C# MAUI.NET / ASP.NET Sample Application

Dr. Georg Hackenberg BSc MSc

Professor for Industrial Informatics | School of Engineering
University of Applied Sciences Upper Austria
Stelzhamerstr. 23, 4600 Wels, Austria

👤 https://github.com/ghackenberg
👤 https://linkedin.com/in/georghackenberg
👤 https://youtube.com/@georghackenberg

Also check out https://mentawise.com and https://caddrive.org 😎

Deck overview

- Section 1 - The software architecture
- Section 2 - The `CustomLib` component
- Section 3 - The `CustomApi` component
- Section 4 - The `CustomSdk` component
- Section 5 - The `CustomCli` component
- Section 6 - The `CustomApp` component
- Section 7 - The follow-up resources

C# MAUI.NET / ASP.NET
Sample Application

Section 1 - The software architecture

Domain and **component model**

Domain model

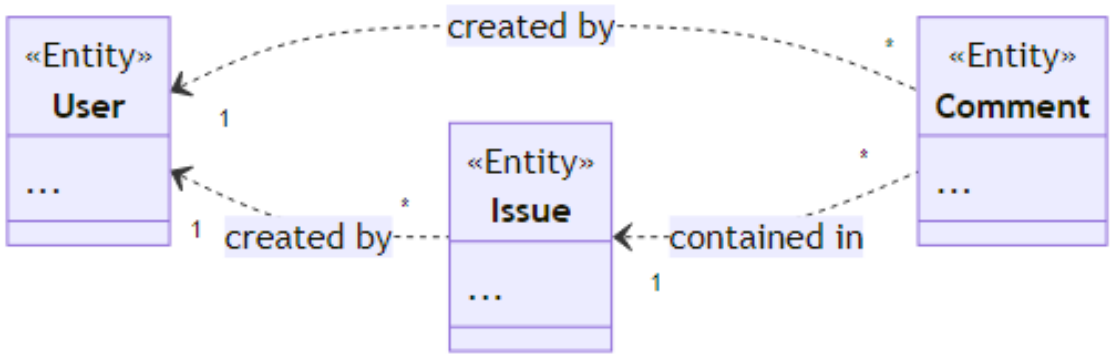
The **entities**, their **attributes**, and their **relationships**

Domain model overview

The diagram on the right shows the **domain model** implemented by the application.

The data model consists of **three entities**, namely `User`, `Issue`, and `Comment`.

Issues and comments are `created by` users, comments are `contained in` issues.

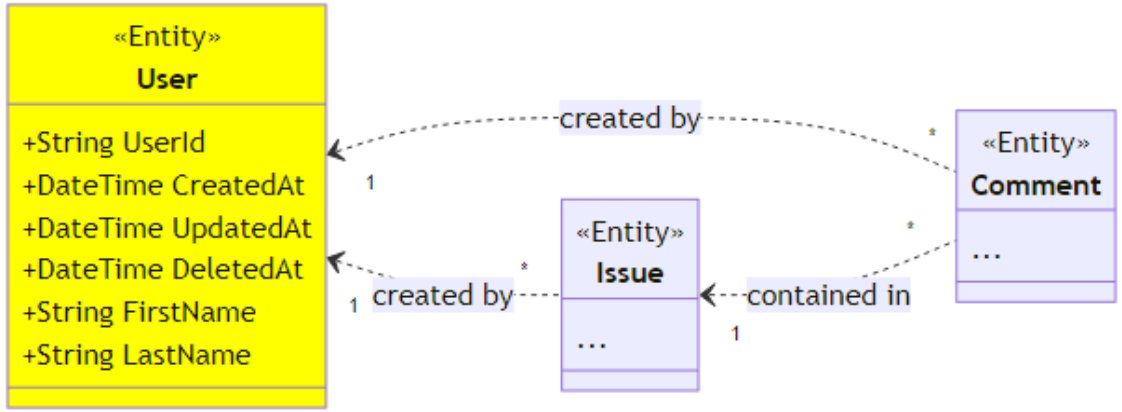


The `User` entity

The `User` entity represents, as the name suggests, the users of the sample application.

For each user, **a first and a last name** must be defined, which are shown in the GUI.

Furthermore, each user has a unique **identifier** as well as create, update, and delete timestamps.

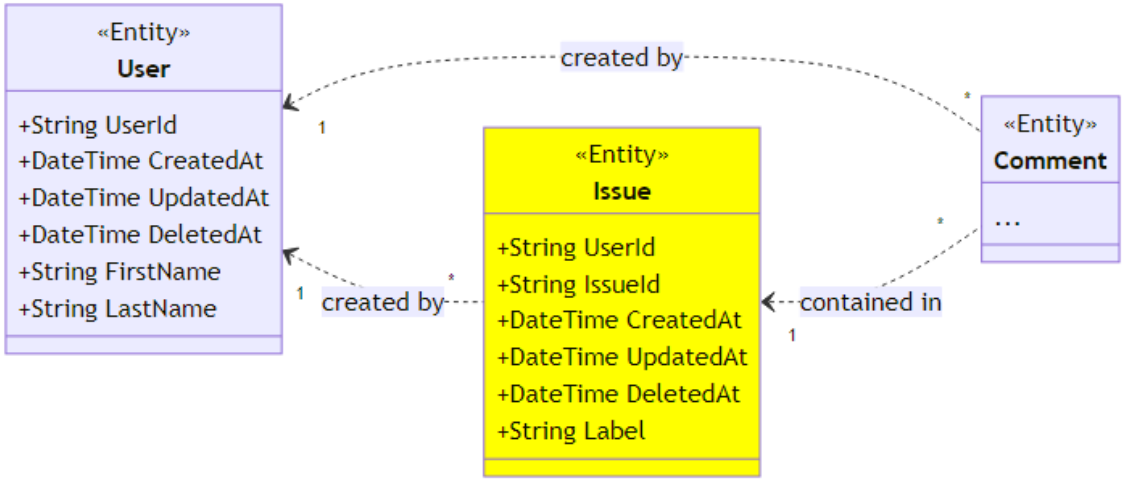


The `Issue` entity

The `Issue` entity represents problems with some machine reported by the users.

Each issue carries the identifier of the corresponding user as well as a **label** explaning the issue.

Also, each issue has a unique **identifier** as well as a create, update, and delete timestamp.

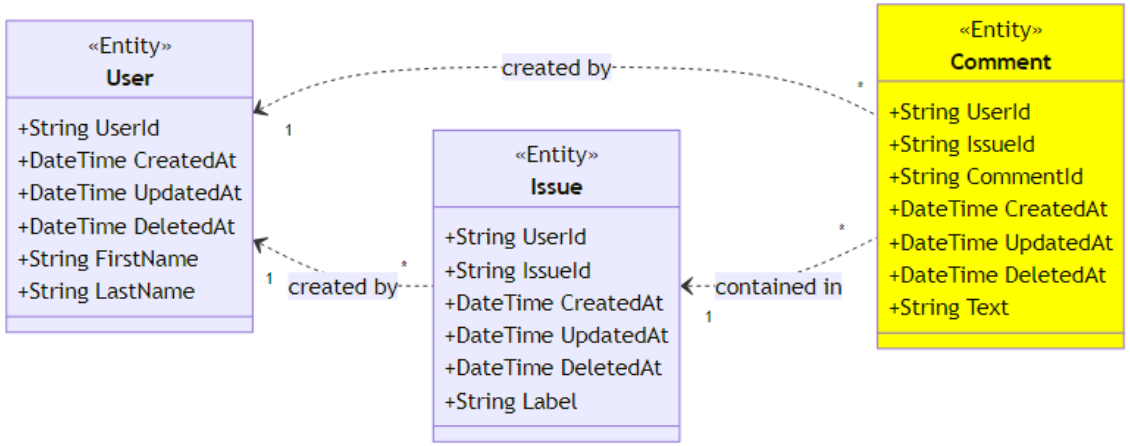


The `Comment` entity

Finally, the `Comment` entity represents, as the name suggests, comments associated to issues.

For each comment, the identifier of the corresponding user and a **text** is defined.

Moreover, each comment has a unique **identifier** as well as a create, update, and delete timestamp.



Component model

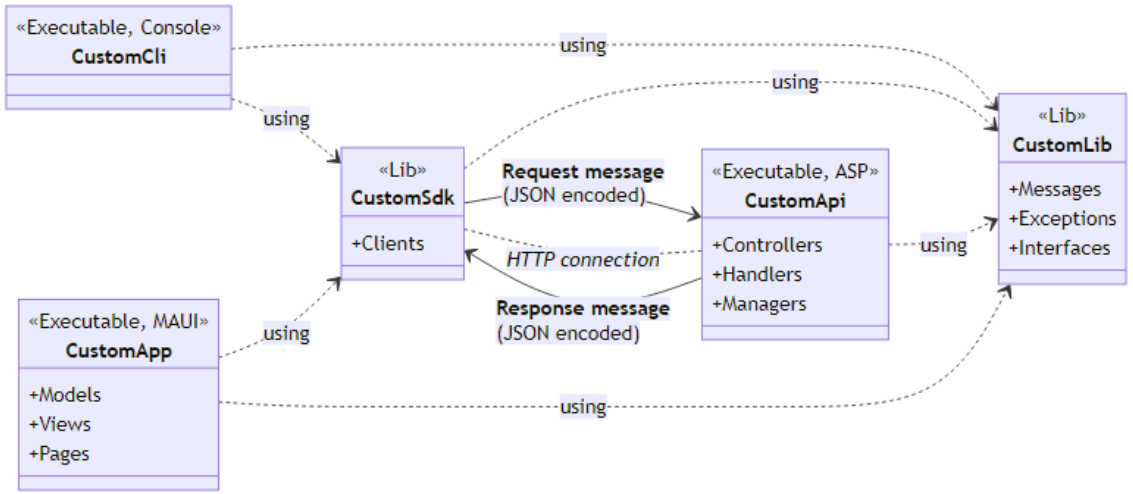
Components and their **dependencies / interactions**

Component model overview

The sample application comprises **two library** and **three executable** components.

The **library components** include the `CustomLib` and the `CustomSdk` components.

The **executable components** include the `CustomApi`, the `CustomCli`, and the `CustomApp` components.

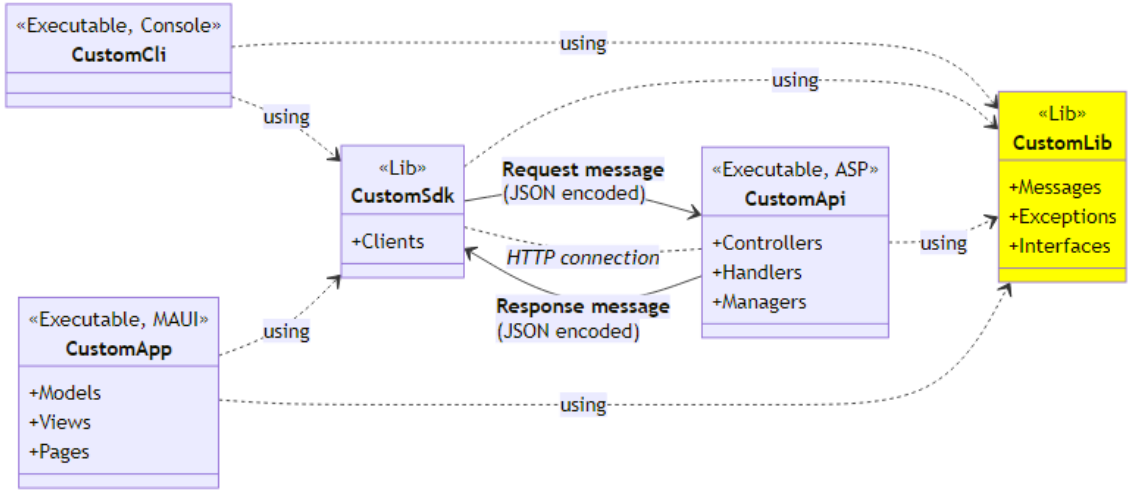


The `CustomLib` component

The `CustomLib` component contains a common set of **classes and interfaces** for the other components.

Most importantly, it defines the **messages** exchanged between the backend and the frontends.

Furthermore, it defines the **contracts** between backend and frontends in the form of *regular interfaces*.

