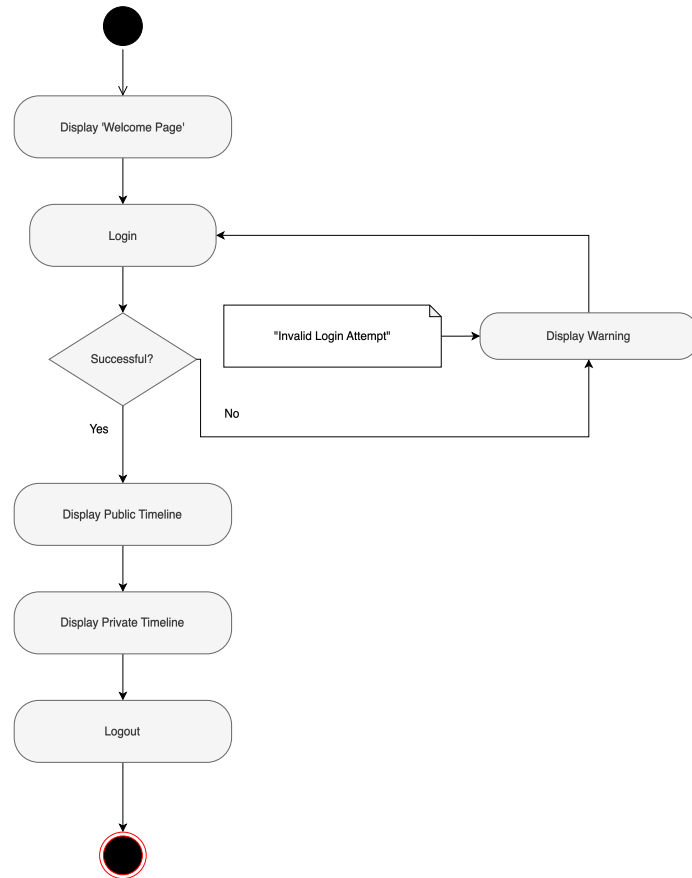
This diagram displays the sequence of a user typing a cheep. If the message box is empty, a warning will be displayed.

1.4.3 Follow User



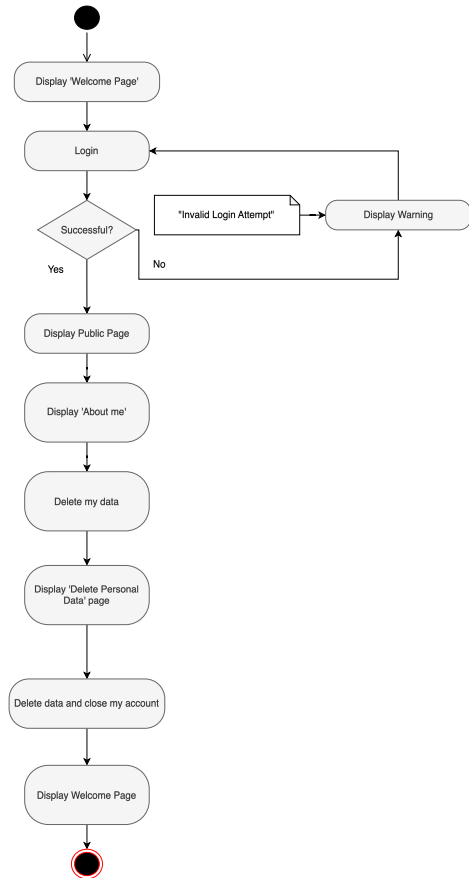
This diagram shows what occurs once a user tries to follow another user. If user isn't logged in, they will be redirected to the login page. Otherwise, depending on whether the user already follows someone else or not, either 'Follow' or 'Unfollow' will be displayed.

1.4.4 Private Timeline



This diagram shows the sequence of a user visiting their own page.

1.4.5 Delete account



If a user wishes to delete their data, this user activity sequence would be a typical scenario.

