



# An Undergraduate Project on Homeland

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Dissertation submitted in partial fulfillment for the degree of Bachelor of  
Science in Computer Science

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# Attestation

This is to verify that I, Ashikur Rahman (1610585), have finished the report named "Homeland," which was submitted in partial fulfillment of the requirements for the degree of Computer Science and Engineering from Independent University, Bangladesh (IUB). It was finished under the supervision of Md. Asif Bin Khaled (Supervisor). I also confirm that everything of my work, which I learnt throughout my internship, is original. All information sources utilized in this research and report have been properly acknowledged.

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Signature

11/09/2021

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Date

Mohammad Ashikur Rahman

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Name

# Acknowledgement

Above all, I want to express my gratitude Allah Almighty for making me able-bodied and able-minded and for providing me with this chance. It was to my advantage that I was hired by Aveneur Solutions.

I am grateful to my director, Md. Asif Bin Khaled, Lecturer, Department of Computer Science and Engineering, Independent University, Bangladesh, for his valuable advice, constructive criticism, and, most importantly, a one-of-a-kind mentoring that has enabled me to face real-world problems and focus on the growing challenges of the professional sector. Mr. Wasif M. Chowdhury (Product Manager, Aveneur Solutions) and Faria Zohora (Project Manager, Aveneur Solutions) deserve special thanks as well. Likewise, I'd want to convey my heartfelt gratitude to all Aveneur Solutions employees that worked with me to complete my job report.

Last but not least, I'd want to express my gratitude to my parents and other family members for their unwavering support.

# **Letter of Transmittal**

September 11, 2021

Md. Asif Bin Khaled

Lecturer, SETS

Department of Computer Science and Engineering

Independent University, Bangladesh

Dear Sir,

It is an honor to submit my Internship report on Homeland under your supervision. In this report, I have attempted to present my project work, my experiences, and my accomplishments.

From June 1st, 2021 till the present, I worked as an intern at Aveneur Solutions as a Full Stack Web Developer. Throughout this time, I have gained real-world job experience and expertise in a variety of areas. This report contains a summary of all of my project work, experiences, and learning during this internship.

I'd want to express my gratitude for your unwavering support, advice, and generosity. I've attempted to do this with the utmost sincerity and honesty. I really hope and pray that this report meets all of your criteria and meets your expectations.

Sincerely,

Mohammad Ashikur Rahman



# Evaluation Committee

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Supervisor

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# Abstract

Bangladesh is a rapidly developing country that has made rapid progress toward becoming a digital nation. The enormous growth in Internet usage over the last decade has had a significant influence on the lives of millions of people across the country. New technologies are rapidly changing our communication techniques, instructional methods, and learning chances. Because of the increased demand for internet access, businesses and other platforms began selling their services and products online.

Homeland is a website for the real estate industry, called Shukran that is interactive, functional, and revenue-generating. This application's main goal is to assist the company in displaying a certain number of property listings on their website.

There are hundreds of Real Estate Websites on the Internet, but the goal of this project is to create something fresh, inventive, and efficient utilizing cutting-edge technologies like as React.js and TypeScript. The major focus is on creating a user-friendly website that successfully displays the intended findings on the graphical user interface.

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# **Chapter 1**

## **Introduction**

### **1.1 Overview of the Work**

In recent years, there has been a major technological shift that has resulted in a significant change in the way people buy and sell homes. Buying and selling homes and buildings in the digital world is largely done through realtor websites. More and more purchasers are turning to the internet first during the buying and selling process.

Before making a final purchase, customers conduct considerable research online. As a result, in the real estate industry, having an internet presence has become a significant marketing technique.

That is where Homeland comes in. The project is e-commerce for units and buildings in the state of Gazipur, owned by a company named Shukraan. And this project has all the basic features of a regular e-commerce website and much more.

### **1.2 Objectives**

Business development can be done through e-commerce by making it the primary and the basic object. In the middle of their direct contact between the company and the consumer, their business relationship will be enhanced. Hence the market area can be increased.

Getting an online presence and attracting more customers is the most important objective. These days, it becomes the mandate of the companies to double their customers, and this can be done by rendering the value add service and maintaining the quality. Therefore, it is also one of the primary objectives of the companies which supply impetus for the robust growth in sales and overall profit.

## 1.3 Scopes

The project's scope of work is described based on extensive technological investigation on potential possibilities for developing the website.

1. **Develop User Interface** - Make reusable react components so that it can be used throughout the application.
2. **API Integration** - Consume APIs (both the projects own and 3rd party APIs). Make HTTP calls to the server and perform necessary updates on the UI based on the response from the server.
3. **Perform Optimization** - Make the application faster by optimizing it. Optimization includes:
  - Minifying Code
  - Optimizing images (reduce size)
  - Delete unnecessary codes

# Chapter 2

## Literature Review

There are several commercial real estate online information service providers that offer a variety of commercial properties and services customized to the national and local demands of the business investing market [1]. Homeland is the first real estate e-commerce web application in Bangladesh that has a payment gateway. Their goal is to persuade local and national purchasers to choose residences that have desirable attributes.

### 2.1 Relationship with Undergraduate Studies

In our studies, we developed a strong foundation of programming that helps us break down a complex problem into small structured parts and solve them.

We learned the basics of **Database Management**, making queries, getting/posting data from/to the database.

Our **Web Applications** course was designed to teach us the basics of web applications and technologies like HTML, CSS, JavaScript, PHP. We learned how the different parts of an application interacts with each other.

We learned the fundamentals of **Object-oriented Programming** (OOP). The whole project follows an object-oriented structure. We even used TypeScript instead of JavaScript which is type secure and has an object-oriented approach to the project.

### 2.2 Related works

The process of unit buying and selling was used to be done by paperworks. This made the process slow and cumbersome. Homeland came up with the idea to digitize the process, reduce paperwork, faster delivery and thus satisfy customers.

There are not many local real estate websites in Bangladesh. This made it hard to come up with something that targets the market in Bangladesh. So we had to research a lot of websites that comes close to our needs[2]. The websites that we looked into the

most for references are:

- <https://www.zillow.com/>
- <https://www.realtor.com/>

A lot of similar functionalities exist between these websites and ours. And a lot of ideas were given shape by following these websites.

# Chapter 3

## Project Management & Financing

### 3.1 Work Breakdown Structure

A work-breakdown structure shows the breakdown of the project into smaller components.