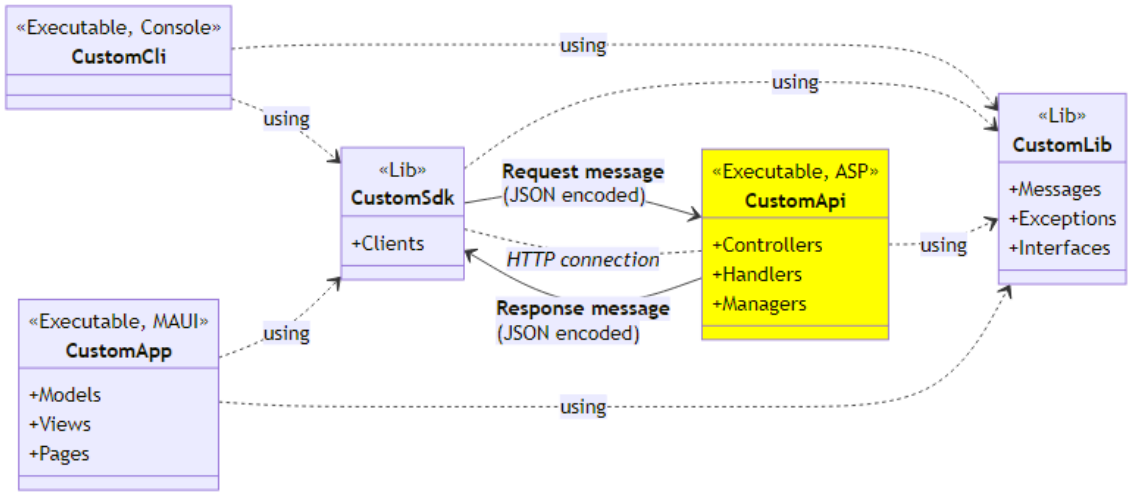


The `CustomApi` component

The `CustomApi` component implements the **backend** of the sample application.

The backend is responsible for **managing and serving** the entity instances.

The backend services are exposed as **HTTP REST API** using the Microsoft ASP.NET framework.

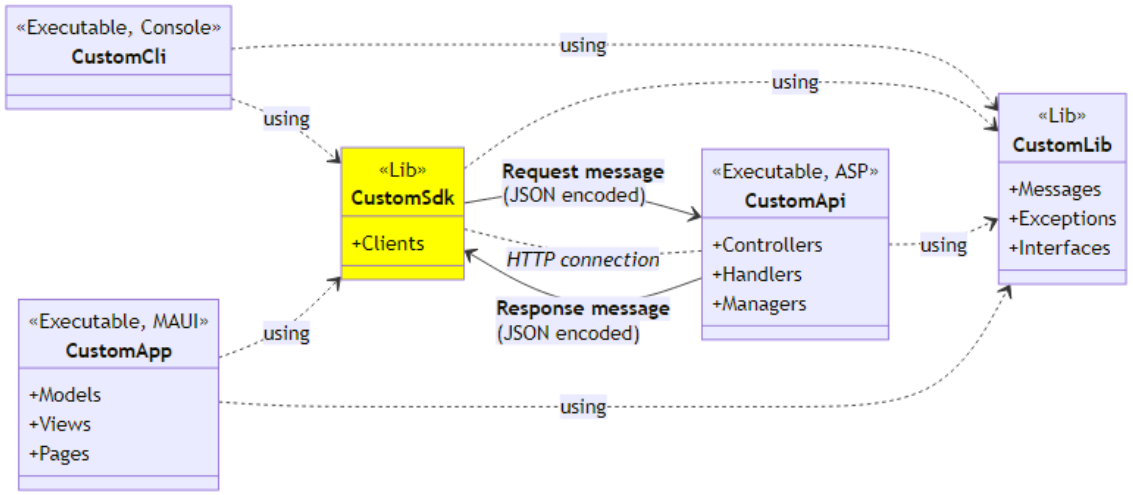


The `CustomSdk` component

The `CustomSdk` provides a set of classes for **interacting** with the `CustomApi` backend.

The interaction is realized by means of **HTTP REST API clients** producing and consuming messages.

These clients send **request messages** to the backend and the backend responds with **response messages**.

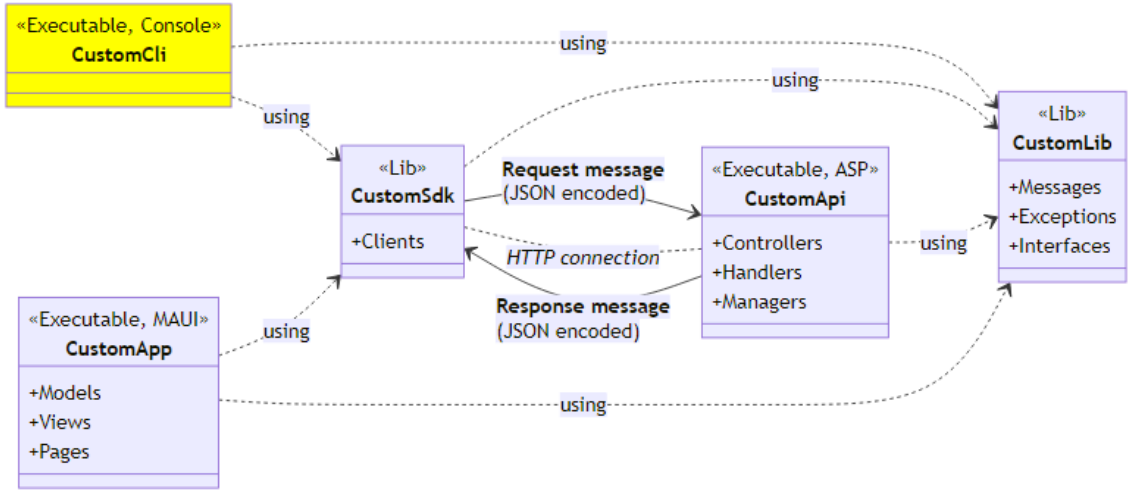


The `CustomCli` component

The `CustomCli` component provides a **command line interface (CLI)** for the backend services.

CLIs represent the simplest form of application and are used, e.g., for **administration tasks**.

The implementation uses the clients of the `CustomSdk` to **access** the backend services.

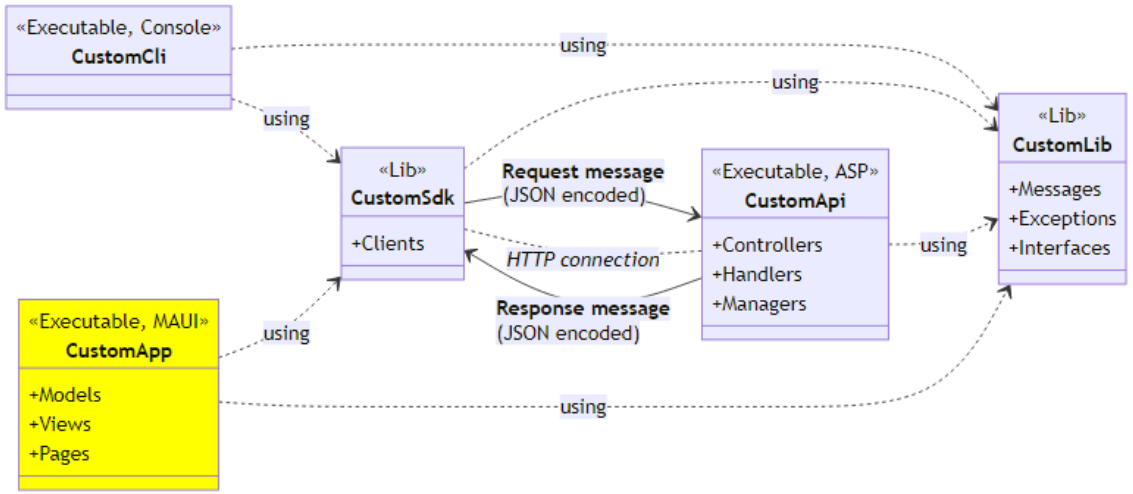


The `CustomApp` component

The `CustomApp` component provides a **graphical user interface (GUI)** for the sample application.

GUIs typically are shipped to the end **users of an application** and excell over CLIs in terms of usability.

The implementation is based in the **Microsoft MAUI.NET** cross-platform application framework.



Section 2 - The `CustomLib` component

Messages, **interfaces**, and **exceptions**

Messages

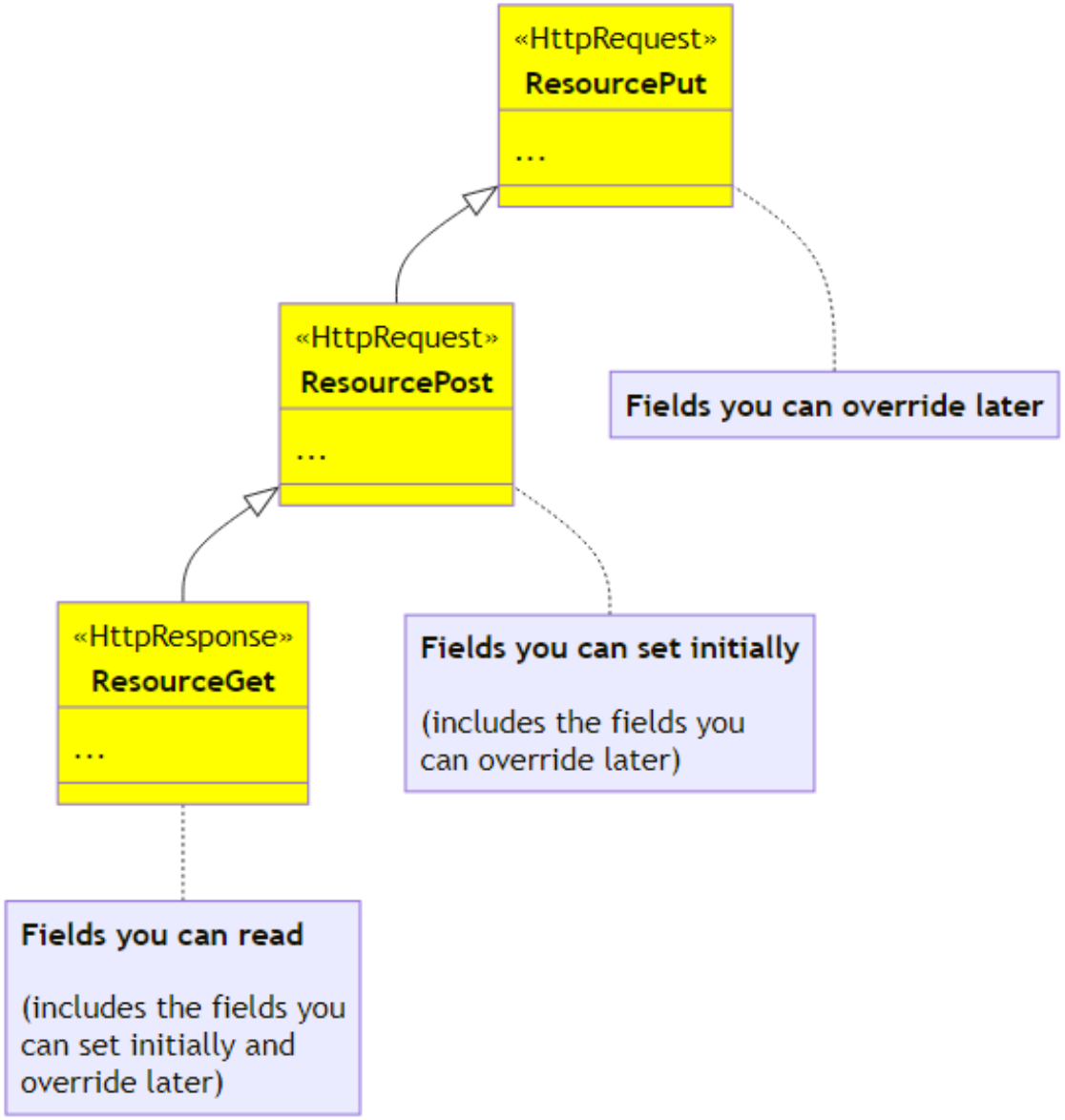
Data exchange between frontends and backend

Message overview

The REST API uses request and response **messages** for working with these entities.

For **each resource** (i.e. user, issue, comment) we distinguish `Get`, `Post`, and `Put` messages.

In the following, we describe each **type of message** in more detail including their data fields.