1.5 Sequence of functionality/calls through *Chirp!*

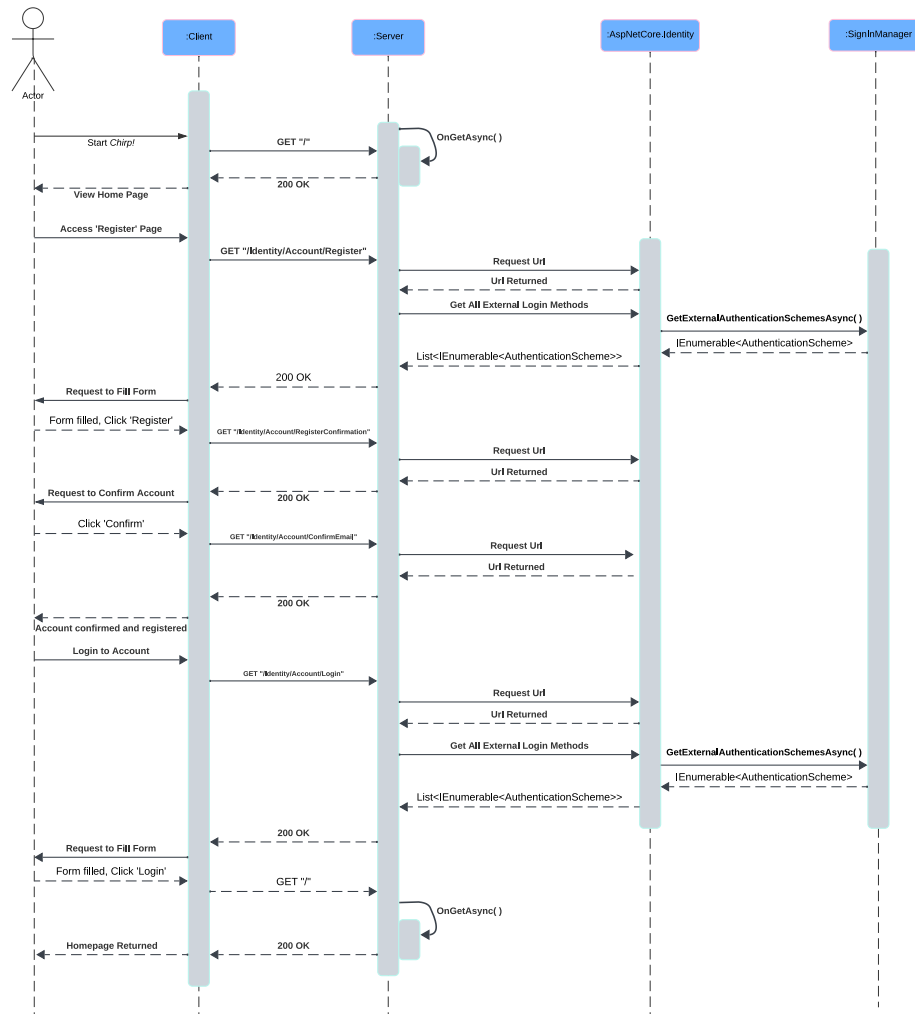
When running the application, messages and data are sent back and forth from the requests from the user to the server and ASP.NET Core. This is illustrated by the UML Sequence Diagrams, that show how the system works, and how the entities interact with each other. The intention of the diagrams is to visualise the process from when a user-request is sent, to the final rendered webpage shown to the user.

The diagrams illustrate the following sequences:

1. when a user registers a new account, and login
2. when a user accesses the Public Page
3. when a user accesses their own private timeline
4. when a user types a cheep
5. when a user follows someone else
6. when a user deletes their account

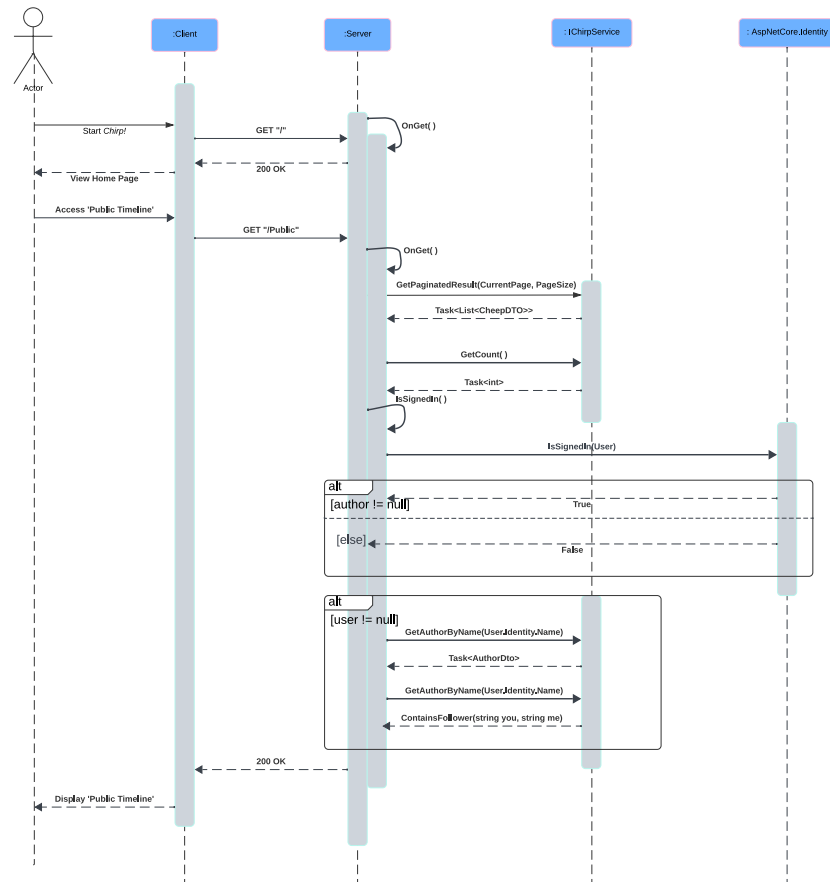
The diagrams are shown below:

