

# Advanced Foreign Services System Design

## Design Scope

- The design will only cover the process of an applicant applying for a visa, and an AFS agent reviewing this visa and either rejecting it or sending the application to the embassy to be processed.
- This scope was chosen as it provides the core functionality of the system, as applying for a visa and this visa being reviewed is the main purpose of AFS.
- The roles involved in this scope are:
  - Authorized Visa Applicant
  - AFS Agent.
- The domain for the design includes:
  - User Stories 5-10, 14-15
  - Use Cases 5 and 9

## Data Design

### Mapping to data store

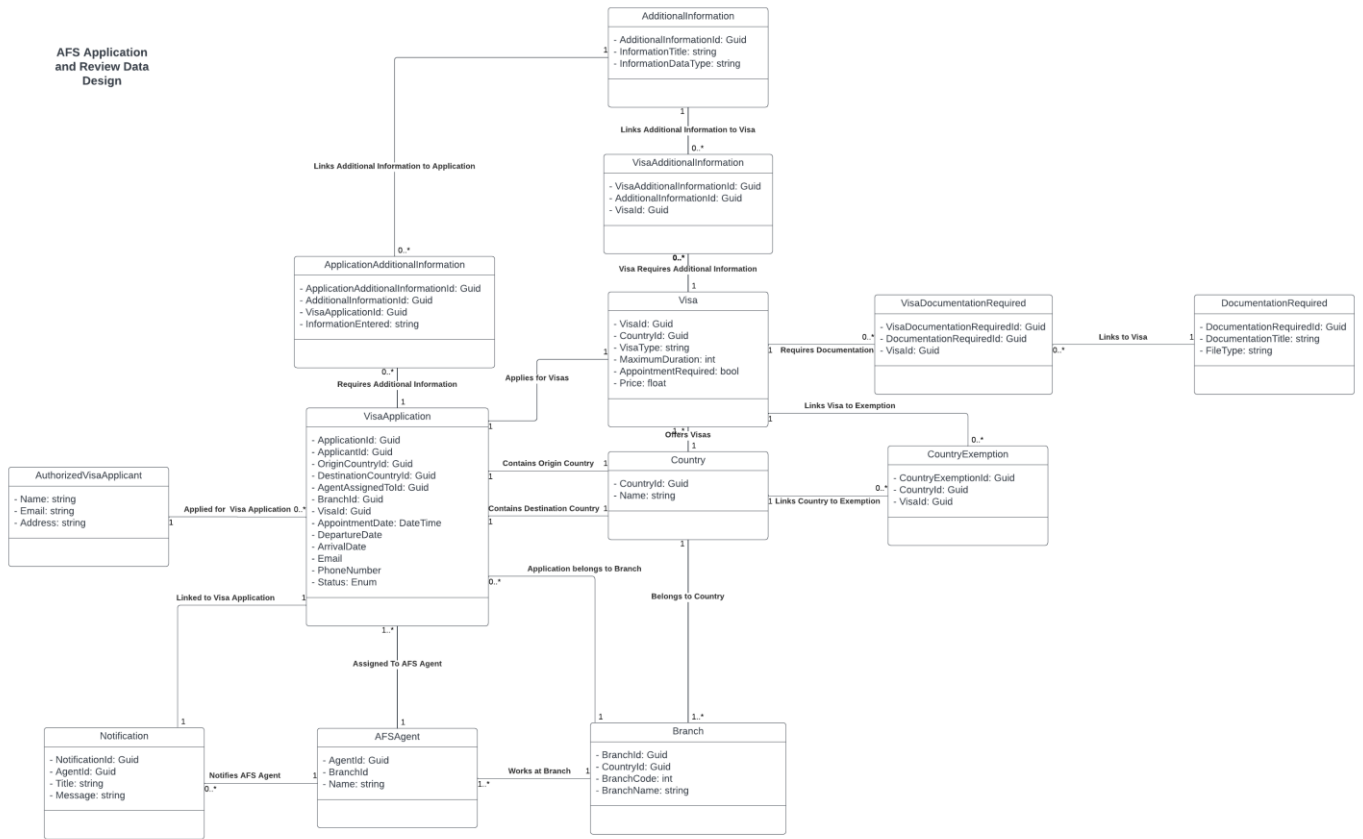
To map the data to our database, I will be implementing the data mapper design pattern, in which there will be a mapper layer between each object and the database, decoupling these elements. To implement this, I will use Entity Framework, an Object Relational Mapper. This will translate the objects in my backend into relational data to be stored by the database. This pattern will invalidate the need for an ERD, as entity framework will handle the conversion of objects to relational data, so the data model will be a class diagram, outlining the objects to be converted by Entity Framework. When creating the database, the class diagram can be used, as classes will map directly to the database entities. The documentation for each application is not included in the data design as this will be uploaded to a separate, unstructured database.