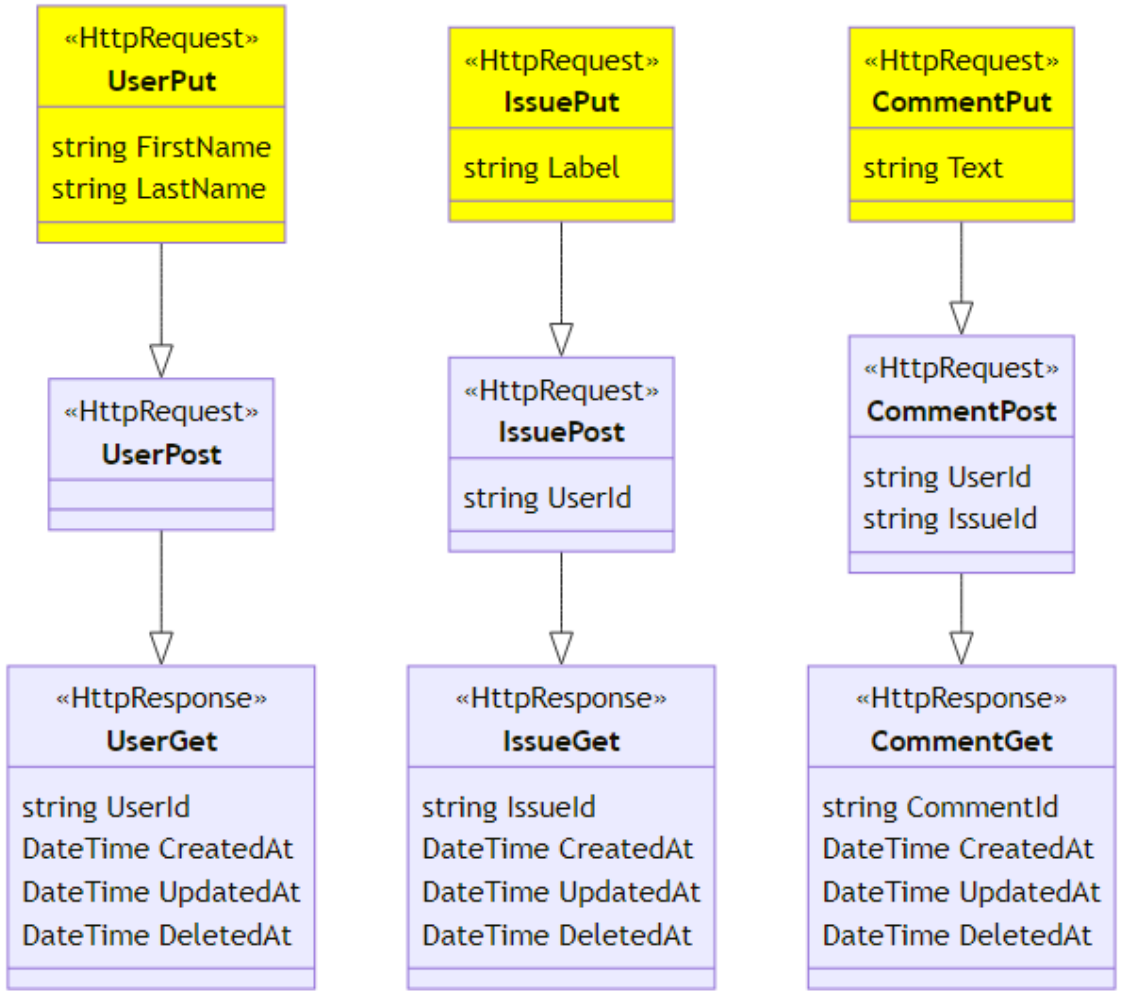


`Put` messages

The `Put` messages contain the fields that you can **override later** after creating an instance.

For `User` entities, **the first and the last name** can be changed any time later.

For `Issue` entities, the **label** can be changed later, and for `Comment` entities the **text**.

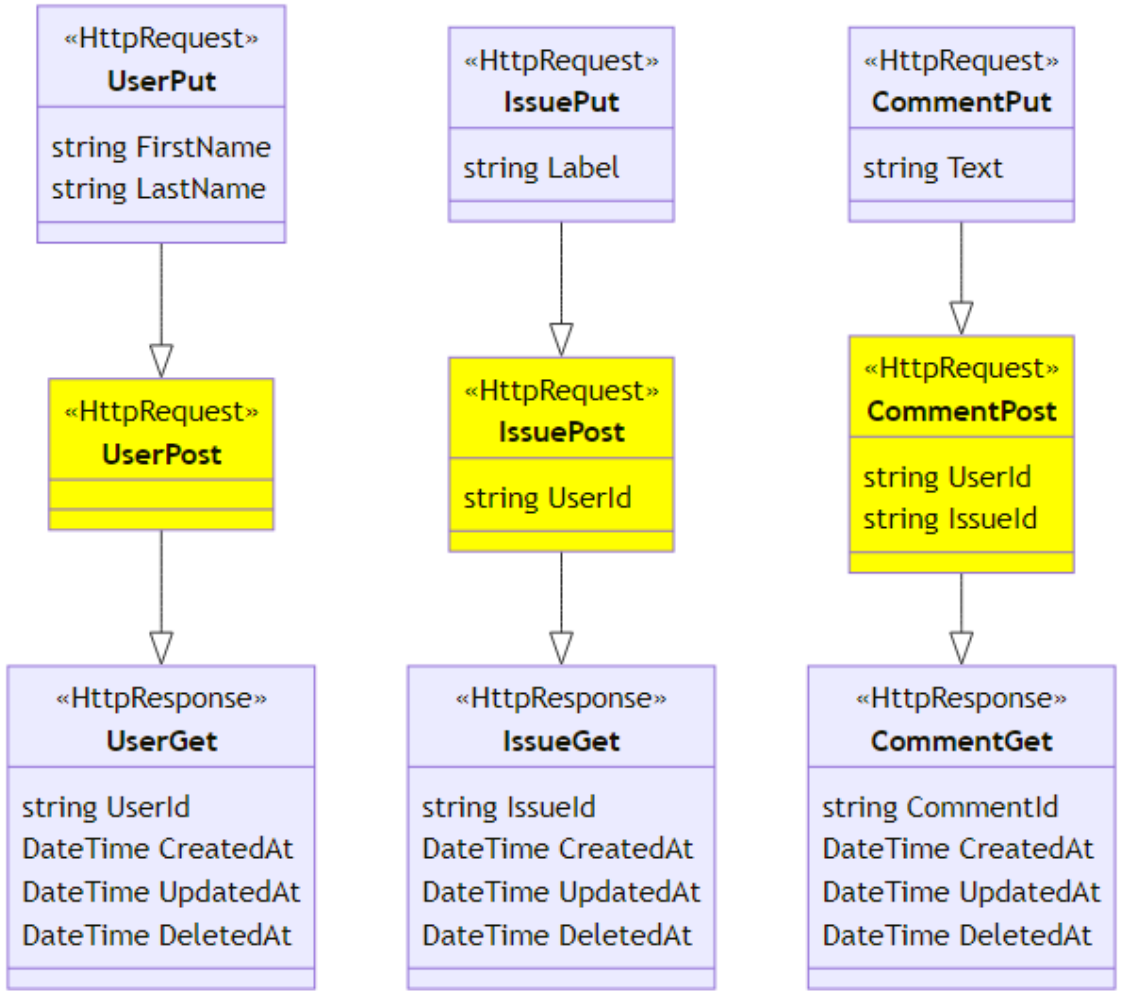


`Post` messages

The `Post` messages derive from the `Put` messages and add the fields that you can **set initially only**.

For `Issue` entities you must define the identifier of the **user** who created the issue.

For `Comment` entities you must define the identifier of the **user** as well as the containing **issue**.

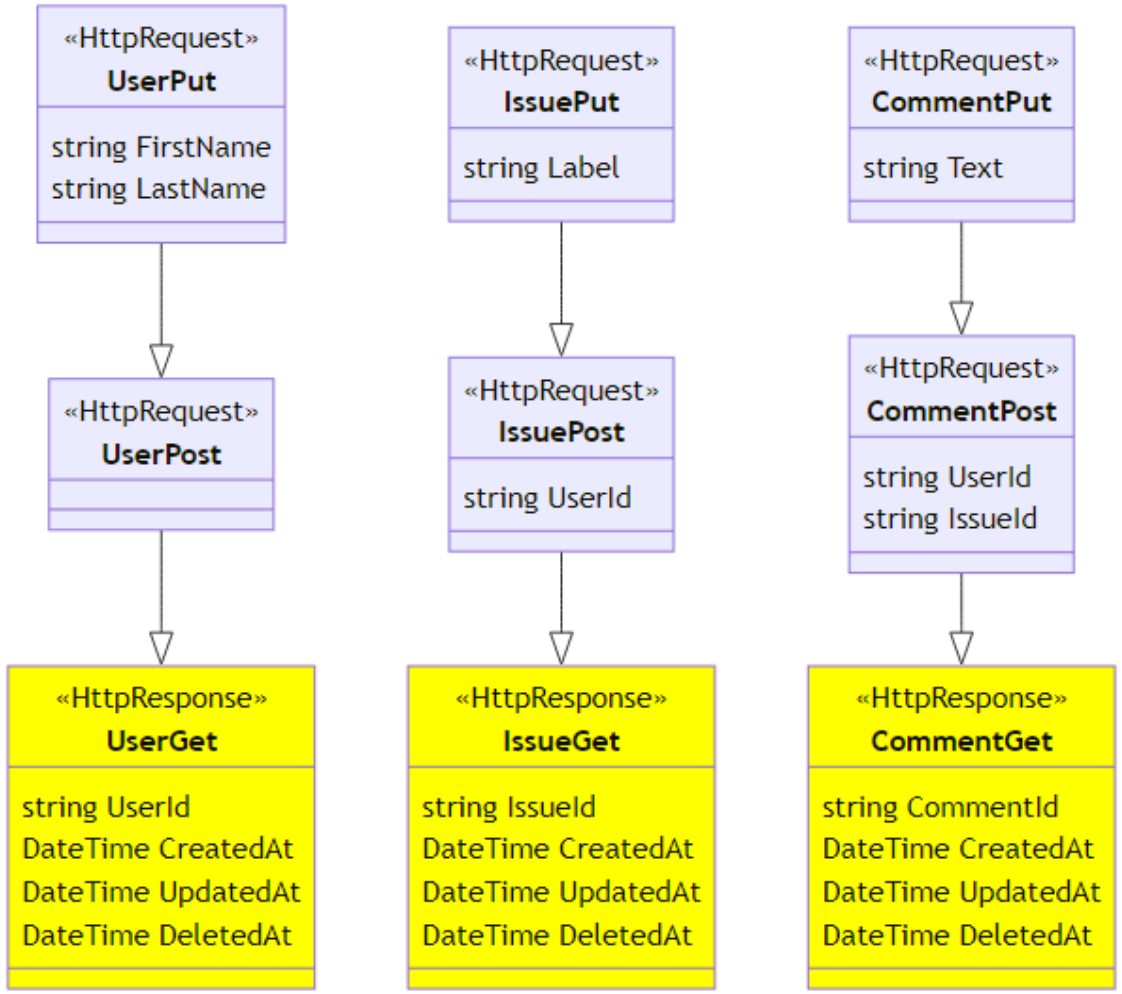


`Get` messages

Finally, the `Get` messages derive from the `Post` messages and add the fields that are **read-only**.

For all entities the read-only fields include the **unique entity identifier** selected randomly on creation.

Furthermore, the read-only fields include **create, update, and delete timestamps** managed automatically.



Interfaces

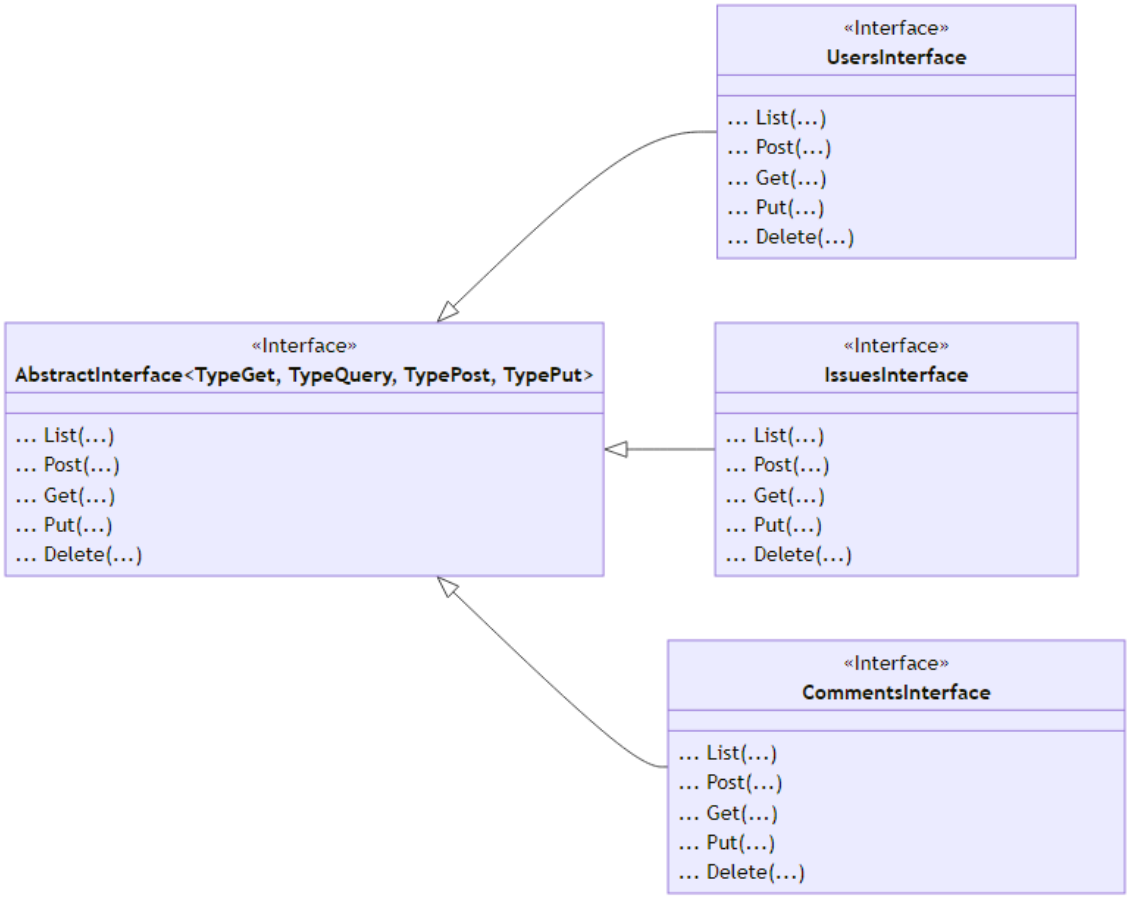
Methods *provided by* backend and *required by* frontends

Interface overview

Based on the message data structures we **define the methods** of the REST API.