1.5.1 Register and Login



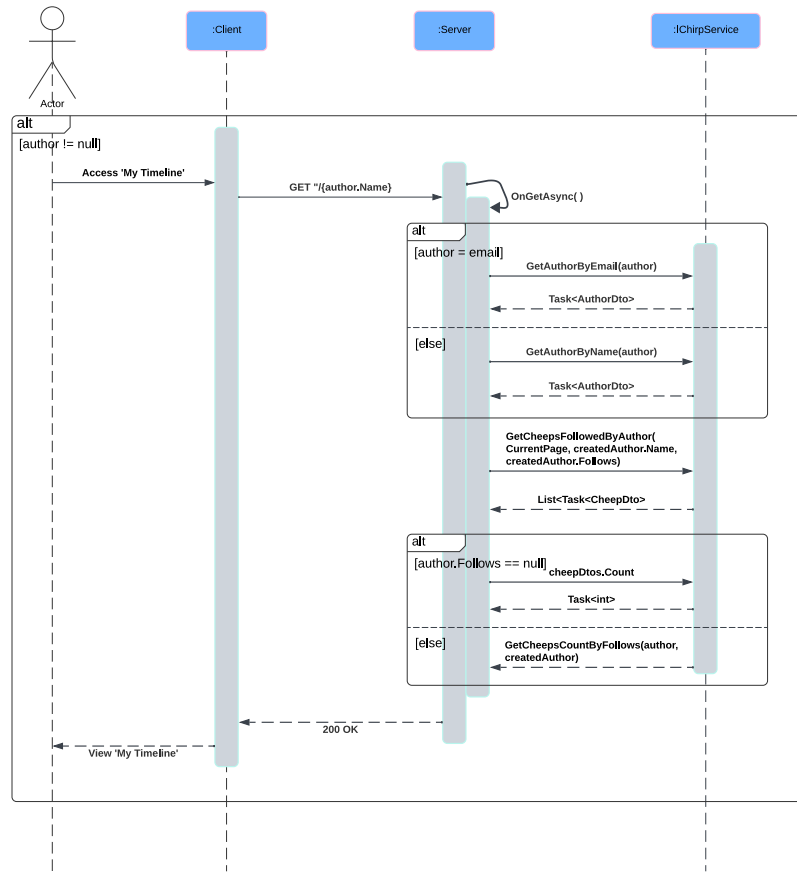
This diagram shows the flow of when a user starts the application and wants to register a new account. After registering, the user logs in to their newly registered account.

1.5.2 Public Page



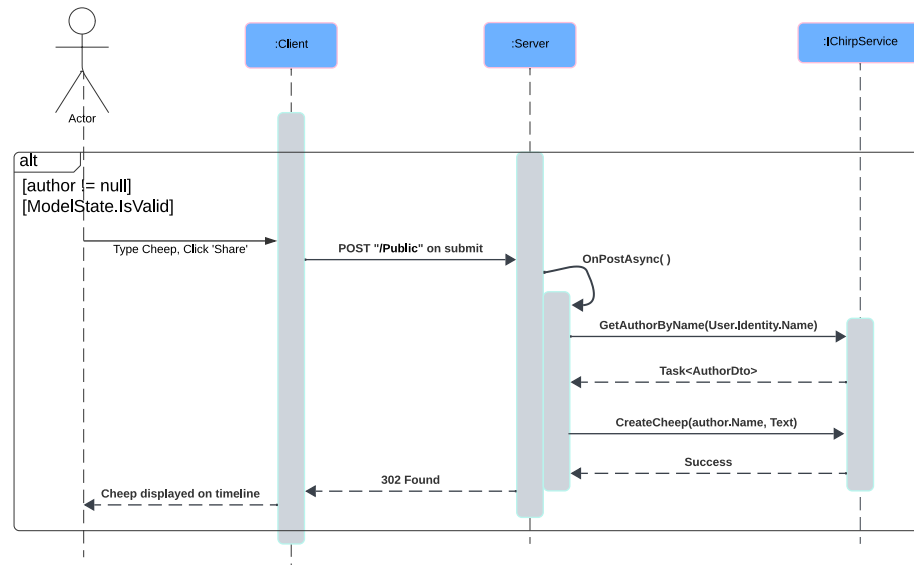
This diagram shows the flow of when a user starts the application, and then tries to access the Public Timeline-site.