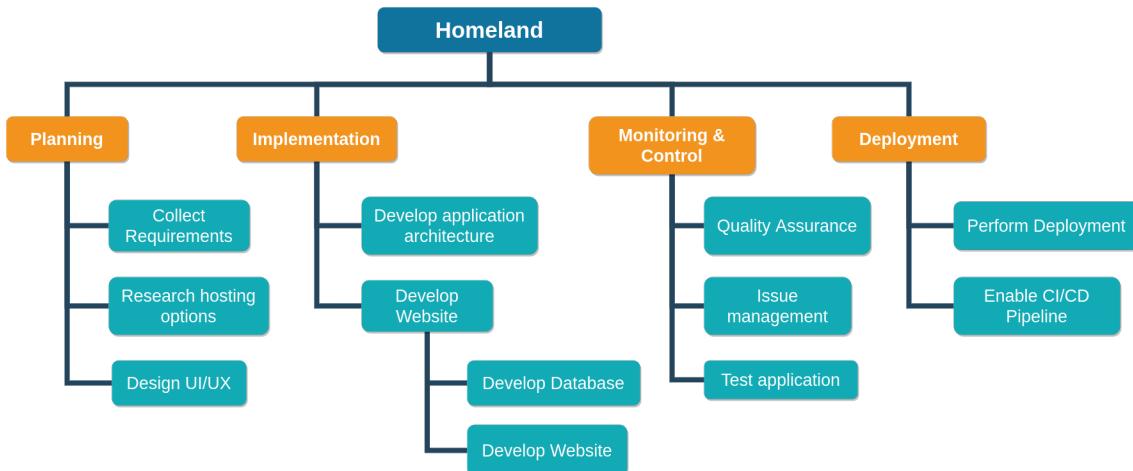


Figure 3.1: WBS of Homeland

The project was decided to be done in phases, which included four main phases:

#### Planning

In the **planning phase**, the team shall gather the requirements, decide on the technology to be used, research hosting options and design the UI/UX based to the requirements.

#### Implementation

The **implementation phase** requires coding. At first, the architecture of the project must be decided. For example, the architecture decided for Homeland was the CQRS(Command

and Query Responsibility Segregation) pattern. Then the team shall start developing the website, frontend and backend concurrently.

## Monitoring & Control

Next comes the **monitoring & control phase**. quality assurance, issue management and testing shall be done.

## Deployment

The last phase is **deployment**. After deploying the project, CI/CD pipeline should be configured to handle any further updates needed.

## 3.2 Activity wise Time Distribution

Estimating the time required to finish the project is an important step as it provides the developers a guide as to how to efficiently they need to work in order to meet the deadlines.

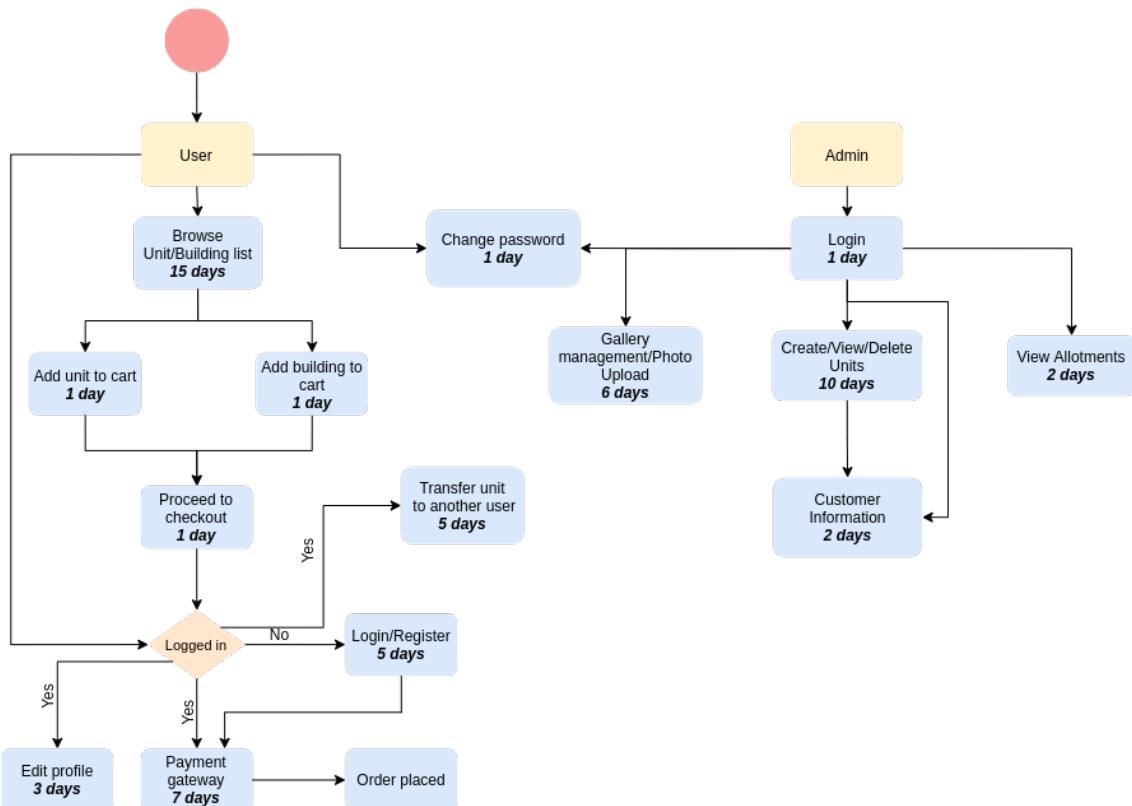


Figure 3.2: Time distribution of Homeland

### 3.3 Gantt Chart

The time duration for the Homeland project was decided to be 3 months. Here is the Gantt Chart that shows the estimated time it would take for each task.

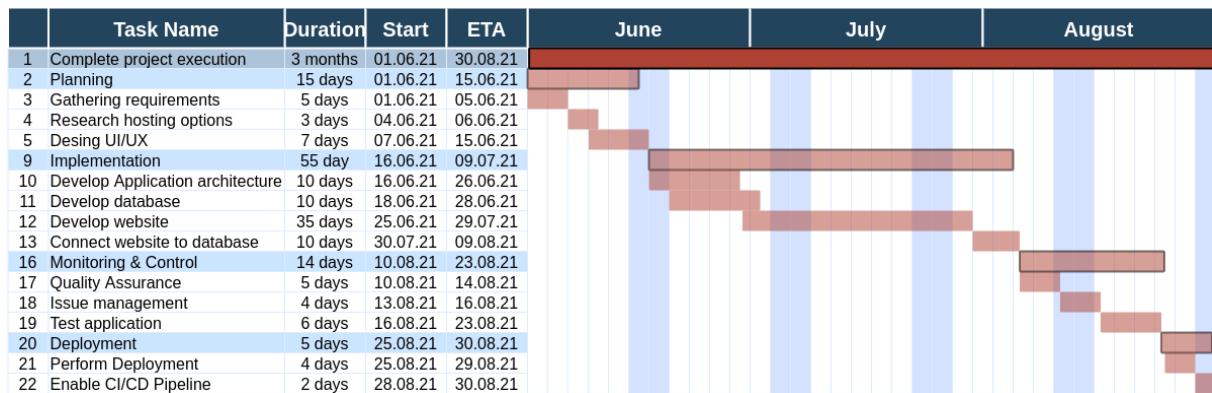


Figure 3.3: Gantt Chart of Homeland

The different phases of the project were assigned a time duration to make efficient use of time. According to the chart, the highest amount of time is taken during implementation of the website by coding.