We use a **generic interface** model including `List`, `Post`, `Get`, `Put`, and `Delete` methods.

In the following, we explain each method **in more detail** including its inputs and outputs.

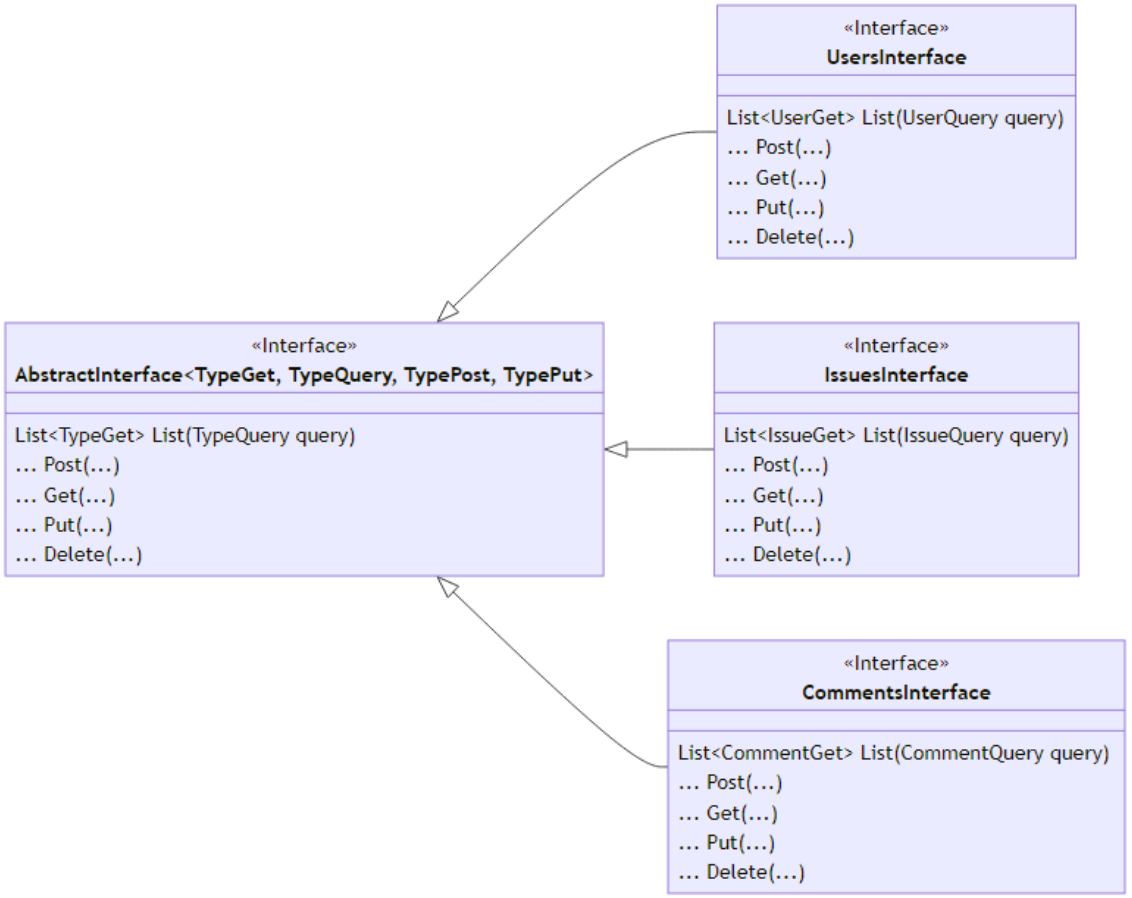


The `List` method

The `List` method returns a **collection** of created (and *not* deleted) instances.

Note that in our case the method **does not require** any input parameters.

*Usually the input parameters are used for **filtering and paging** the instances on demand.*

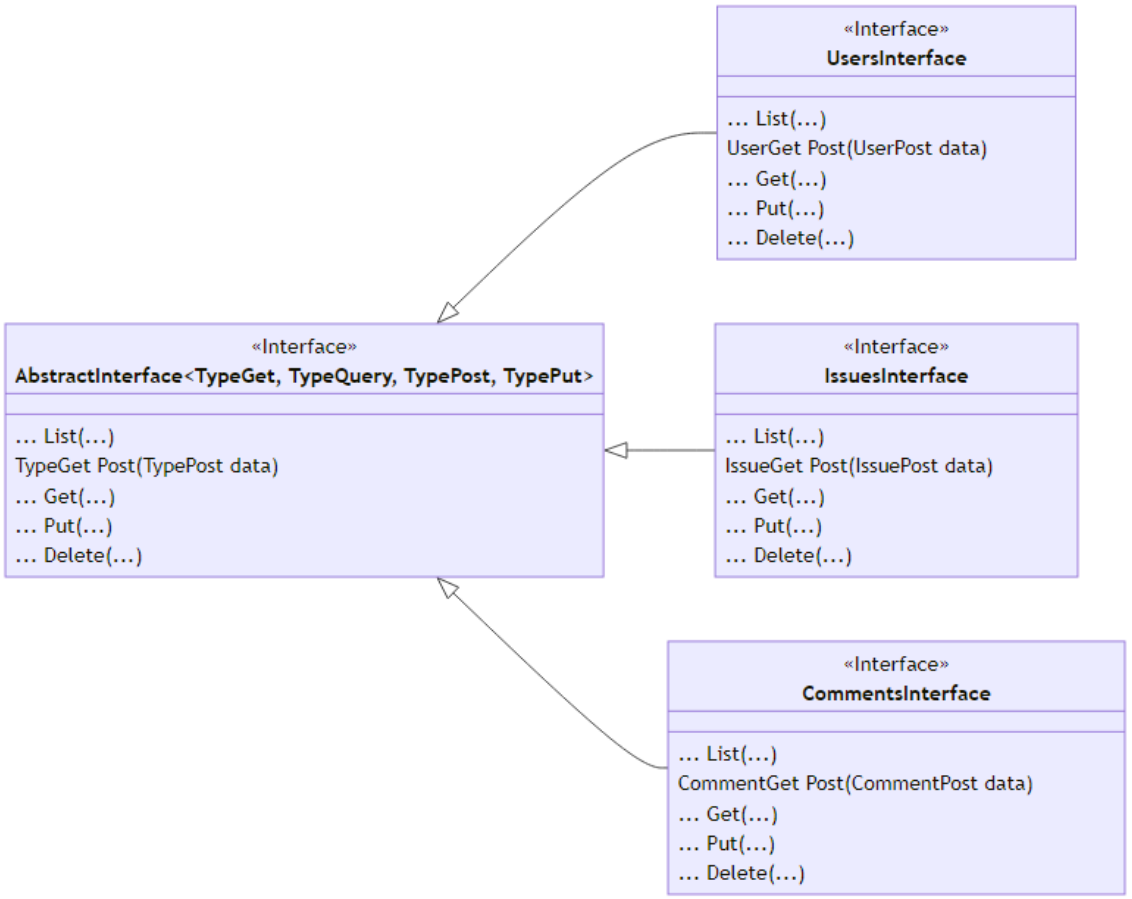


The `Post` method

The `Post` method **creates and returns** new instances of a given entity type.

The **input parameters** use the corresponding `Post` message defined previously.

The **return type** corresponds to the respective `Get` message from before.

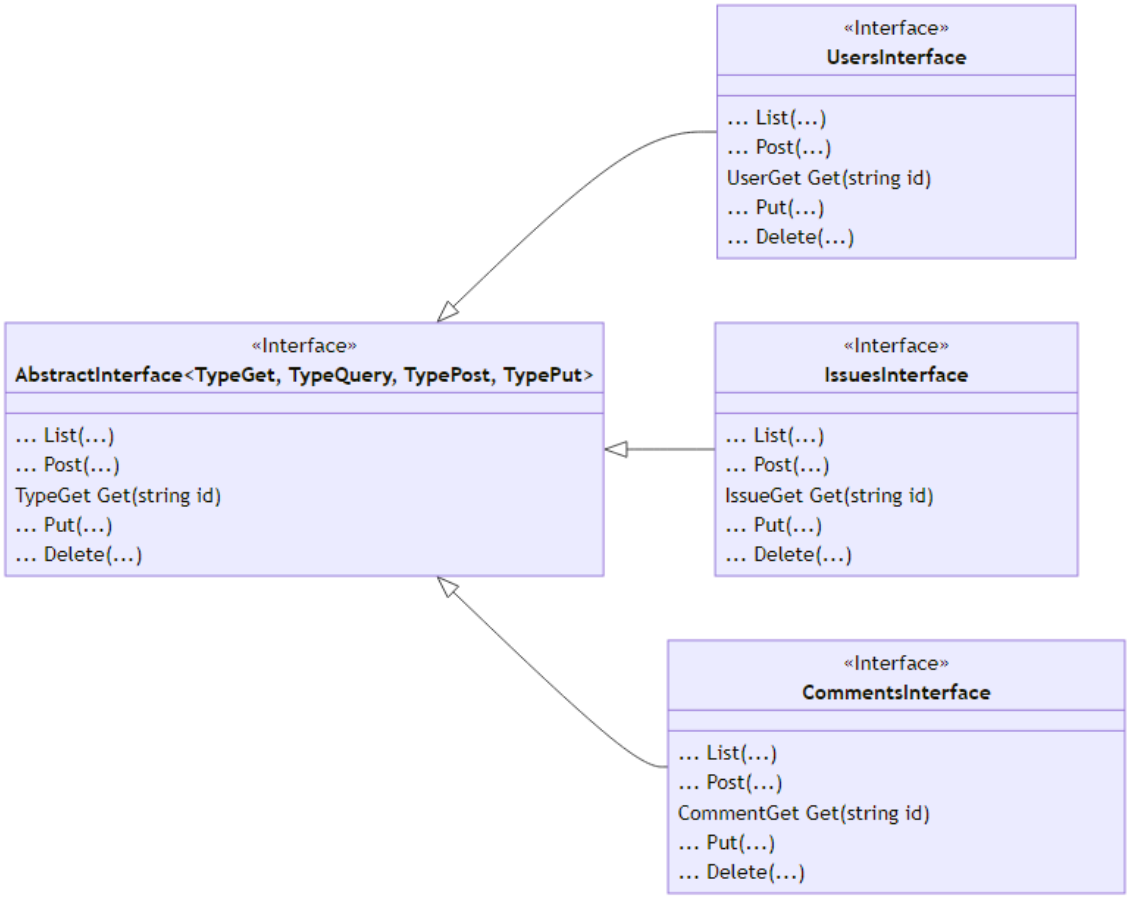


The `Get` method

The `Get` method **returns** an existing instance with a given identifier.

The **single input parameter** represents the identifier of the desired instance.

The **return type** corresponds to the respective `Get` message from before.