1.5.3 Private Timeline



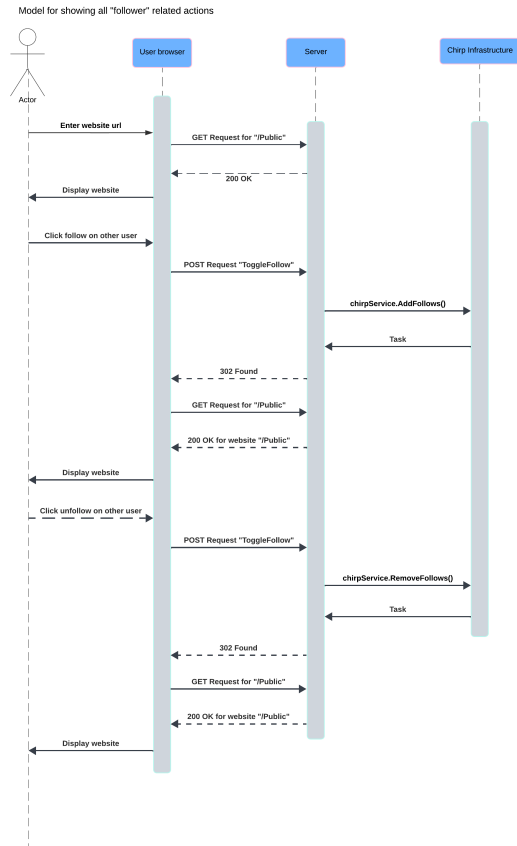
This diagram shows the flow of a user accessing their own timeline, 'My Timeline'. This sequence is only available when a user is logged in.

1.5.4 Type Cheep



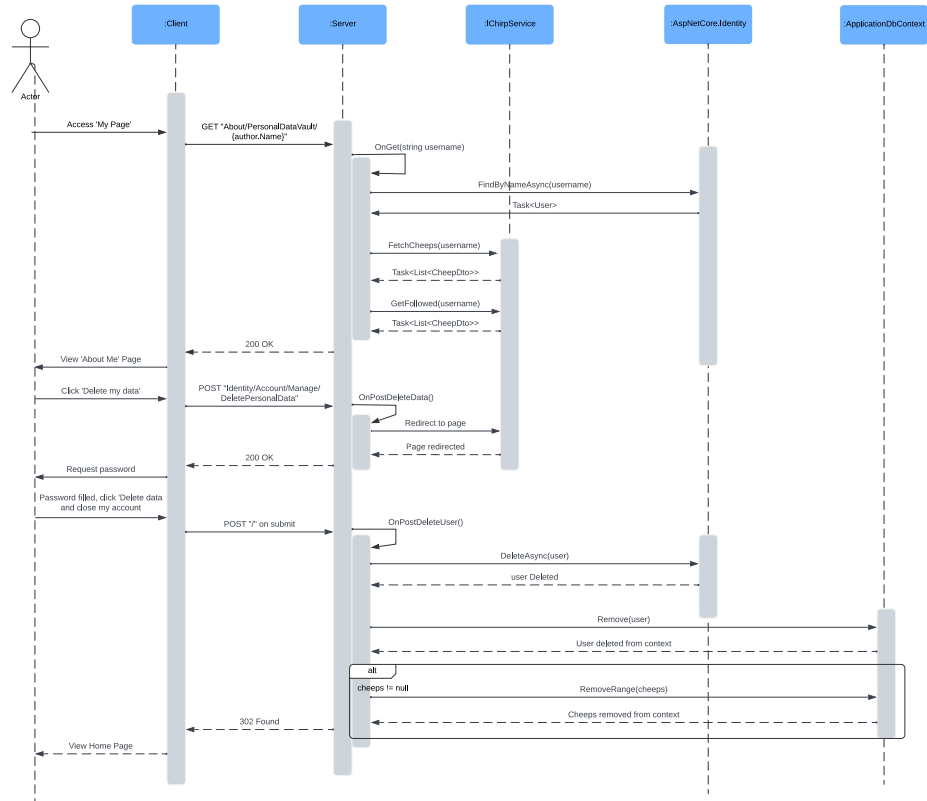
This diagram shows the interaction between the entities when the user wants to type a cheep in the application. This function is only available when a user is logged in.