With the Gantt chart, it's easier to explain the overall schedule, show timing of critical steps and their dependencies on other tasks or present the status of project activities over time.

### 3.4 Activity wise Resource Allocation

Resource Type	Name	Description
HARDWARE	Desktops/Laptops	Platform needed to work
	Routers	Assigned to the team to get maximum speed
	Hard Disks (HDD/SSD)	Needed to store the projects and its relevant files
	USB Drives	Offline data transfer
NETWORK	Internet	Connection to the web
	Hosting	Making website available via World Wide Web
	Domain	Website identification string
HUMAN	Project Manager	Organizes and allocates work
	UI/UX Designer	Designs website interface
	Developers	Code and develop the project
	DevOps	Optimizes the flow of data and automates infrastructure
SOFTWARE	Visual Studio Code	Text Editor and Development environment
	Windows	Operating systems preferred by developers
	Linux	
	MacOS	
	Postman	Test APIs

Table 3.1: Resource allocation table

The resources necessary for the projects are listed according to their types. The resource types are

- **Hardware** - every type of hardware that we need, from laptops to USBs.
- **Network** - it includes the domain, hosting and everything required to make the website accessible from anywhere in the world.
- **Human** - the people that would be working on different roles of the project.
- **Software** - operating system and software of developer's choice.

### 3.5 Estimated Costing

The company, Shukran, was charged 2 lakhs for the project. This price was based on the cost model of the Avenir Solutions's expenditure. The cost model along with the projects cost is provided below:

Resource Type	Name	Price
HARDWARE	Desktops/Laptops	Tk. 480,000
	Routers	Tk. 10,000
	Hard Disks (HDD/SSD)	Tk. 10,000
	USB Drives	Tk. 5,000
NETWORK	Internet	Tk. 2,000/month
	Hosting	Tk. 4,995/year
	Domain	Tk. 1,000/year
HUMAN	Project Manager	Tk. 40,000/month
	UI/UX Designer	Tk. 10,000/month
	Developers	Tk. 35,000/month
	DevOps	Tk. 25,000/month
SOFTWARE	Visual Studio Code	Free
	Windows	Tk. 22,999
	Linux	Free
	MacOS	Not provided
	Postman	Test APIs

Table 3.2: Estimated costing

# Chapter 4

## Methodology

Software development methodology is a procedure or arrangement of procedures utilized in programming advancement.

The agile methodology that utilizes iterative development and prototyping is widely used in a variety of industry projects as a lightweight development method that can satisfy the changes of requirements [3]. In our project, the agile methodology was our methodology of choice.

The Homeland application has been deployed on a test site so the clients can be updated of our progress. Meetings are being held after fixed intervals so that we are provided with the clients feedback and make necessary changes.

Agile is a process by which a team can manage a project by breaking it up into several stages and involving constant collaboration with stakeholders and continuous improvement and iteration at every stage [4].

### Reasons for choosing agile methodology

1. **Faster time to market** - Instead of taking up months to deliver something to the clients, it is better to show signs of improvement and get the project online as soon as possible.
2. **Customer satisfaction** - The option to add frequent new highlights based on the client's feedback makes them happy. This helps us to build good relationships with our customers, one where we are working together to get problems solved.
3. **Early risk reduction** - By consulting early with the clients and getting their feedback, we reduce our chance of building an inappropriate product. Changes needed can be handled early, which saves both time and money.
4. **Higher quality product** - Project phases could also be so filled with features that developers have to rush to finish them and very little time is left for testing. As a

result, they'll not have the time needed for correct mobile application testing. On an Agile project, the team does not work on all features at once. Instead, the team assigns a smaller subset of features to every teammate. That way, the developers have longer to perfect those items before release.

# **Chapter 5**

## **Body of the Project**

### **5.1 Work Description**

Homeland is a real estate website that focuses on buying and selling of properties. The developers of this website will have to create and implement strategies that make online transactions possible.

Some of the roles and responsibilities include:

1. Work with Web Development team to identify what the system needs and its solutions.
2. Configure, design, and develop solutions including integrations to 3rd party libraries.
3. Demonstrate and train business users on the proper use of the system.
4. Monitor and track system processing and performance indicators to ensure project requirements are being met.
5. Create and make necessary changes needed to the website.
6. Work closely with different teams (product management, graphics, sales) to create updated content.
7. Program the website such that it works without any reloading.
8. Having ability to multitask and meet deadlines while maintaining attention to detail.

### **5.2 System Analysis**

To identify the objectives of a system, system analysis is conducted for the purpose of studying it and its parts. This is a problem-solving process that determines how

efficiently the system is running to accomplish its purposes. Planning, analysis, design, deployment, and maintenance are some of the phases covered in this section. It is a process of interpreting and collecting facts, finding out the problems, and splitting up the system into its components.

### 5.2.1 Six Element Analysis

Process	Human	Non-Computing Hardware	Computing Hardware	Software	Database	Network and Communication
Access Website	All users	n/a	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Login/Registration	All users	n/a	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Add units to cart	All users	n/a	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Place order	All users	n/a	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Make payment	All users	Payment Card	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Edit profile	All users	Camera	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Transfer units	All users	Unit information	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Add new units	Admin	Unit information	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Update units	Admin	Unit information	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Delete units	Admin	Unit information	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Upload images	Admin	Images	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
Change password	All users	n/a	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
View customer info	Admin	n/a	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN
View bookings/transfers/allotments	Admin	n/a	PC, Laptop, Smartphone, Tab	Browser	SQL Server	WAN

Table 5.1: Six element analysis

### **5.2.2 Feasibility Analysis**

The analysis of a proposed project is to determine whether it is feasible and whether the project should go ahead. This is called feasibility analysis [5]. Confirmation of design, plan, and strategy is the main priority of this analysis. This can be used to validate assumptions, constraints, decisions, and approaches. Some of the parts of feasibility analysis are:

1. **Technical feasibility** - The proposed system's software, hardware, and other technical needs are examined in technical feasibility. This section describes how we plan to deliver a product or service to the customer. It aids organizations in determining whether the technical resources serve their needs and whether the technical team is capable of turning concepts into operational solutions.