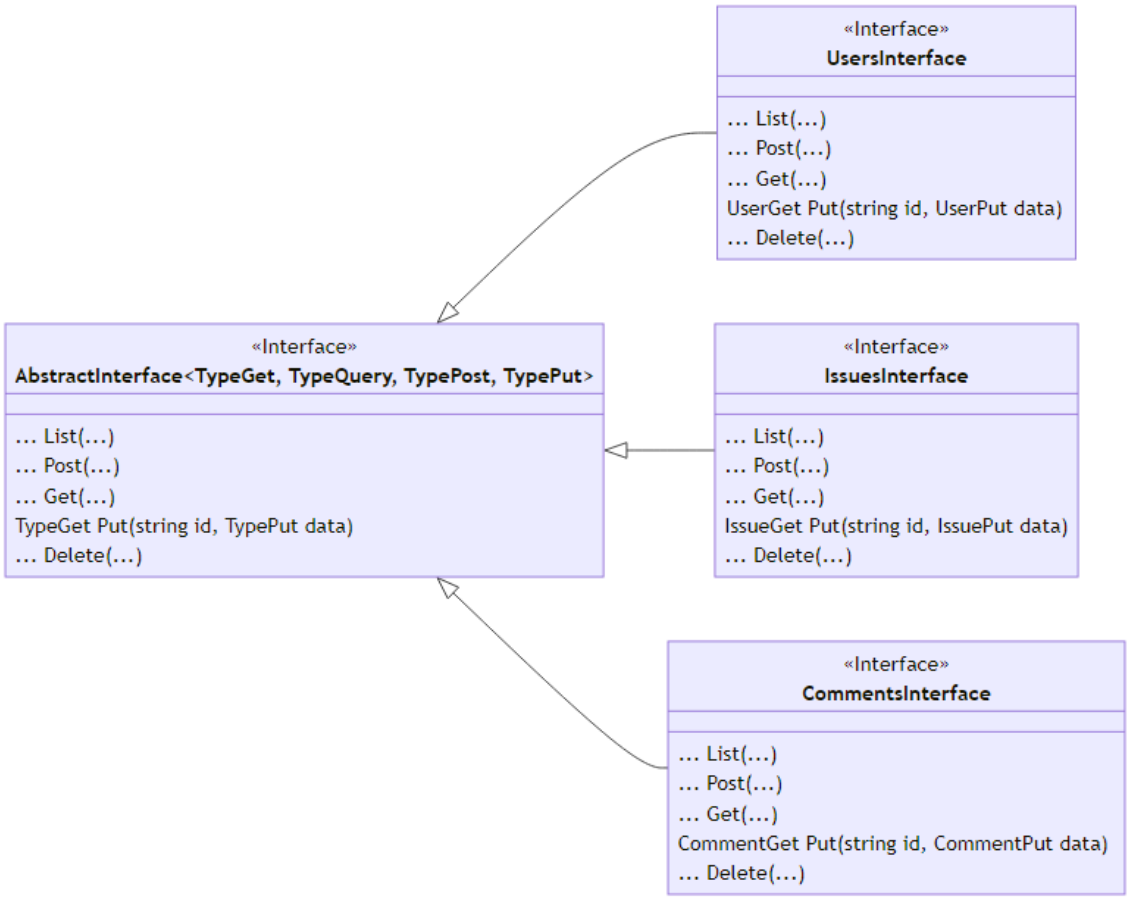


The `Put` method

The `Put` method **overrides and returns** an existing instance with a given identifier.

The **two input parameters** are the identifier of the instance and the respective `Put` message.

The **return type** corresponds to the respective `Get` type as introduced before.

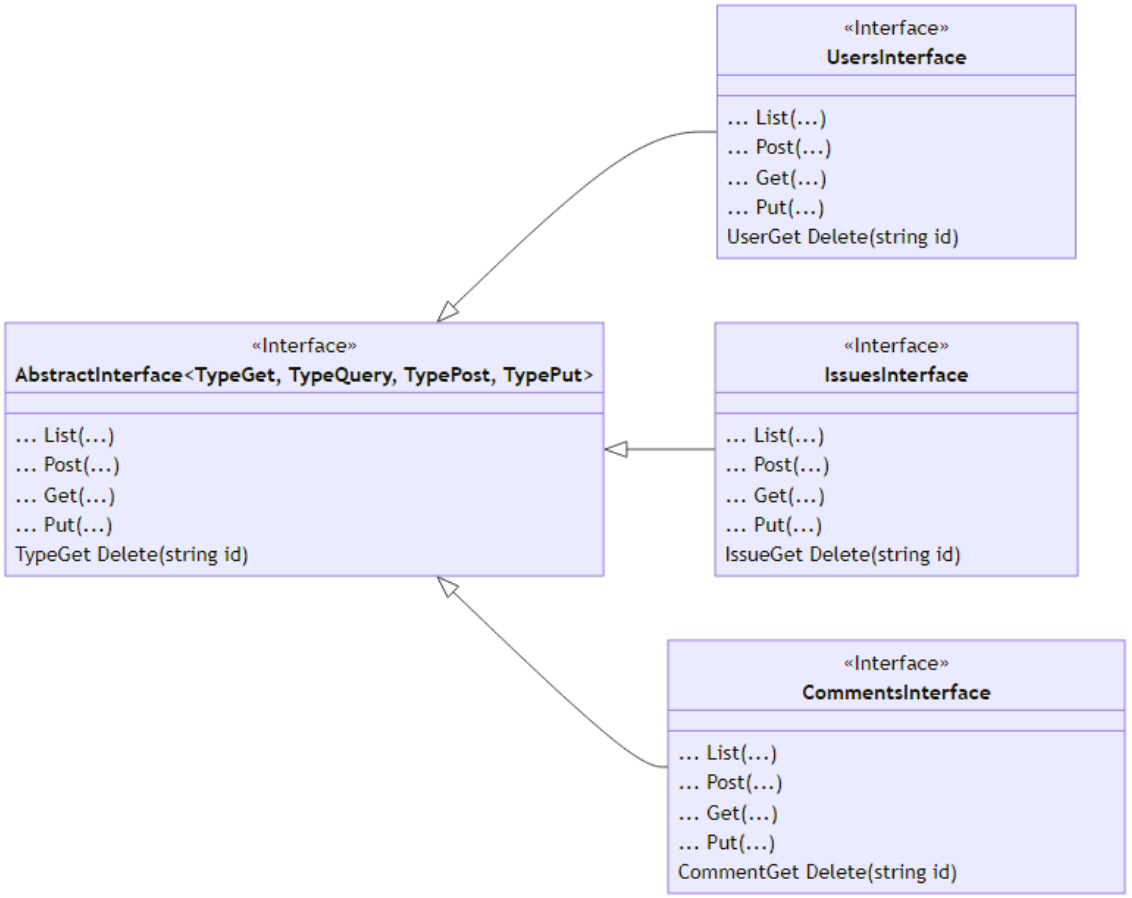


The `Delete` method

Finally, the `Delete` method **deletes and returns** an existing instance with a given identifier.

Note that deleting an instance **does not remove** the dataset from the database.

Instead, the `DeletedAt` timestamp of the instance is **set to the current timestamp**.



Exceptions

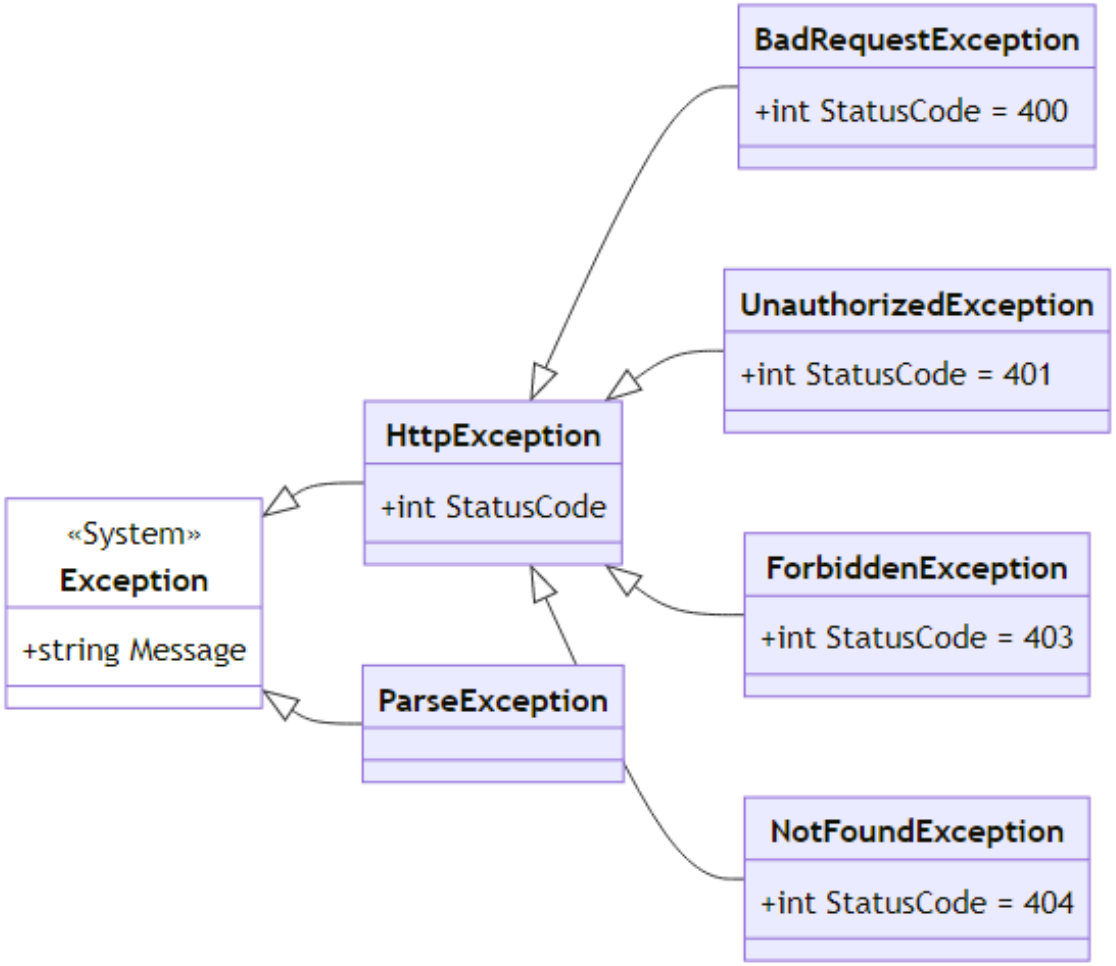
Potential problems during method execution

Exception overview

Under some circumstances, the interface methods **cannot** execute successfully.

If such circumstances occur, the methods **throw** one of the exceptions shown on the right side.

In the sample application we distinguish two exception types: **HTTP** and **parse exceptions**.

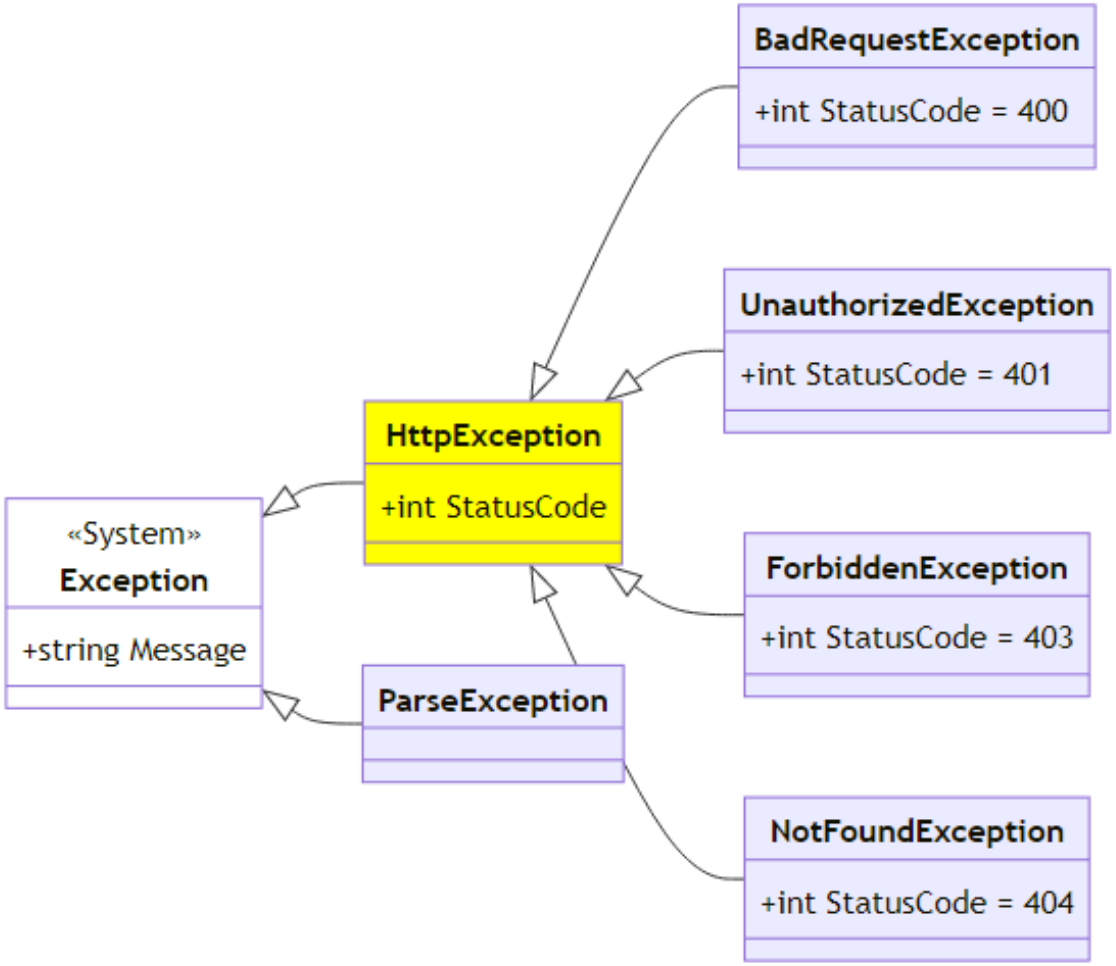


HTTP exceptions

HTTP exceptions indicate that the method **could not** be executed successfully.