### Integration with other applications

This application will not directly interact with data from other applications. Whilst our system requires up-to-date visa information from each country, this information will be manually entered into the system by visa administrators.

# Data Design Diagram

[Link to Data Design Diagram](#)



## Security

As a service-oriented architecture is being implemented. It is vital that all endpoints are protected, and only those with the correct role may make a request to an endpoint.

Permission ID	Method	REST Endpoint	Roles Permitted	Description
P-001	Apply for Visa	POST/apply-for-visa	Authorized Visa Applicant	Begins the visa application process
P-002	Review Visa Application	POST/review-visa-application	AFS Agent	Begins the application review process

P-003	Get Visas by home and destination country	GET/visa/{home-country-id, destination-country-id}	Authorized Visa Applicant	Returns the visas offered to applicants from the home country to the destination country
P-004	Get available appointments	GET/appointment/{home-country-id, destination-country-id}	Authorized Visa Applicant	Returns a list of available appointment dates at their closest branch
P-005	Create Application	POST/application	Authorized Visa Applicant	Creates a new visa application
P-006	Create notification for AFS agent	POST/notification/{agent-id}	Authorized Visa Applicant	Sends a notification to an AFS agent, alerting them to the new application.
P-007	Get applications assigned to agent	GET/application/{agent-id}	AFS Agent	Gets visa applications assigned to a particular AFS Agent
P-008	Get visa by application	GET/visa/{application-id}	AFS Agent	Gets the visa the application is applying for, allowing the agent to review the rules
P-009	Update application status	PUT/application/{application-id}/status	AFS Agent	Updates the status of the application based on the outcome of the review
P-010	Send email with results to applicant	POST/email/{applicant-id}/results	AFS Agent	Sends an email to the applicant with the results of their application.