Homeland has been developed using the Reactjs framework with ASP.net Core. The use of typescript components and the regular HTML, CSS and JS helped to build a much efficient and faster website. Moreover, these technologies are very popular in the modern industry and are being used thoroughly in many enterprises.

2. **Operational feasibility** - The operational feasibility test analyzes and determines whether the organization's needs can be addressed by finishing the project. Operational feasibility studies also look at how well a project plan meets the requirements specified during the requirement analysis phase.

Homeland has been developed in such a way that it can be conducted very easily. It is a well-planned system. The whole business policy of the organization depends on this system. Users need not have a lot of technical knowledge to run this system. Every instruction is very clear to the users. We hope this system will be able to fulfill the requirements of the users.

3. **Economic feasibility** - This economic feasibility analysis includes a cost/benefit analysis of the project, which assists businesses in determining the costs and benefits of a project before allocating financial resources. It also serves as an independent project evaluation and boosts project credibility. This assists decision-makers in determining the project's economic benefits to the organization.

The business of the current project will entirely depend on the proposed system. If this system can reach the users it will definitely bring benefits. It will reduce the need for manpower and the cost of manual documentation.

### **5.2.3 Problem Solution Analysis**

Despite the benefits, a business using online system as a platform has challenges of its own. Here are some of the problems and their solutions:

1. **Competitor analysis** - In this competitive business field, there are other competitors offering the same product and services. This makes it hard for our platform to make a mark.

**Solution:** Conduct a very thorough competitor analysis to identify the services they provide. Figure out the services that are in high demand. In the case of Homeland, the payment gateway already sets apart our system from any other real estate e-commerce in Bangladesh.

2. **Customer loyalty** - A business tries to grow its customer base and focuses on attracting new customer. But existing customers should also be a priority. It can cost up to five times more to acquire new customers than to maintain existing ones. The success of selling rate to an existing customer is much higher than that of a new one.

**Solution:** To maintain customer loyalty, excellent customer service should be provided. Positive experiences must be provided to the customers so that their trust is gained. Happy customers will likely make a purchase again or recommend new users.

3. **Data security:** Of all the e-commerce business challenges today, technical issues in e-commerce can be one of the most difficult to overcome. And worst kind of technical issue is related to data security. Attackers can not only infect the website with viruses, but they can also expose confidential data.

**Solution:** For Homeland, data security was given handled by using the ASP.Net Core technology for backend. This provides a decent layer of security, and for the authentication and authorization the Dotnet core identity package was used which is recommended by Microsoft themselves.

## 5.3 System Design

### 5.3.1 Rich Picture

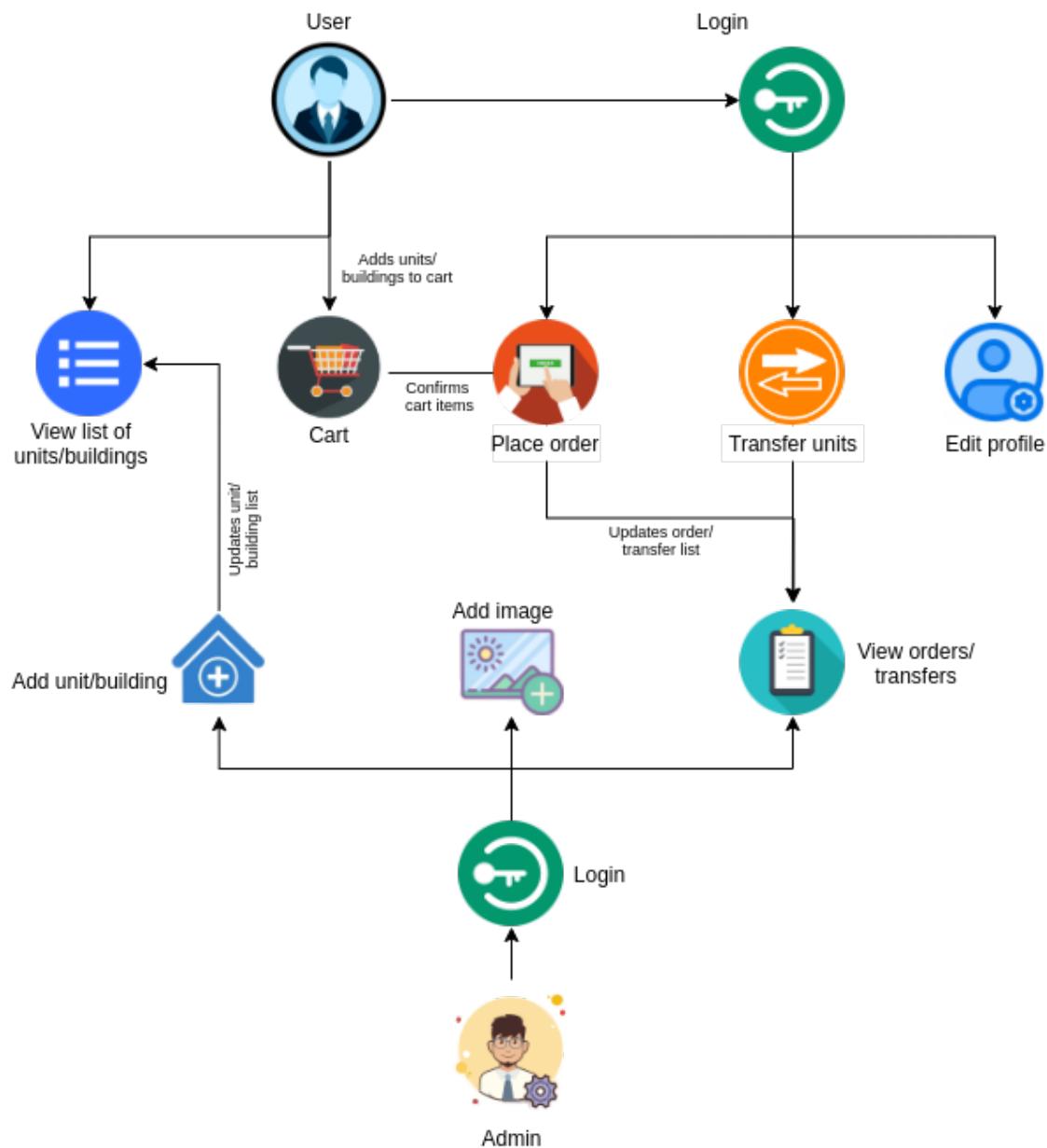


Figure 5.1: Rich picture of Homeland

A Rich Picture is a method of exploring, acknowledging, and defining a situation, and then expressing it using diagrams to form a rough mental model. A detailed graphic aids in having a discussion and reaching a broad, common knowledge of a topic.