1.5.5 Follow User



This diagram illustrates how the user accesses the public page, and wants to follow or unfollow another user from said page.

1.5.6 Delete Account

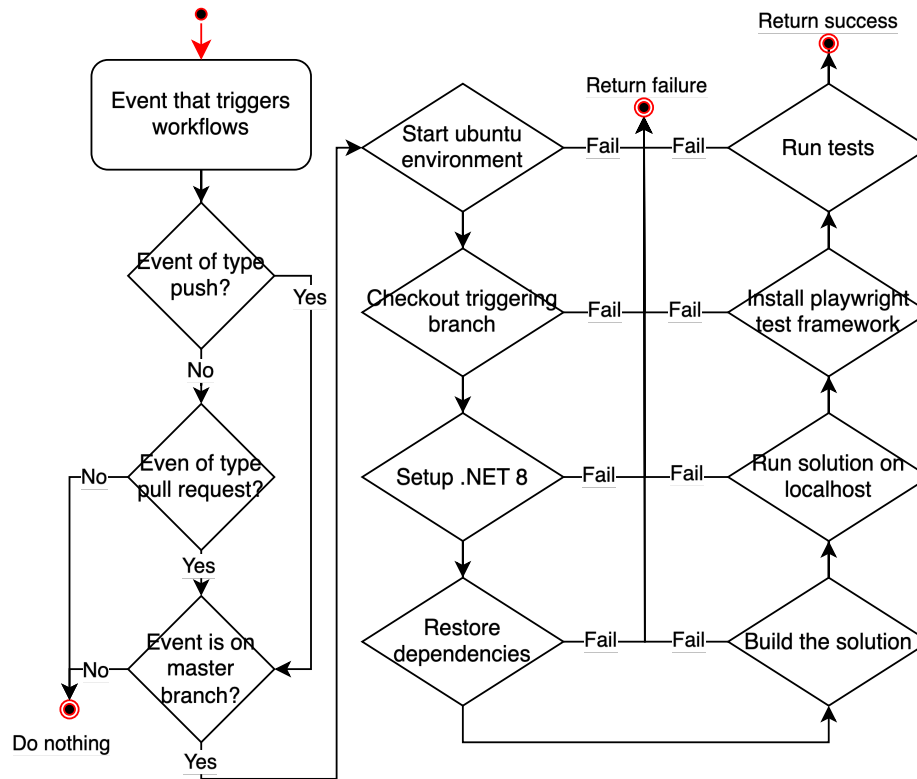


This diagram shows the interaction between the entities, when a user decides to delete their account.