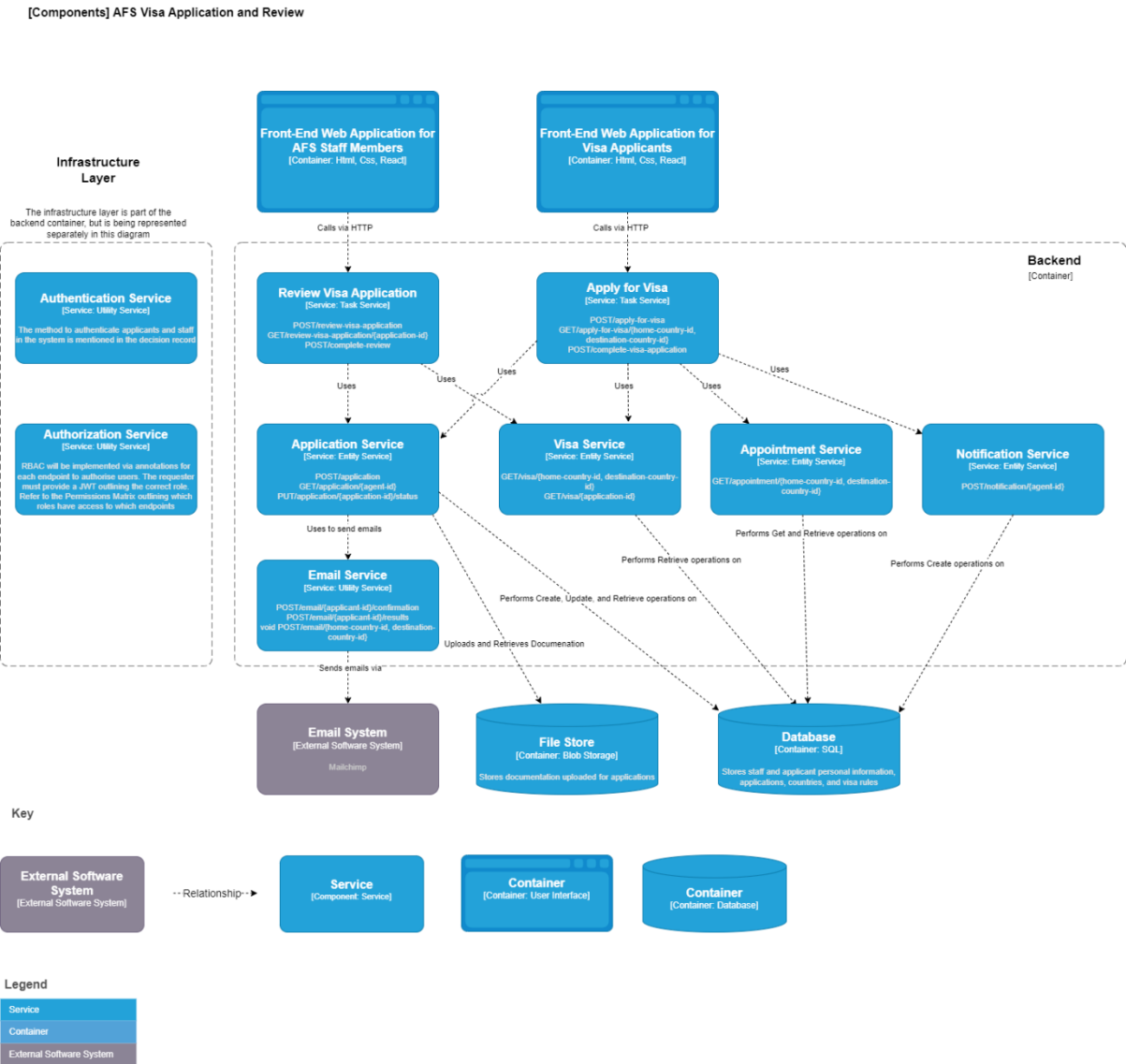
## Components

I will be using the C4 notation for the component diagrams as this is consistent with the rest of my C4 diagrams. UML will be used for the sequence diagrams as UML is a commonly used and well-understood modelling language.

As my system will be implementing the REST and Service Orientation architecture styles, I will be using Thomas Erl's book on Service-Oriented Architecture (Erl, 2016), chapters 6-9, as a reference for the services and contracts.

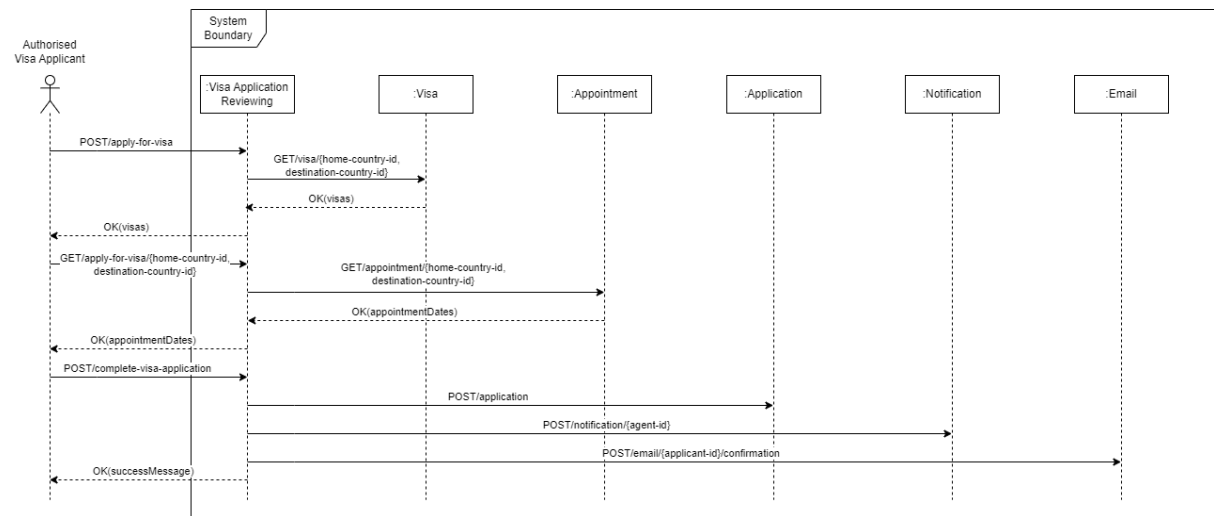
# Component Diagram

[Link to Component Diagram](#)