There are different reasons why **method execution** might not have been successful.

In the HTTP protocol and HTTP REST APIs, the reasons are **differentiated** by means of *status codes*.

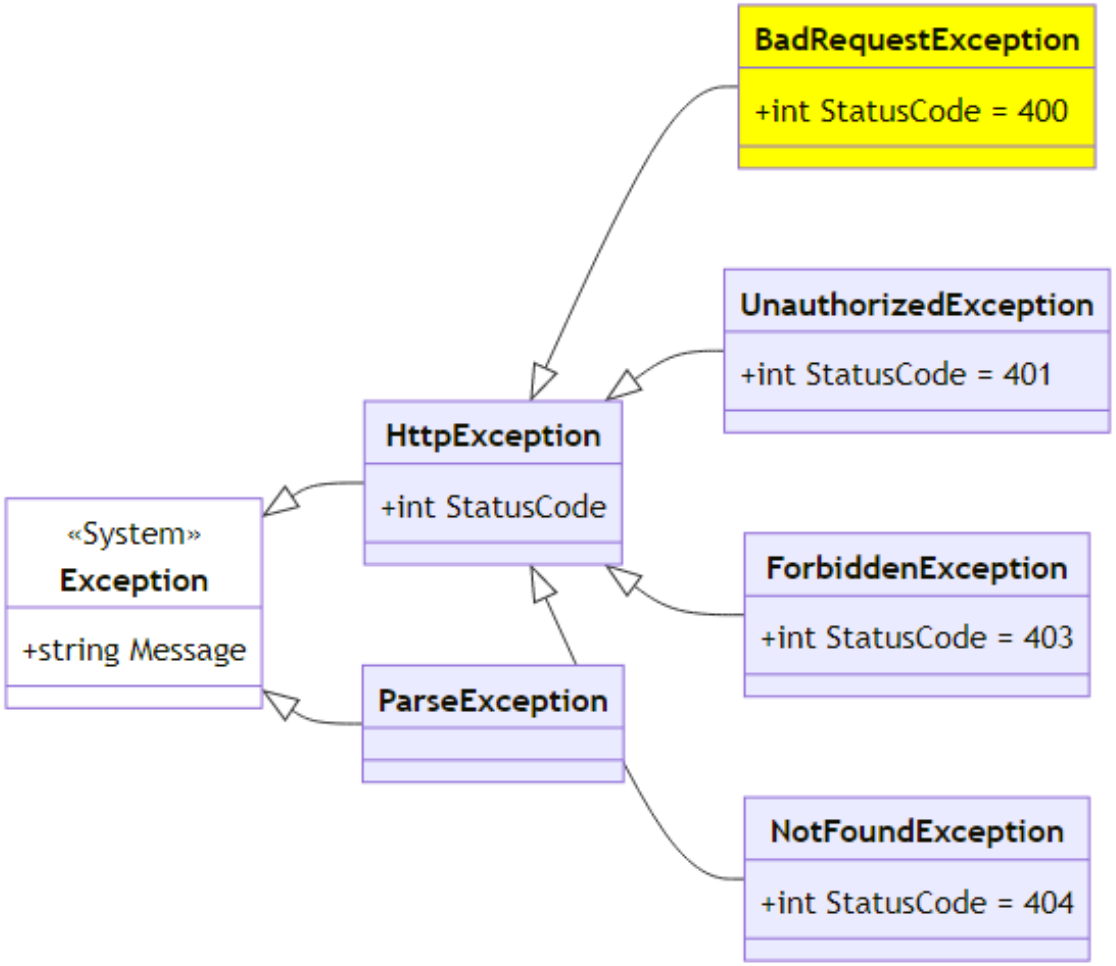


Bad request exceptions

The first possible reason is called **bad request** and comes with a status code of `400`.

Bad request exceptions indicate an **issue** with the **HTTP request message** sent to the backend.

For example, the request message might **miss mandatory parameters** for method execution.

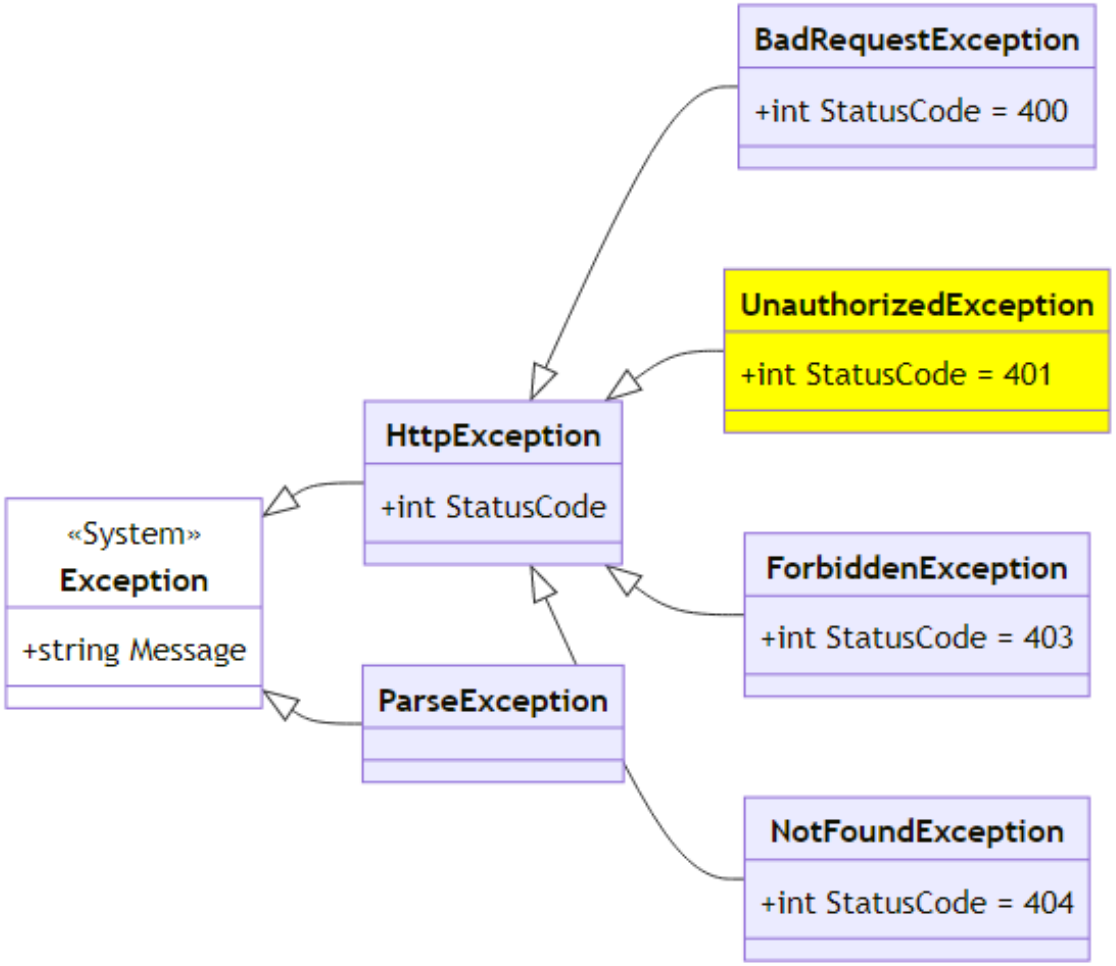


Unauthorized exceptions

The second possible reason is that the caller **has not provided** authorization information.

Typically, backend methods can only be executed by users, which have **registered and signed in**.

If an adequate authorization proof is missing, the backend will answer with **unauthorized status** `401`.

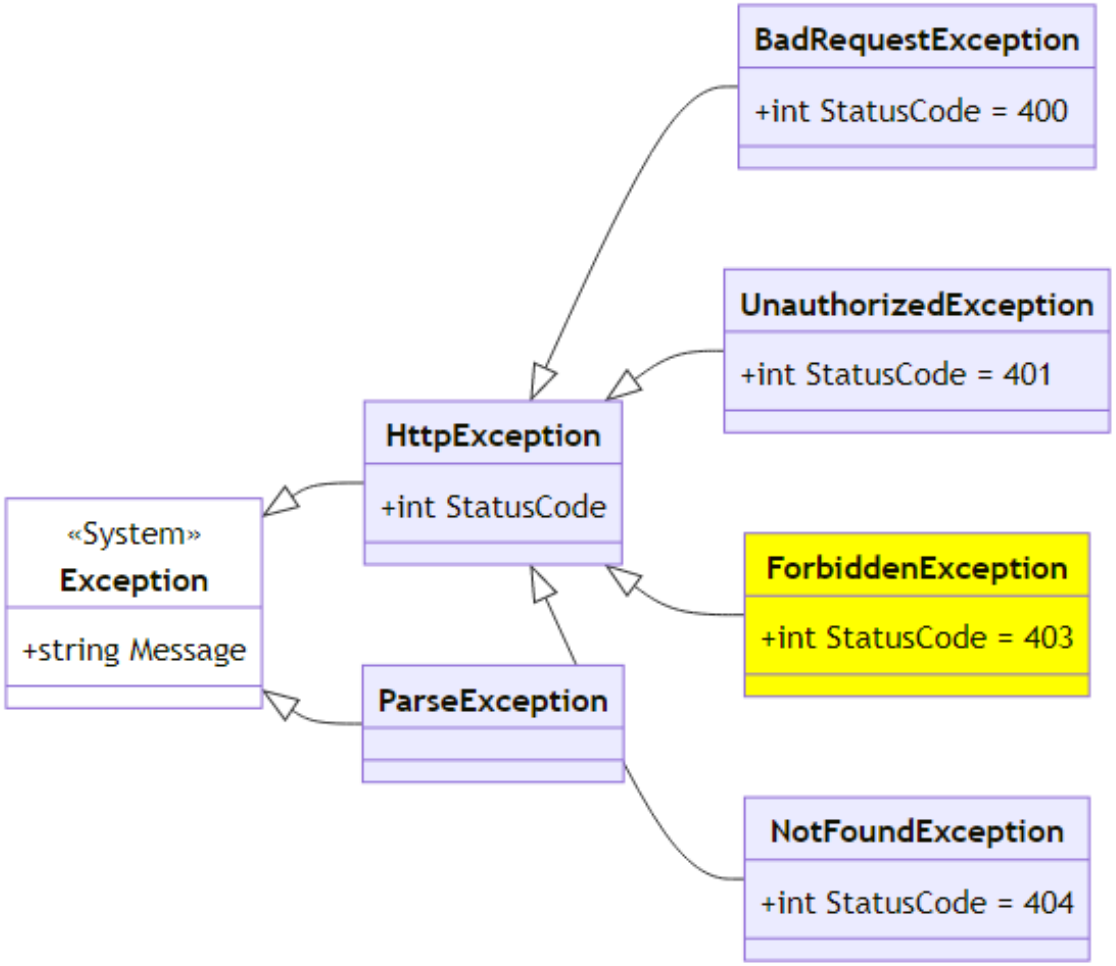


Forbidden exceptions

The third possible reason is that the caller has authorized, but does not have the **necessary permissions**.

For example, a registered and signed in user **should not be allowed** to change other user profiles.

If such request is received by the backend, it will answer with the **forbidden status** `403`.