The provided rich picture of Homeland summarizes the project and defines all the major processes.

### 5.3.2 UML Diagrams

The objective of a UML Diagram is to depict an application's model. UML diagrams are diagrams that can be effectively mapped to object-oriented languages and are thus commonly utilized during the construction process.

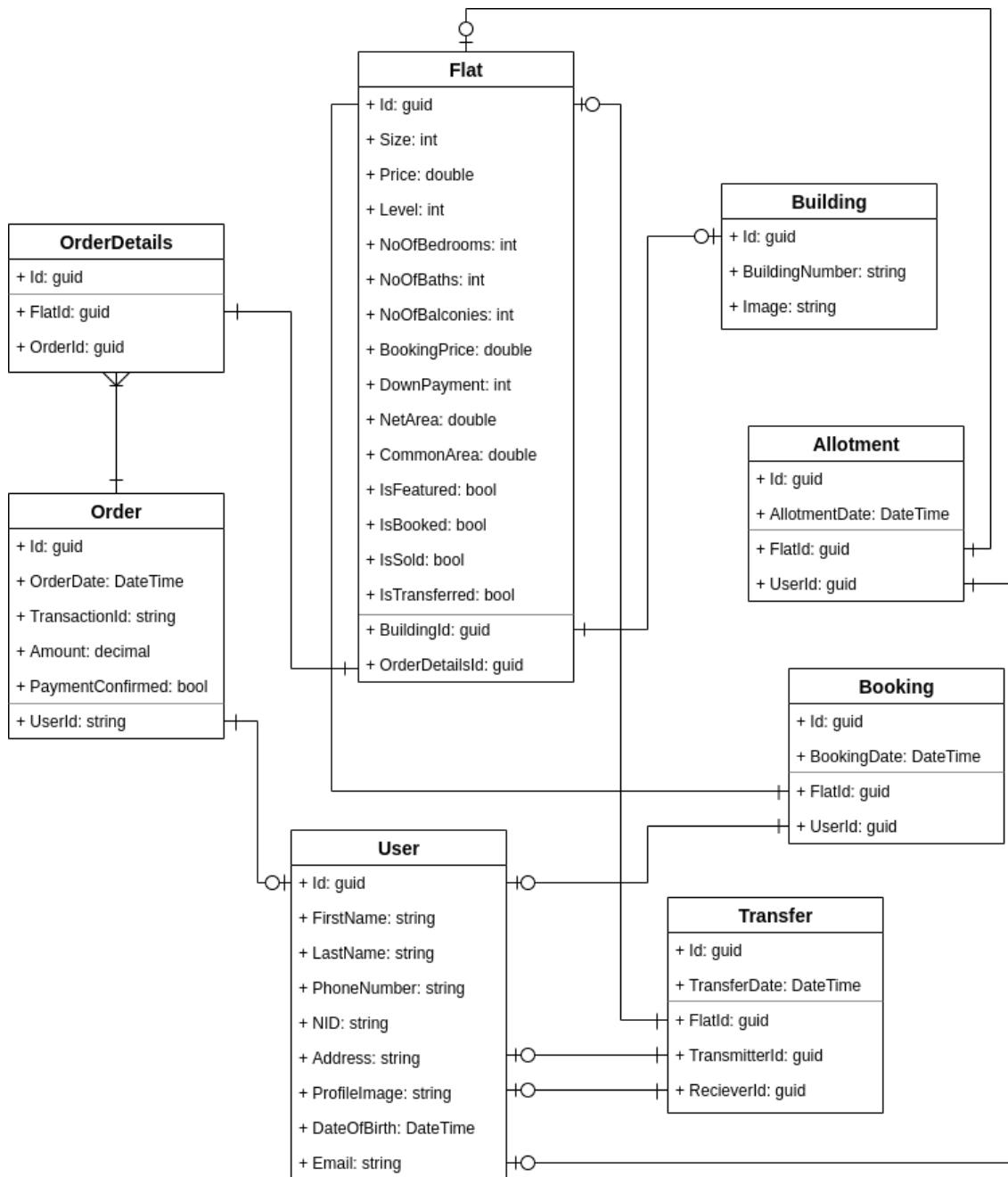


Figure 5.2: UML class of Homeland

### 5.3.3 Functional and Non-Functional Requirements

#### Functional requirements

The basic system behavior is defined by functional requirements. They describe what the system does or does not do, and can be conceived of in terms of how the system reacts to inputs. Calculations, data input, and business processes are frequently included in functional requirements, which specify the if/then behaviors.

Functions	Input	Process	Output
Add item to cart	Click on add-to-cart button	Add an unit or building to the cart	Notify user unit has been added
Login/Registration	Fill up form and submit	Logs in or creates a new account	Redirects to the last page with authorized privileges
Place order	Click place order button on cart page	Confirms and places the order	Redirects to SSL Commerce procedure
Transfer Unit	Provide necessary information and password	Transfers the unit to another user	Notify the user unit has been transferred
Edit profile	Enter profile details	Updates the profile with the new data	Redirects to updated profile page
Add/update/delete unit	Enter necessary information	Updates the unit list	Redirects to the list of updated units
Change password	Provide new password	Updates the password	Notify the user password has been changed

Table 5.2: Functional requirements

#### Non-functional requirements

A non-functional requirement, simply put, is a specification that outlines the system's operational capabilities and limitations that improve its functionality. These can include things like speed, security, and dependability.

- **Performance and scalability** - This determines how quickly the system returns results and how well it works as workloads increase. We will test our system in GTMetrix and Google Page Speed after it is launched to see how fast it is and how responsive it is.
- **Portability and compatibility** - This decides which operating systems, browsers, hardware, and versions are supported by the website, as well as if it interferes with other processes in these environments.
- **Security** - This determines how are the system and its data protected against attacks. In our system we have implemented JWT Authentication which prevent attacks such as SQL Injection.

- **Usability** - It means how easy it is for our users to use the system. Homeland has been built by keeping every kind of user in mind. It is an interactive website made with ReactJS and easy functionality. This makes it user-friendly and therefore has high usability.

## 5.4 Product Features

### 5.4.1 Input

Some input features are listed below with pictures.