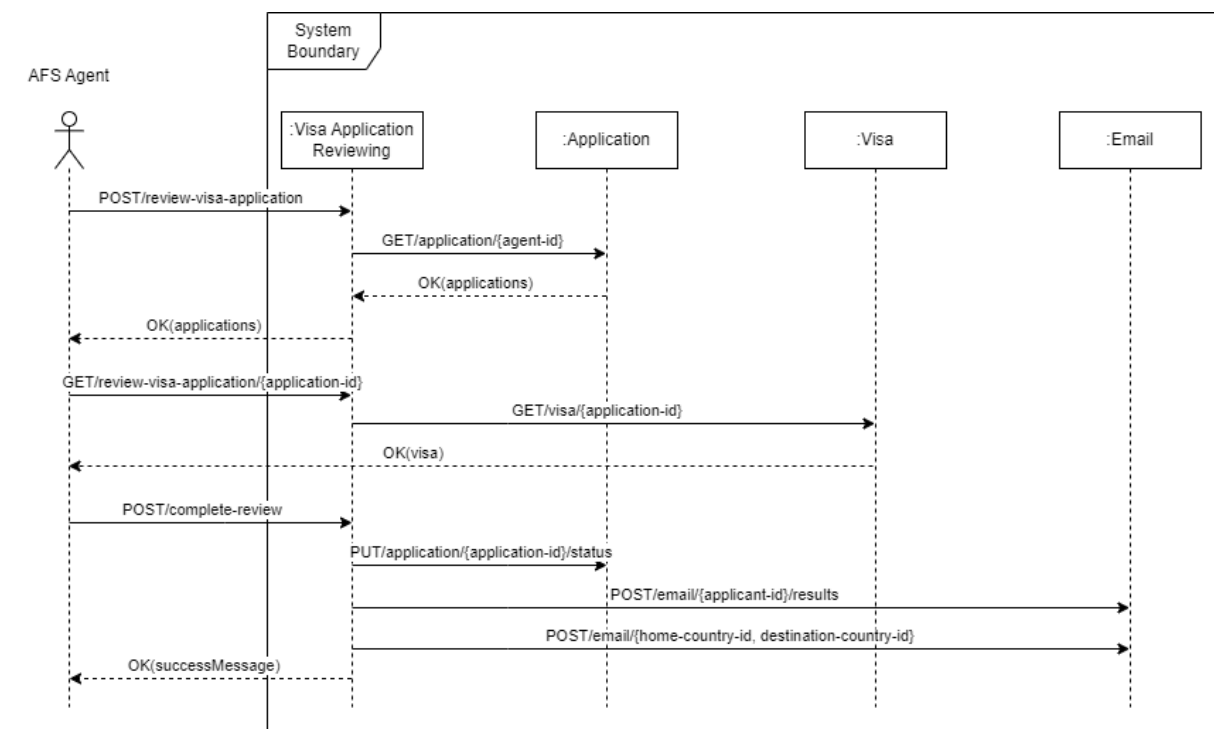


# Sequence Diagrams

## [Link to Applying for Visa Sequence Diagram](#)

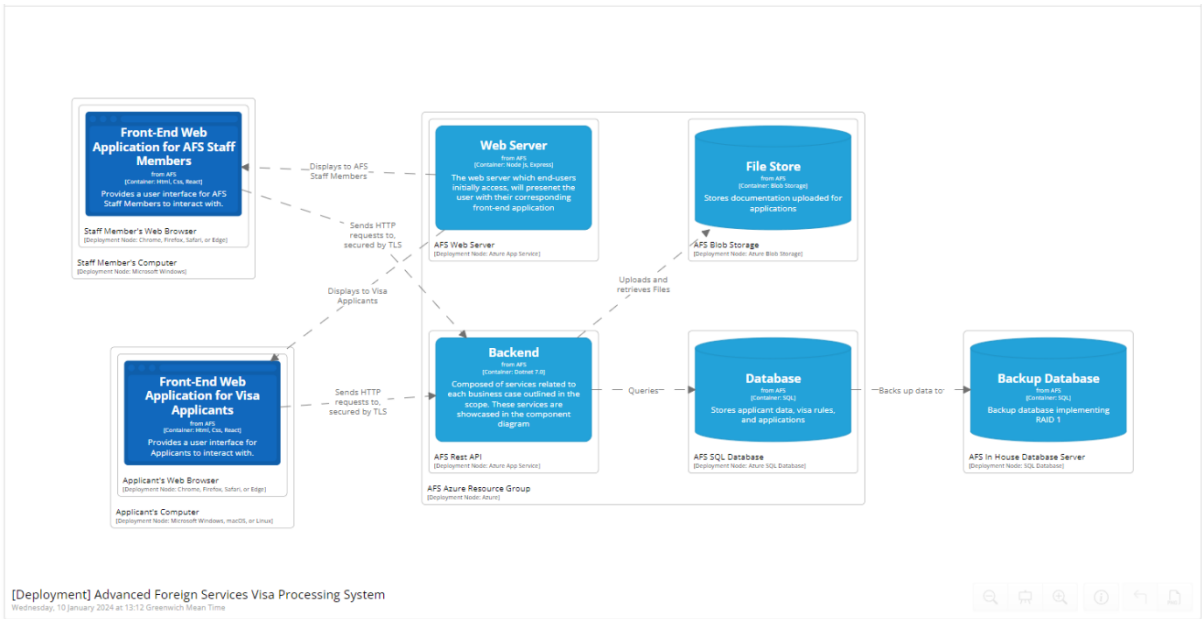


## [Link to Application Reviewing Sequence Diagram](#)



# Deployment

[Link to Deployment Diagram](#)



Key



Legend

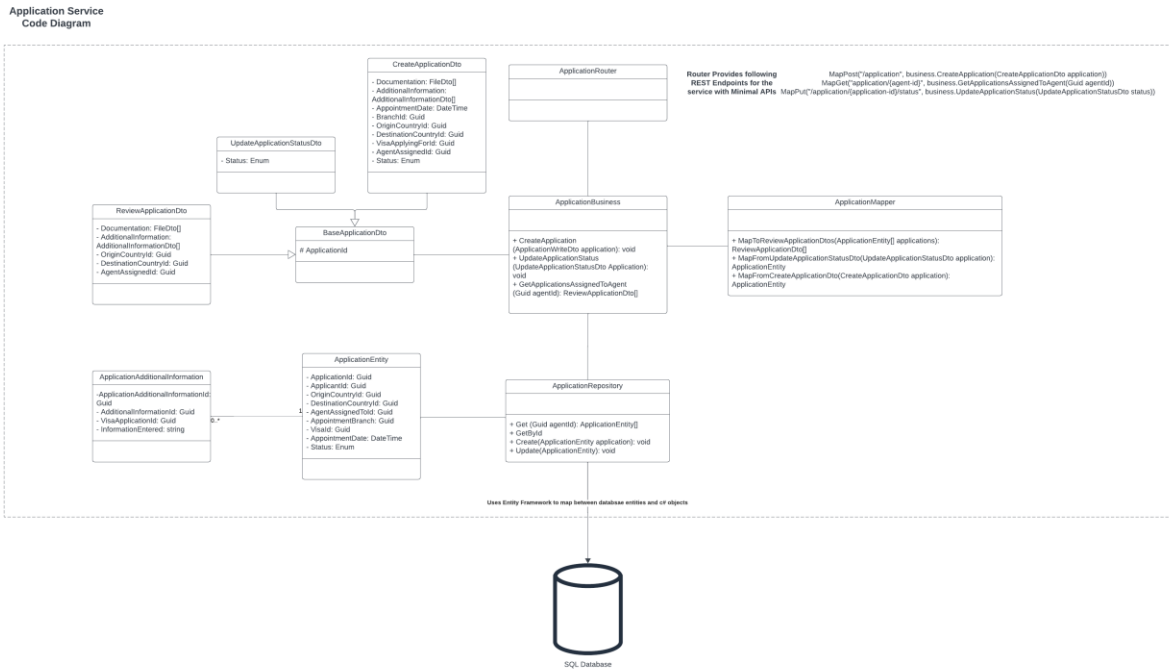


# Code

## Concrete Design

Firstly, a code design needed to be developed for one of the services outlined in the component diagram. This design needed to perform all the functionality specified in the component diagram. During the creation of this design, it was necessary to use design patterns to provide a proven solution to some problems encountered during the code design. The repository design pattern is implemented to separate the data access logic from the business logic, and the DTO pattern is used to reduce the data sent between the api and the frontend.