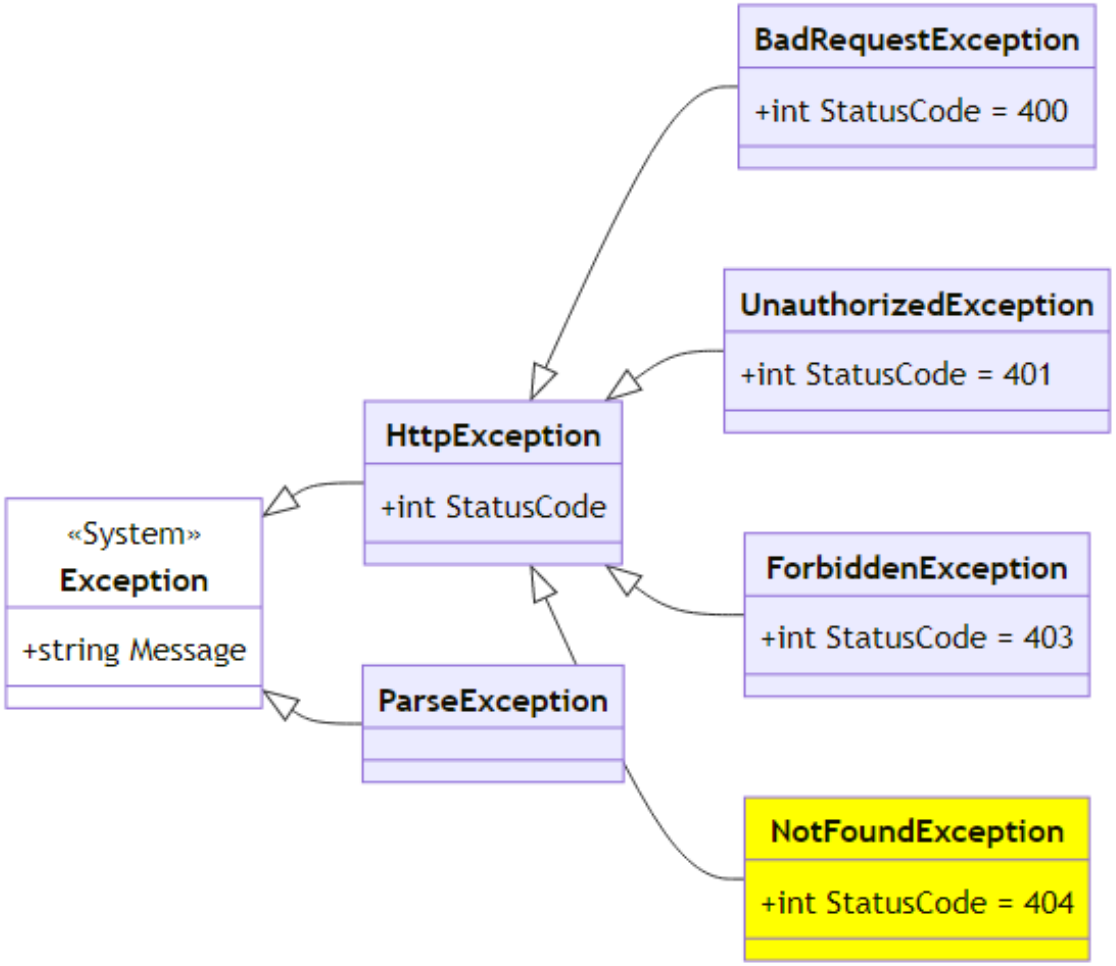


Not found exceptions

The fourth possible reason is that the user tries to **access an entity** which does not exist.

For example, the user might want to update an entity which has been **deleted in the meantime**.

In such cases the backend will respond with the **not found status code** `404`.

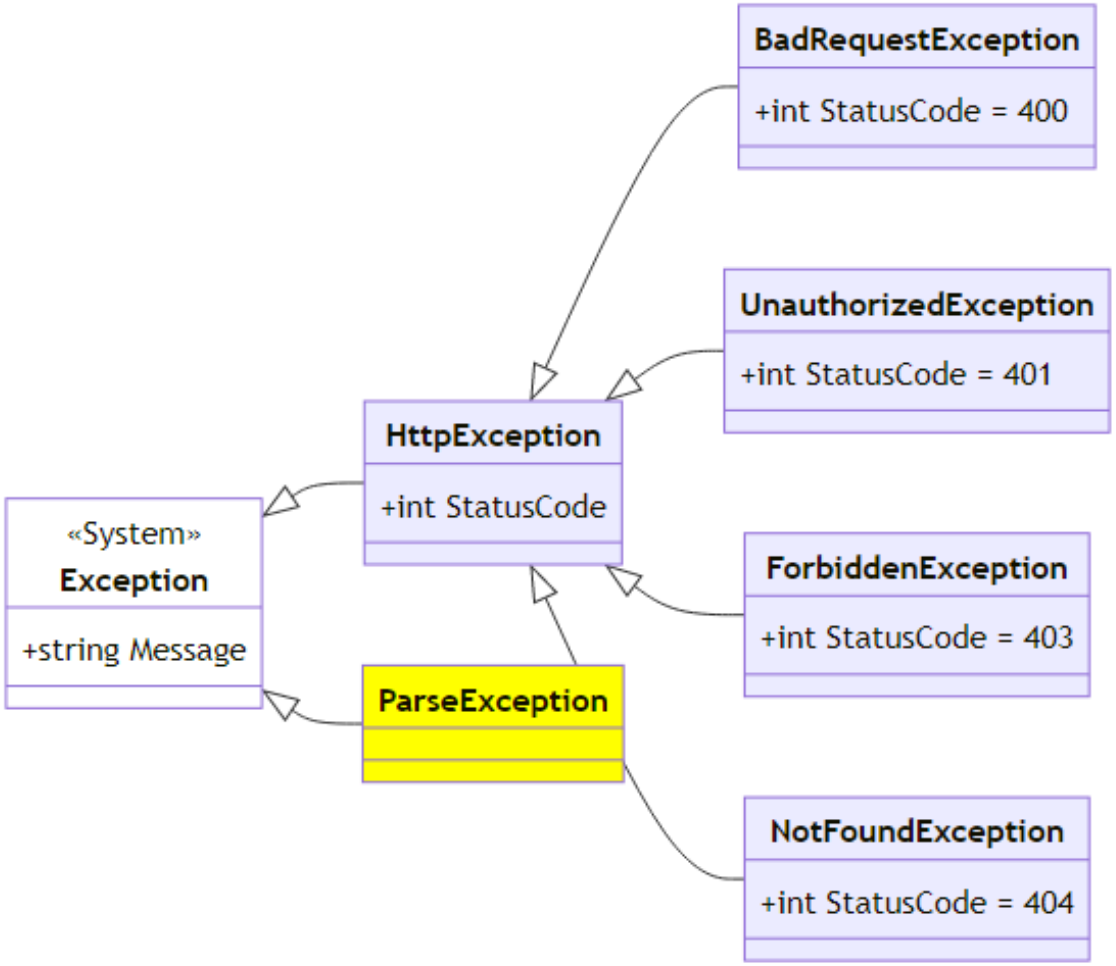


Parse exceptions

Even if none of the previous exceptions occur, **another kind** of problem might arise.

In the sample application all interface methods are **expected to consume and produce** JSON encoded data.

If the JSON parser **fails to decode** a message, a parse exception will be thrown.



Section 3 - The `CustomApi` component

Swagger UI and **controllers**

Swagger UI

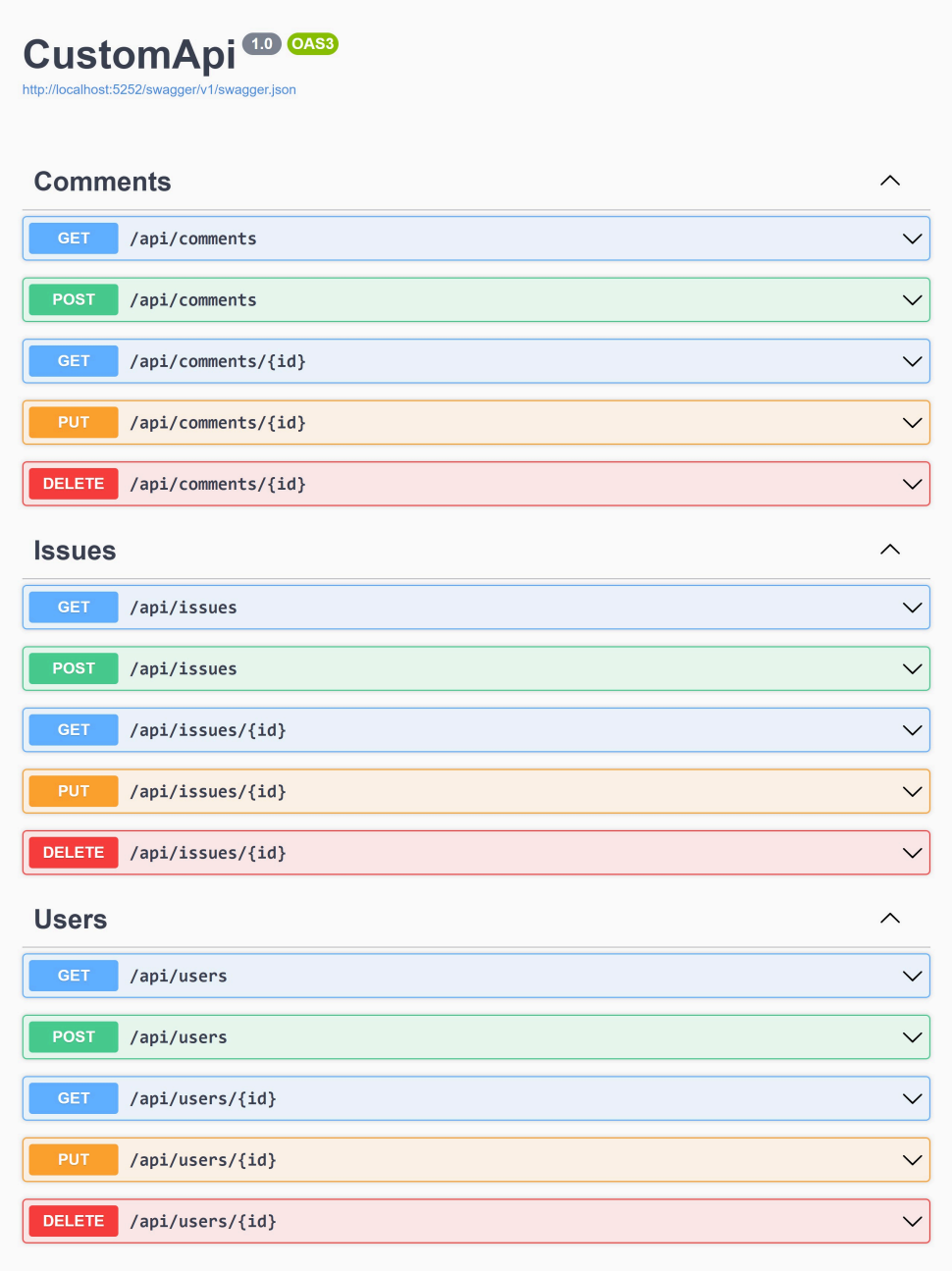
Coming soon

Swagger UI overview

The data itself is managed by an **ASP.NET backend** service with standard REST API.

The screenshot on the right provides an **overview** of the API services exposed.

For each **resource** (i.e. user, issue, comment), the same set of functions is defined.



Controllers

Coming soon

Controller overview

Coming soon

Section 4 - The `CustomSdk` component

Coming soon

Software development kit (SDK)

Coming soon

Section 5 - The `CustomCli` component

Coming soon

Command line interface (CLI)

Coming soon

Section 6 - The `CustomApp` component

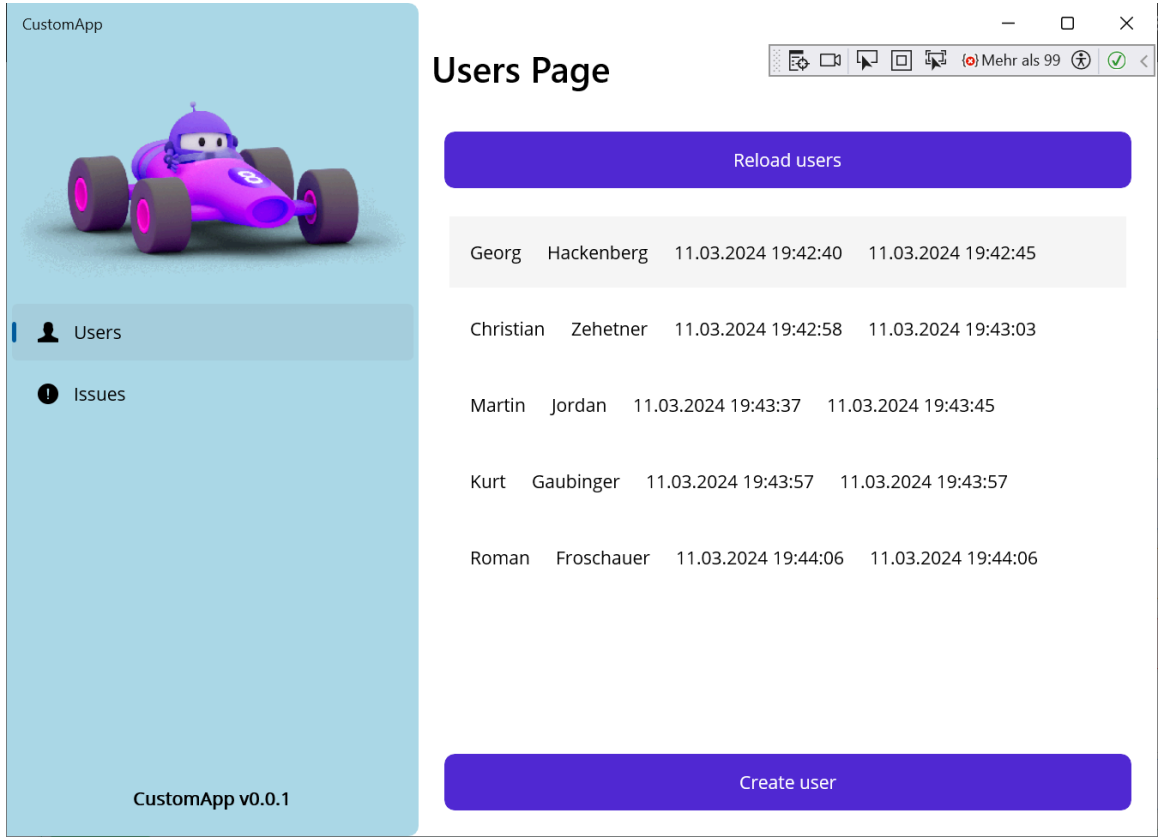
MAUI.NET frontend, **view models**, and **pages**

MAUI.NET frontend

The C# MAUI.NET / ASP.NET Sample Application features a **basic** graphical user interface (GUI).