2 Process

2.1 Build, test, release, and deployment

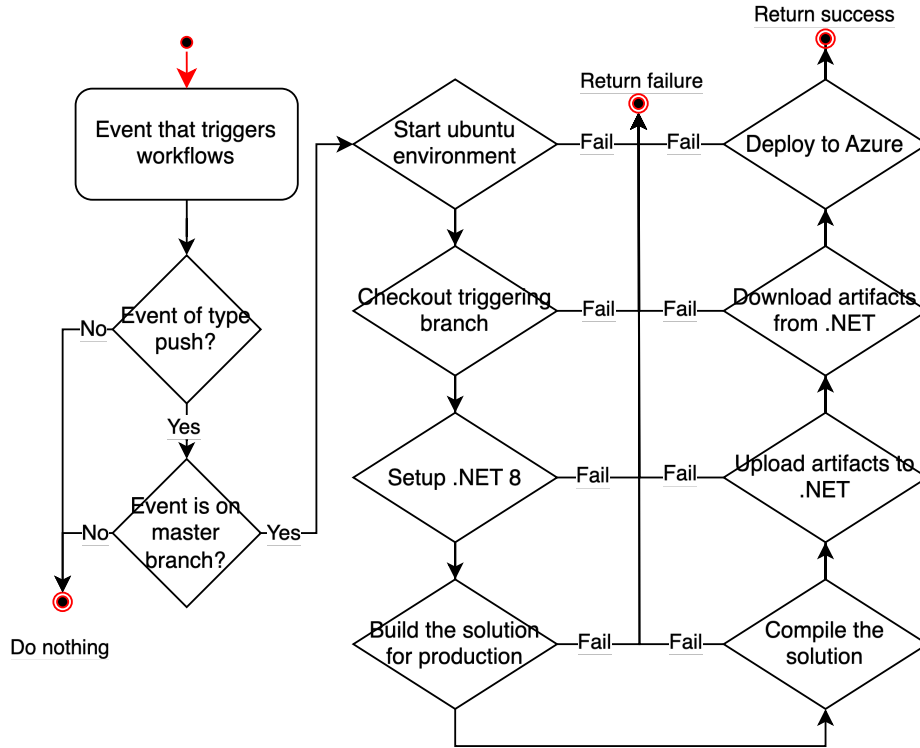
2.1.1 build_and_test.yml



This workflow builds and tests the code on push- and pull-requests on the master branch. When this condition is achieved, it restores dependencies, builds with no restore because of the last step, and attempts to run it locally. Before running the tests, it installs the test-framework 'PlayWright' in order to run the tests found in PlaywrightTests directory. The ones found in test/Chirp.Razor.Test are run by xUnit.

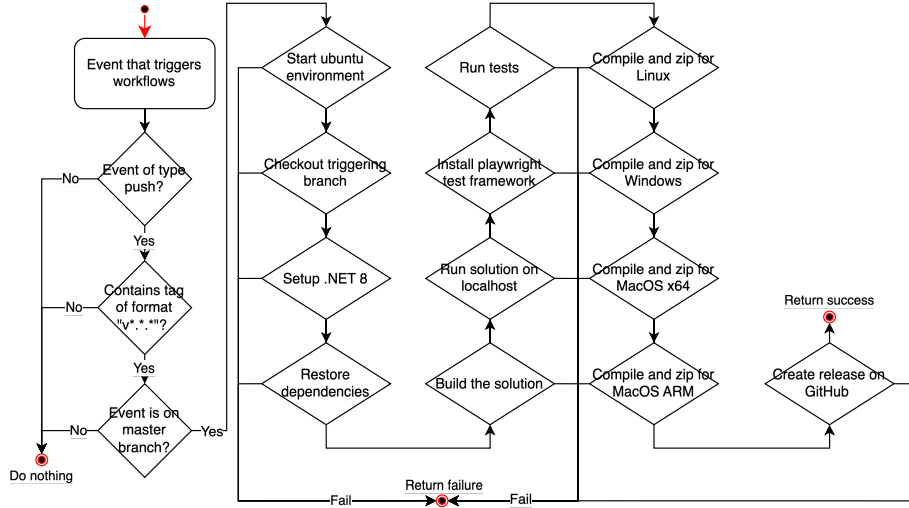
If any of these steps fail, the workflow fails and the push or pull-request on the master branch is cancelled. If not, it proceeds with the action.

2.1.2 master_bdsagroup5chirprazor2024.yml



This workflow is triggered by a push on the master branch and is responsible for deploying the code/build to Azure. When triggered, it creates a build with the release configuration. Next, it publishes the project to the output folder defined after -o and uploads the published folder as an artifact for the Azure web application to deploy. The 'Deploy to Azure'-step deploys the application to the Production environment with the webapp URL.

2.1.3 release.yml



This workflow is triggered when adding the following tag on push: - v*.*.*

The steps *restore*, *build* and *tests* are the same as the previously mentioned *build_and_test* workflow. If it succeeds, it proceeds with the workflow by publishing the following project files:

1. src/Chirp.Core/Chirp.Core.csproj
2. src/Chirp.Infrastructure/Chirp.Infrastructure.csproj
3. src/Chirp.Web/Chirp.Web.csproj

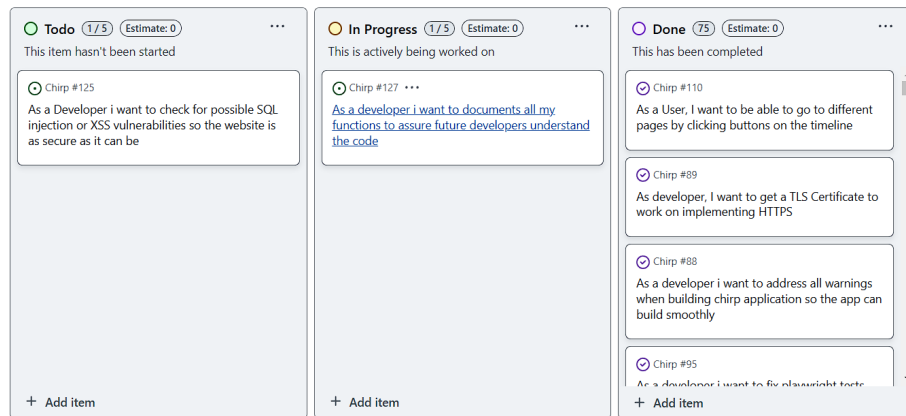
with the following release configurations: linux-x64, win-x64, osx-x64 and osx-arm64 with corresponding output folders and compresses them into zip-files. The release then include the zip-files and the source code