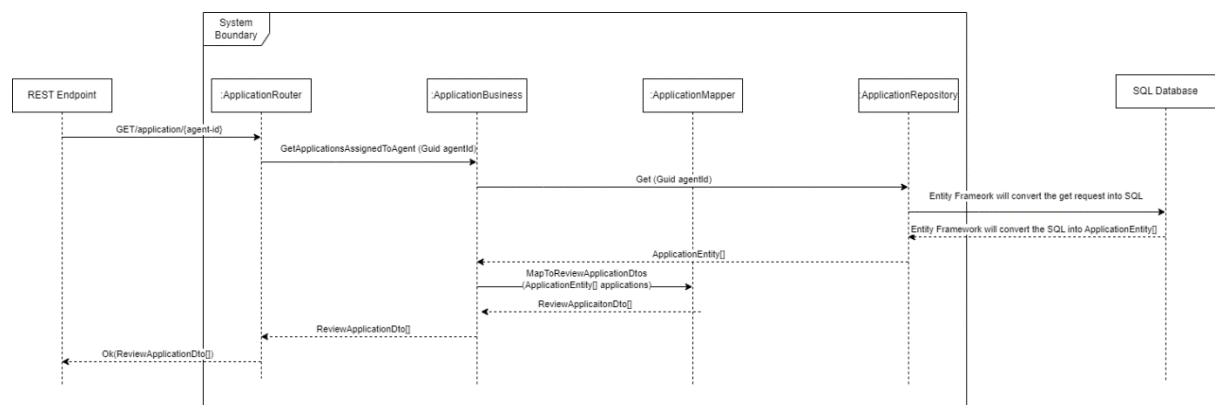
[Link to Concrete Design](#)



## Sequence Diagram

Once a concrete design was developed, it was important to showcase the flow of the code throughout the structure outlined in the class diagram. This was chosen to be showcased in a sequence diagram, as class diagrams and sequence diagrams are compatible.

[Link to Sequence Diagram](#)