With the GUI you can manage the **users** and the **issues** stored in the underlying database.

The screenshot on the right shows the **users page** listing all created user entities.

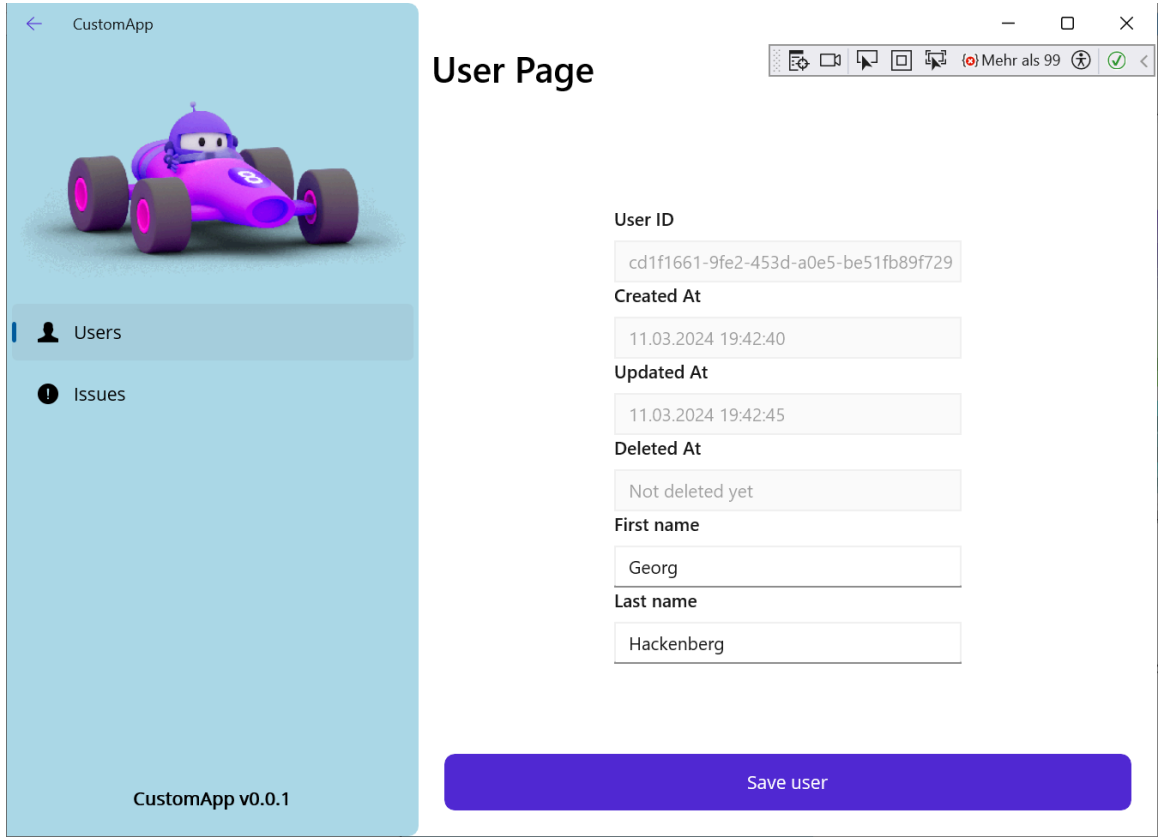


MAUI.NET frontend (cont'd)

When clicking an existing user or creating a new user, you enter the **user detail** page.

The user detail page shows all the **data associated** with a user entity in the database.

You can change the **first and last name**, the other fields are set automatically.

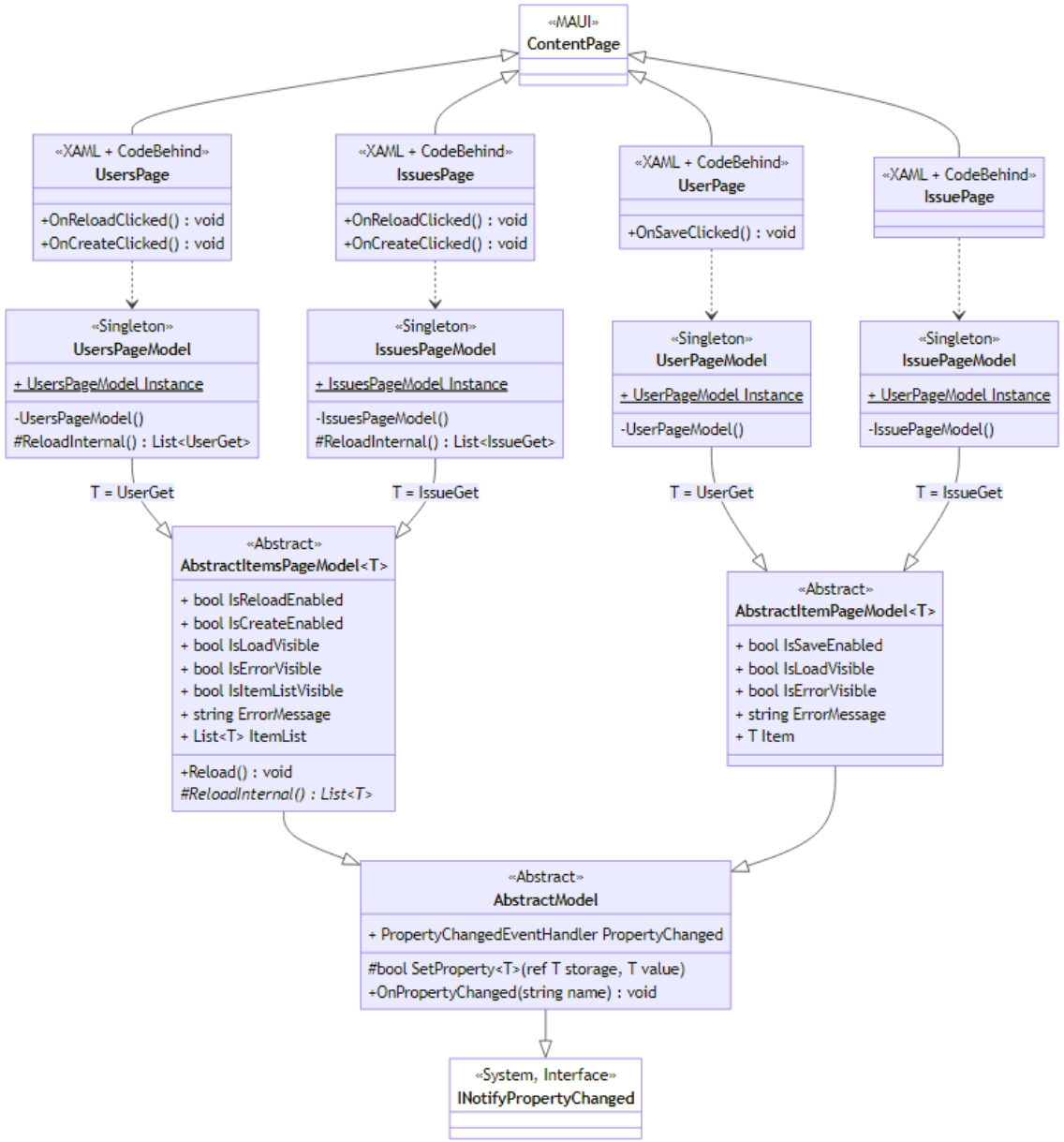


View models

Coming soon

View model overview

Coming soon



Pages

Coming soon

Page overview

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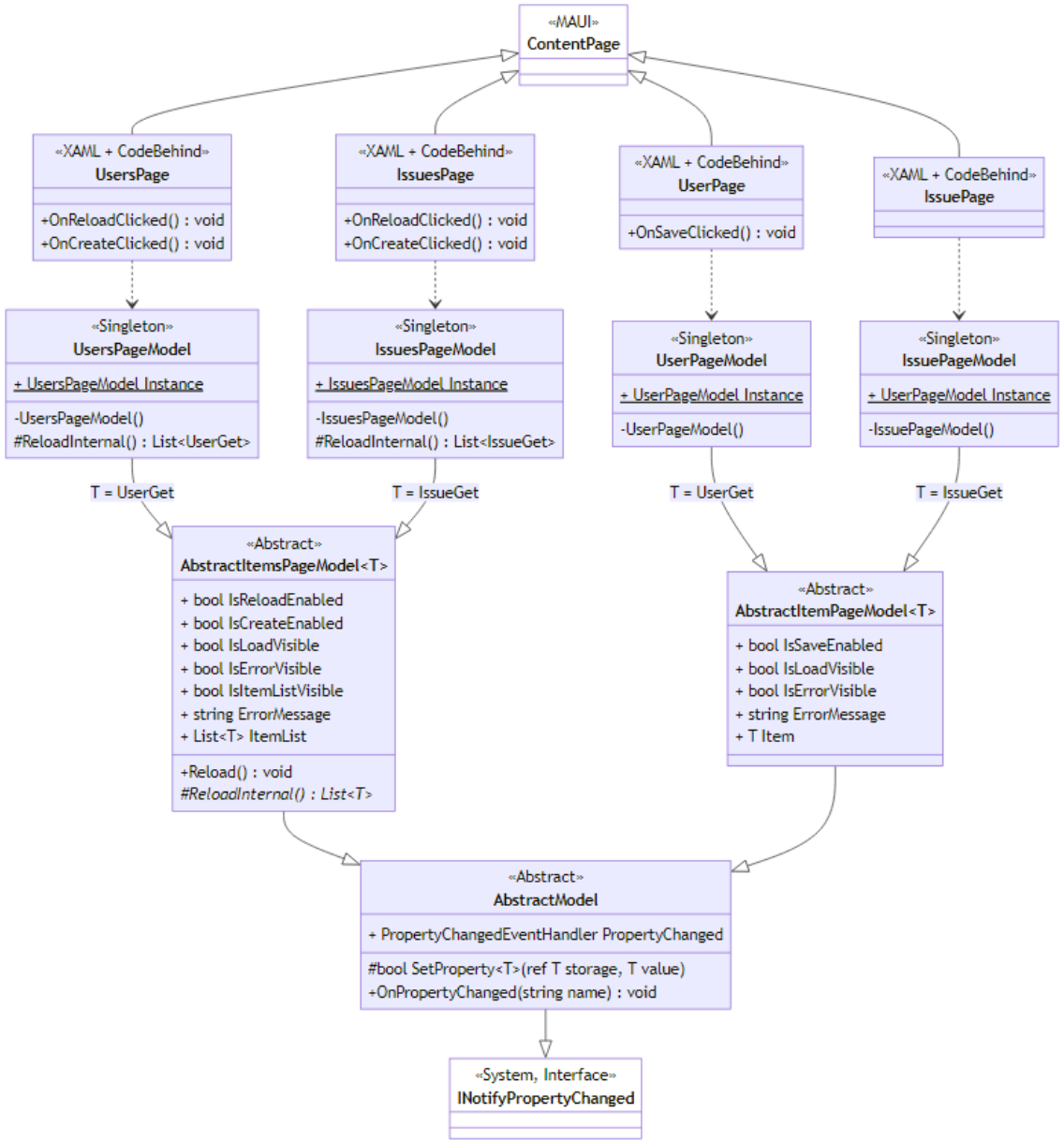

Section 7 - The follow-up resources

Coming soon

Follow-up resource overview

Coming soon

You are ready to code 👩‍💻

Well done!