Unit ID	Size	Price
HL01	1000 sqft.	3300000 Tk
HL02	1000 sqft.	3300000 Tk
HL04	1000 sqft.	3300000 Tk

Building: 1 Level: 10 Net Area: 1000 Common Area: 200

Building: 1 Level: 10 Net Area: 1000 Common Area: 200

Building: 1 Level: 10 Net Area: 1000 Common Area: 200

Figure 5.3: Filter search unit list

Figure 5.4: Transfer unit form

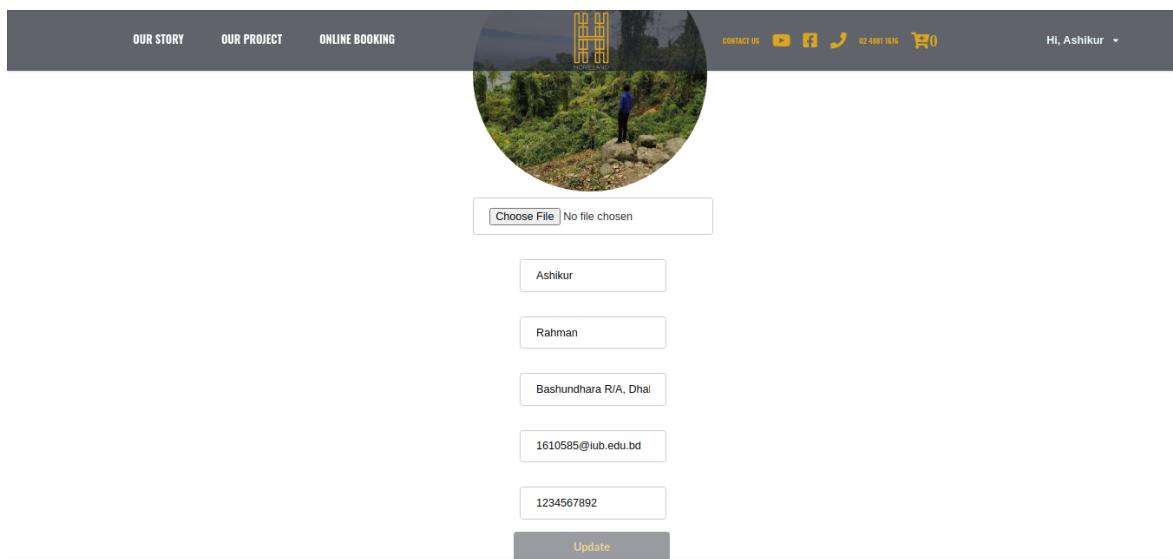


Figure 5.5: Edit profile form

The screenshot shows a form for adding a new unit. At the top left is a "Go to List" button. The form consists of several input fields: "ID" (empty), "Size" (empty), "Price" (empty), "Level" (empty), "Building Number" (dropdown menu showing "1"), "No. of Bedrooms" (empty), "No. of Baths" (empty), "No. of Balconies" (empty), "Net Area" (empty), "Common Area" (empty), and "Booking Price" (empty).

Figure 5.6: Add unit form

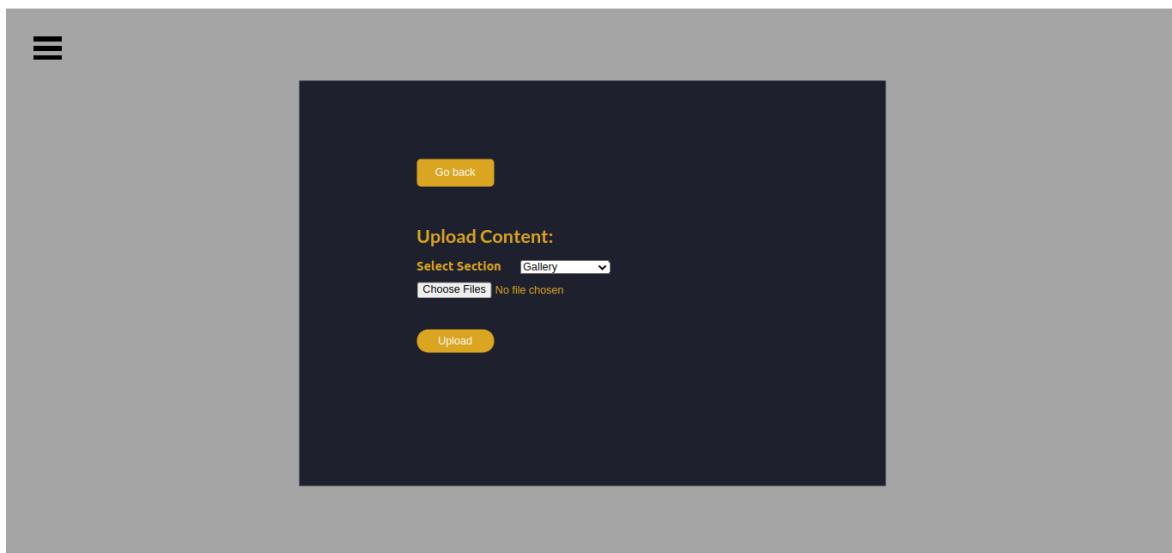


Figure 5.7: Photo upload widget

#### 5.4.2 Output

Some of the features that are outputted to the users are provided below.

Filter Units		Search...				
UNIT ID	SIZE	PRICE	BOOKING PRICE	Level	STATUS	Action
HL01	1000	3300000	100000	10	Available	
HL02	1000	3300000	100000	10	Available	
HL03	1000	3300000	100000	10	Sold	
HL04	1000	3300000	100000	10	Available	
HL05	1000	3300000	100000	10	Sold	
HL06	1000	3300000	100000	10	Available	
HL07	1000	3300000	100000	10	Available	

Figure 5.8: Unit list in the admin panel

## CHAPTER 5. BODY OF THE PROJECT

List of all bookings			
UNIT ID	Customer Name	Date Booked	
HL12	King	05 Jul 2021	
HL121	Ashikur	05 Jul 2021	
HL09	King	05 Jul 2021	
HL10	King	05 Jul 2021	
HL21	Umar	10 Jul 2021	

List of all Transfers			
UNIT ID	Transferer's Name	Reciever's Name	Date Transferred
HL121	King	Ashikur	05 Jul 2021
HL21	Ashikur	Umar	10 Jul 2021

Figure 5.9: Bookings and transfer list in the admin panel

The screenshot shows the 'My Profile' section of the admin panel. At the top, there is a navigation bar with links for 'OUR STORY', 'OUR PROJECT', and 'ONLINE BOOKING'. To the right of the navigation bar are icons for 'CONTACT US', 'YouTube', 'Facebook', 'RENTALS', and a shopping cart with a count of '0'. On the far right, it says 'Hi, Ashikur' with a dropdown arrow. Below the navigation bar, the 'My Profile' section has a yellow header. It features a circular profile picture of a person standing in a green, hilly landscape. To the left of the picture is a box containing the user's details: NAME: Ashikur Rahman, ADDRESS: Bashundhara R/A, Dhaka, PHONE: +8801837440069, EMAIL: 1610585@iub.edu.bd, and NID: 1234567892. At the bottom of the yellow header are two buttons: 'Edit Profile' and 'Change Password'.