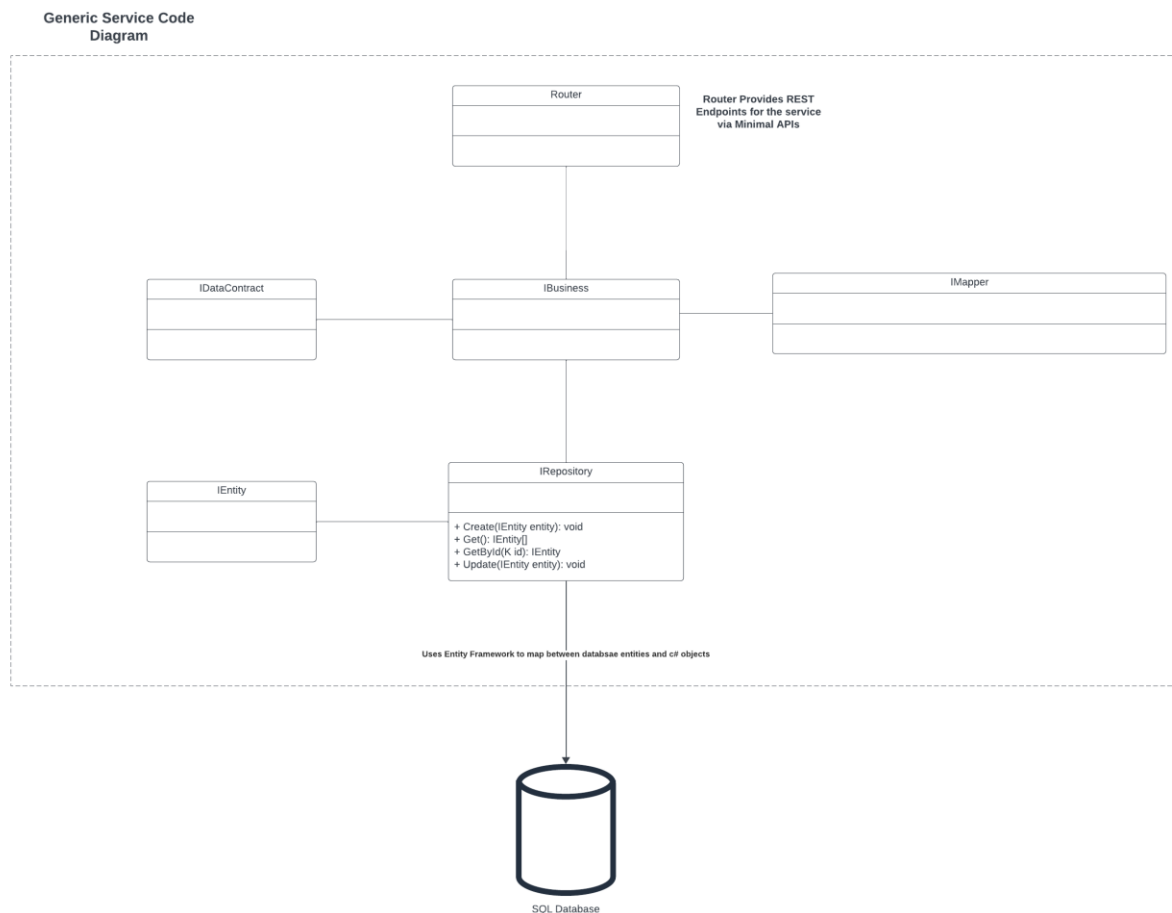


## Generic Design

After the concrete design for the application service was created, a generic design could be based off it. All services will require a router to create the REST endpoints which will call a function from the business. The business must implement the `IBusiness` interface. The Business layer will make use of a Mapper to map between dtos

and entity classes. The mapper will implement the IMapper interface, the will implement the IDataContract, and the entity will implement the IEntity interface. The repository class will handle the data access logic, and must implement the IRepository interface, which will force the Repository to implement a Get, Create, and Update method. Most of the interfaces and the router have been left blank because there aren't any fields or methods they must enforce.

[Link to Generic Design](#)



## Wireframes

Wireframes have been created to showcase the user's interaction with the system and how the system caters to usability requirements. The scope of the wireframes is the visa application process, as this was sufficient for showcasing that the system could meet all usability requirements.

[Link to Wireframes](#)

[Link to Wireframe demonstration.](#)





# Visa Processing... Advanced

Enter your destination and origin country and get started with an application - alternatively, you can determine whether you'll need a visa, and what visa you would need.

Origin Country

China



Destination Country

United Kingdom



Do I Need A Visa?

Begin Application



## United Kingdom

From China

### Visa

Required For Travel

Valid for 6 Months

**Visitor Visa**

Unlimited Entry

**£115**



Valid for 5 Years

**Student Visa**

Unlimited Entry

**£490**



Apply Now



# United Kingdom – Visitor Visa

## Trip Details

When do you arrive at your destination?

17/02/2024

When do you depart from your destination?

17/06/2024

Phone Number

+44 0123456789

Email Address

john.doe@gmail.com

Save and Continue



# United Kingdom – Visitor Visa

## Documentation

Passport Details

Passport\_Details.png

Browse Files

## Appointment

Appointment Location

Beijing



Appointment Date

01/02/2024 - 2pm

Save and Continue



## United Kingdom – Visitor Visa

### Payment

Card Holder Name

John Doe

Card Number

0000 0000 0000 0000

Expiry Date

07/30

Security Code

\*\*\*

### Costs

United Kingdom – Visitor Visa (1) £115

AFS Processing Fee £50

**Total £165**

Complete Application



## United Kingdom – Visitor Visa

### Payment

Card Holder Name

John Doe

Card Number

0000 0000 0000 0000



### Payment Successful

Your application will be reviewed shortly

Home Page

Complete Application

# Visa Processing... Advanced

Enter your destination and origin country and get started with an application - alternatively, you can determine whether you'll need a visa, and what visa you would need.