2.2 Team work

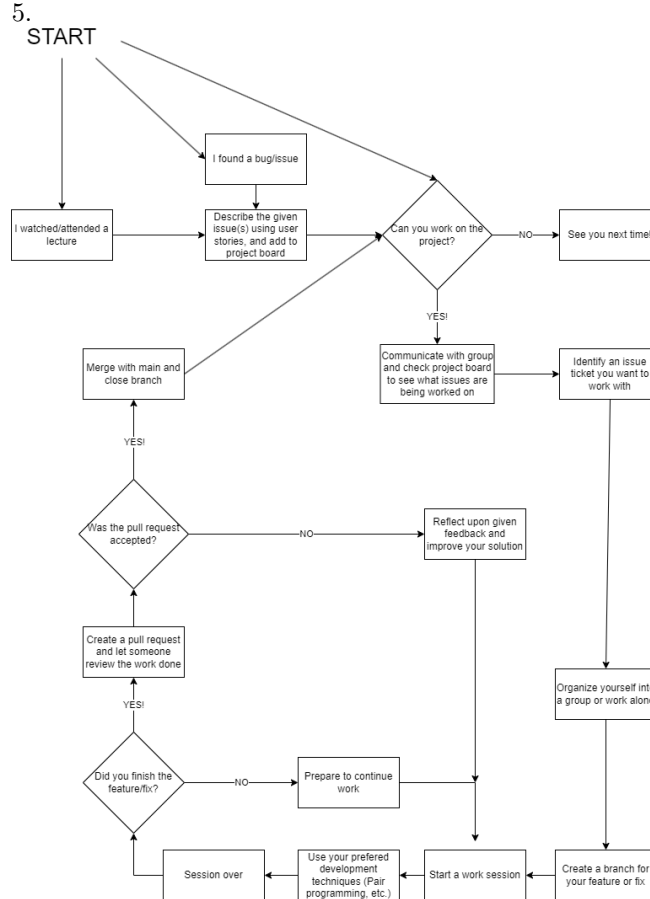
Below is the project board for Group 5. The uncompleted tasks are:

1. As a Developer i want to check for possible SQL injection or XSS vulnerabilities so the website is as secure as it can be
2. As a developer i want to documents all my functions to assure future developers understand the code

All other features have been completed, this solution for *Chirp!* should not be missing any features or functionality.



Below is a flowchart modeling of how teamwork has been conducted in Group



The process “From issue to solution” starts after all members having attended the given week’s lecture. Shortly after that lecture, the group will find a room

to sit and organize themselves. Here, a few group members start identifying and then quantifying that week's problems by creating issue tickets. When all problems have their respective issue tickets, the group will subdivide itself into smaller groups where individuals work together or independently to solve the specific issue(s). A new branch will be created where all work for the feature/fix will be deposited. Whenever a specific issue is solved, its respective branch may be merged into main and the issue will be closed. If an issue is not solved by the end of the day, individuals will work from home to solve/close the issue, or if necessary, the group will meet again before the next week's lecture (when new issues will be added).

2.3 How to make *Chirp!* work locally

2.3.1 Running from Compiled

1. Access our release page.
2. Download the zip containing the compiled version of the program corresponding to the system you want it to run on.
3. Unzip the zip file into a given directory / %unzippedcontentdir% and run
UNIX-based systems

3.1. Open up a terminal and run the following

```
cd %unzippedcontentdir%/publish/%systemarchitecture%  
./Chirp.Web
```

Windows

3.1. Open up CMD and run the following

```
cd %unzippedcontentdir%/publish/win-x64  
Chirp.Web.exe
```

4. The terminal/cmd should now show the following: Now listening on:
http://localhost:5000
5. Accessing your localhost on the given port should now give you access to the local running instance of the web-app

2.3.2 Running from Source code

1. Pull the source code from GitHub. This can be done by opening terminal/cmd and typing the following

```
git clone https://github.com/ITU-BDSA2024-GROUP5/Chirp.git
```

2. Navigate to the project directory and run

```
cd Chirp/src/Chirp.Web  
dotnet run
```

3. By default, the terminal should now show - Now listening on:
`http://localhost:5177`

If not, follow the following steps.