Figure 5.10: Updated profile page

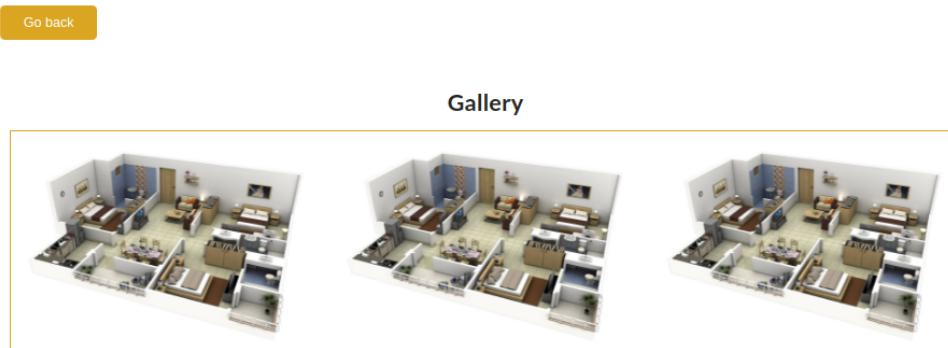


Figure 5.11: Image gallery in admin panel

### 5.4.3 Architecture

#### Clean Architecture

This project is a **multi-project ASP.Net Core solution** created with **Clean Architecture**, **CQRS** and **Mediator pattern**, making the code easy to comprehend, reason about, and extend [6].

The objective of the clean architecture is the separation of concerns. To achieve this separation, the software is divided into layers. Each has at least one layer for business rules, and another for interfaces.

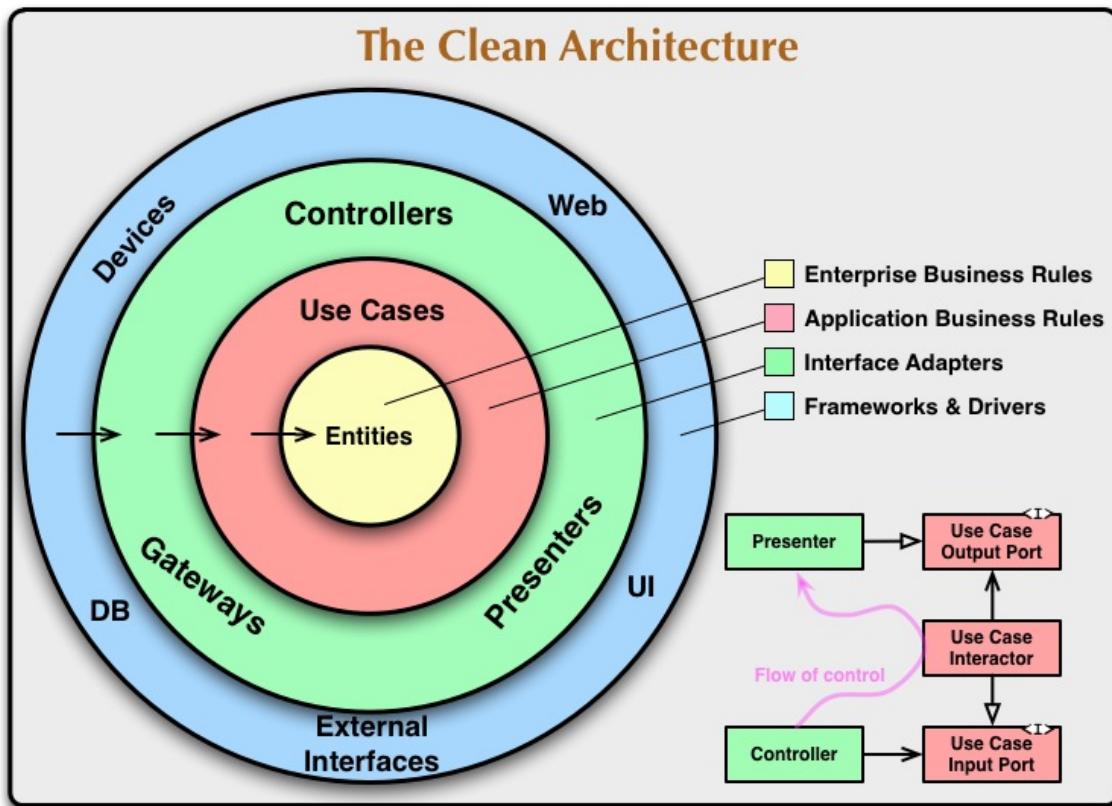


Figure 5.12: The Clean Architecture diagram

The Dependency Rule is the overriding rule that makes this design operate. Source code dependencies can only point inwards, according to this criterion. Nothing in the inner circle can have any knowledge of what is going on in the outer circle. In particular, the code in an inner circle must not mention the name of something declared in an outer circle. That includes, functions, classes, variables, or any other entity.

## CQRS Mediator pattern

CQRS is an acronym for **Command Query Responsibility Segregation**. Therefore, instead of having all four CRUD activities together, an application's Command (write) and Query (read) models are separated to scale, read and write operations independently [7].

We develop **interfaces** for our data access layer, inject it in the constructor of API controller, and execute the operations to decouple the application. However, when our application grows in size, the number of dependencies grows as well, requiring the injection of several interfaces into the API controller, increasing the program's complexity. This is where CQRS & Mediator pattern comes in.