Origin Country

China

Destination Country

United Kingdom

Do I Need A Visa?

Begin Application



Dark Mode

Language

English

# Elaborazione dei visti... Avanzato

Inserite il Paese di destinazione e quello di origine e iniziate a presentare la domanda. In alternativa, potete determinare se avete bisogno di un visto e di quale visto avete bisogno.

Paese di origine

Cina

Paese di destinazione

Regno Unito

Ho bisogno di un visto?

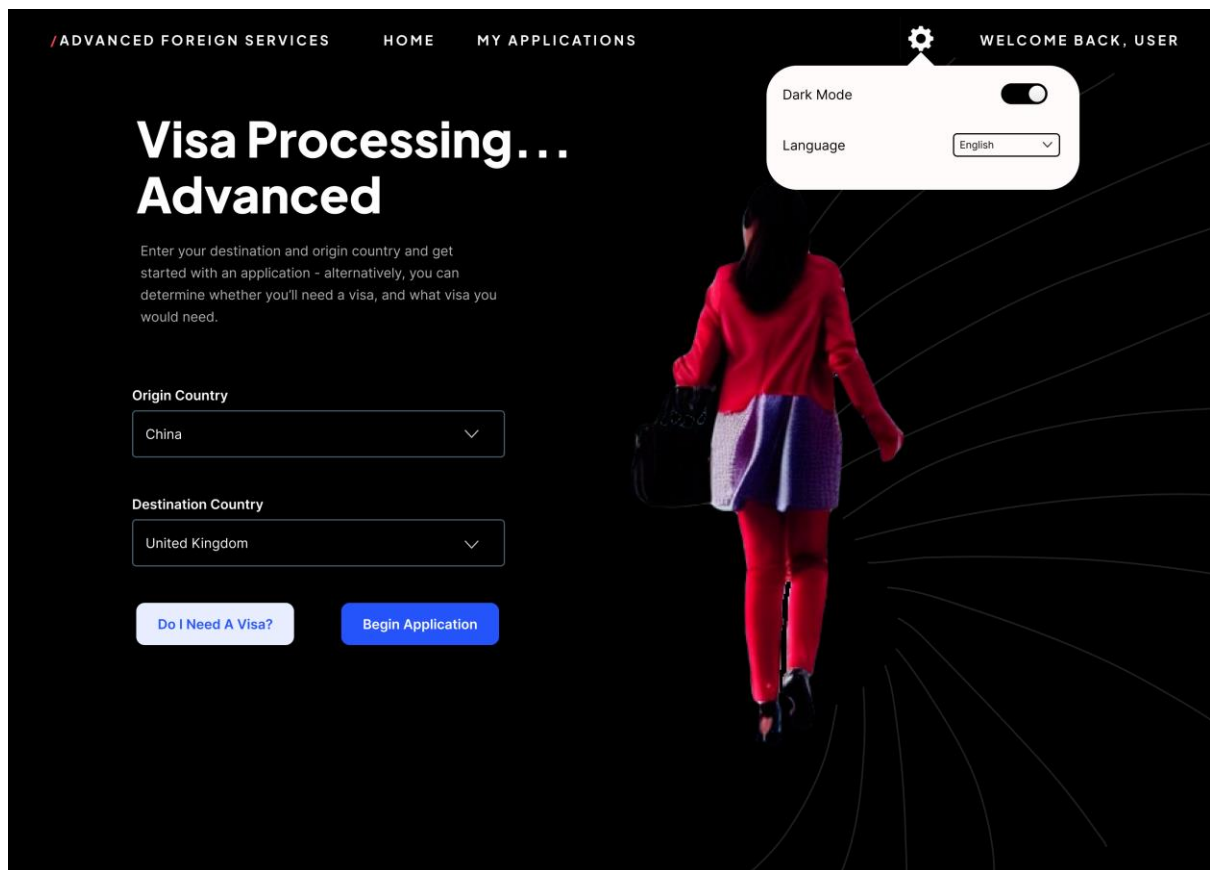
Inizia l'applicazione



Modalità scura

Lingua

Italiano



## References

Erl, T. (2016). *Service-Oriented Architecture: Analysis and Design for Services and Microservices*. Pearson.