1. Run `dotnet dev-certs https --trust`
2. Set user secrets by

```
dotnet user-secrets init
dotnet user-secrets set "authentication:github:clientId" "YOURCLIENTID"
dotnet user-secrets set "authentication:github:clientSecret" "YOURCLIENTSECRET"
```

2.4 How to run test suite locally

The test suite is separated into two folders: `Chirp.Razor.Test` contains unit and integration tests, and `PlaywrightTests` contains end-to-end tests. Unit tests are made for all the methods in `AuthorRepository` and `CheepRepository`. A couple of integration tests are created in the `Razor Page` framework. The end-to-end tests are run with `Playwright` and tests the UI elements `Chirp` by simulating user input.

2.4.1 Prerequisites

`Playwright` needs `powershell` to be installed locally

Guide to download for linux: <https://learn.microsoft.com/en-us/powershell/scripting/install/installing-powershell-on-linux?view=powershell-7.4>

Guide to download for MacOS: <https://learn.microsoft.com/en-us/powershell/scripting/install/installing-powershell-on-macos?view=powershell-7.4>

2.4.2 Windows

There is 2 ways to run the test suite

The provided script

1. Run `cd test; ./CompileAndRunTests.bat`

Manually running the commands

1. Run `dotnet run --project src/Chirp.Web`
2. Open `powershell` and run `.\Test\PlaywrightTests\Bin\Debug\net8.0\playwright.ps1 install`
3. Open a new command prompt
4. Run `dotnet test`

2.4.3 Linux

There is 2 ways to run the test suite

The provided script

1. Run `cd test; ./CompileAndRunTests.sh`

Manually running the commands

1. Run `dotnet run --project src/Chirp.Web &` to start it as a background process so it doesn't block the command prompt
2. Run `pwsh -ExecutionPolicy Bypass -File "/test/PlaywrightTests/Bin/Debug/net8.0/playwright.ps1" install-deps`
3. Run `pwsh -ExecutionPolicy Bypass -File "/test/PlaywrightTests/Bin/Debug/net8.0/playwright.ps1" install`
4. Run `dotnet test`
5. Run `kill -9 $(lsof -t -i tcp:5177)` to kill the background process running the website

2.4.4 Mac

There is 2 ways to run the test suite

The provided script

1. Run `cd test; ./CompileAndRunTests.sh`

Manually running the commands

1. Run `dotnet run --project src/Chirp.Web &` to start it as a background process so it doesn't block the command prompt
2. Run `pwsh -ExecutionPolicy Bypass -File "/test/PlaywrightTests/Bin/Debug/net8.0/playwright.ps1" install-deps`
3. Run `pwsh -ExecutionPolicy Bypass -File "/test/PlaywrightTests/Bin/Debug/net8.0/playwright.ps1" install`
4. Run `dotnet test`
5. Run `kill -9 $(lsof -t -i tcp:5177)` to kill the background process running the website

3 Ethics

3.1 License

The license chosen for the program is the MIT license due to its simplicity and flexibility. The license is short and transparent, making it easy to understand. It has minimal restrictions and allows for both commercial and non-commercial use. Anyone wanting to use the source code are allowed to use it for their purposes but as it is, meaning that the source code is delivered as is without any warranty and that we the developers do not hold any liability .

3.2 LLMs, ChatGPT, CoPilot, and others

LLMs have been used in a limited capacity in the development of Chirp. CoPilot, as an integrated feature in Rider and GitHub, have mainly been used in code generation/assistance and has cut down the time spent on writing generic code. Occasionally, LLMs has been used for bug fixes. This is usually done by giving ChatGPT a block of code along with the prompt “Please fix” to identify simple syntax errors, which have been hard to spot. Aside from directly in-code, LLM has been used in research as a substitute for search engines and documentation. An example from development would be using ChatGPT to research how to implement “Identity Core”.

In terms of helpfulness, LLMs have been used in cases where advice and guidance was needed and not when looking for a direct solution. The benefits of using LLMs are similar to asking a TA for help in understanding a certain topic or troubleshooting, but more accessible and time-efficient. When presented with an incorrect or false response, it is simply dismissed and heeded as bad advice.

Generally, the use of LLMs have sped up the development by enabling individual work by giving benefits similar to peer-programming.