## CQRS Pattern

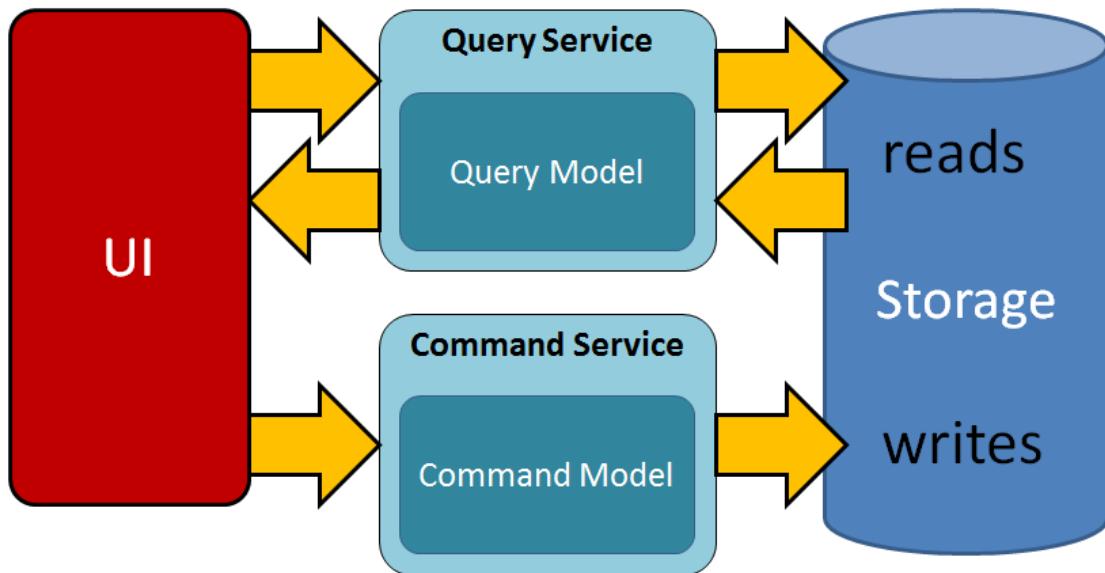


Figure 5.13: The CQRS Pattern

**Mediator** is a tool for simplifying communication between various objects or classes. This pattern creates a mediator class that generally handles all communication between distinct classes and encourages loose coupling to make code easier to maintain. The mediator pattern is classified as a behavioural pattern.

A Mediator performs two types of operations:

- Accepts incoming request
- Handles the incoming request and provide the response

CQRS & Mediator pattern are preferred over large projects.

# Chapter 6

## Results & Analysis

The Homeland project was largely designed to make it easy for purchasers to purchase flats and for Shukran to sell their properties. The main goal was to compile all of the project details onto a single website so that potential buyers could find everything they needed without having to physically go out and research for it.

The following is a summary of what we've accomplished thus far and how it will help website visitors:

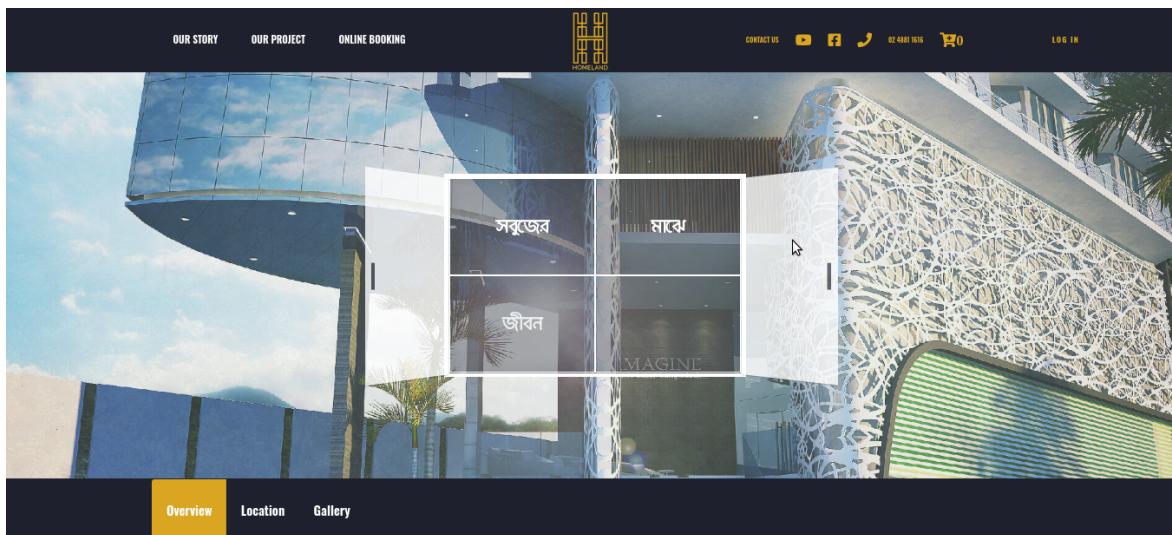


Figure 6.1: Homeland landing page

This is the **landing page** of our project. The requirement was to display the motto in a creative way. Another was to show the map of the area with the units.

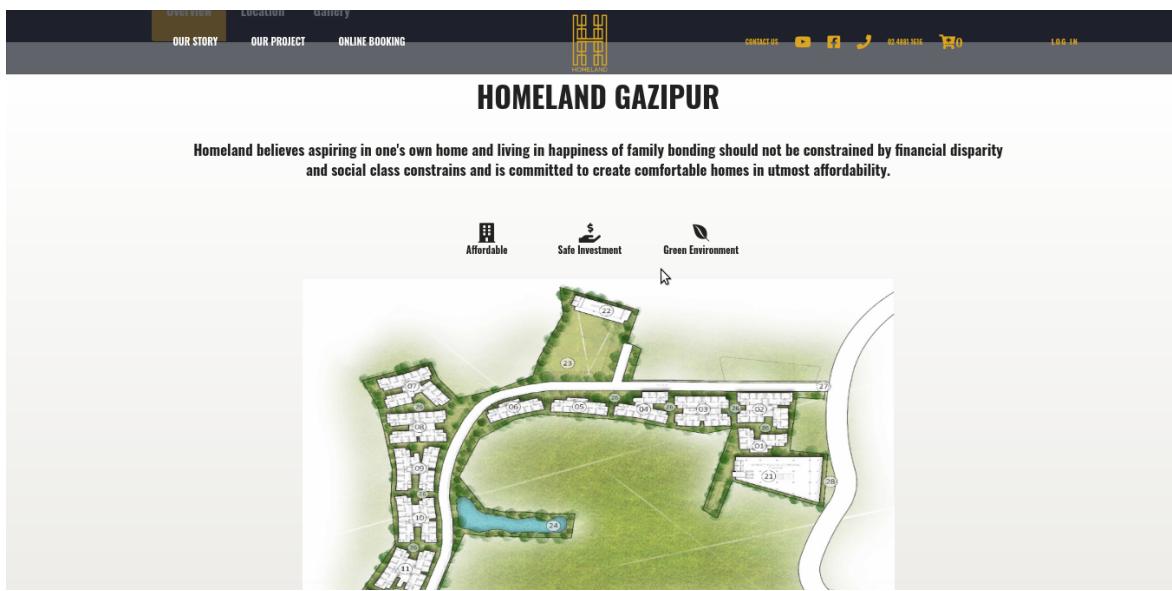


Figure 6.2: Unit selection

Then comes the unit booking page, where we can sort the units by its price and size. The units can be selected by clicking the nicely designed checkboxes. If the "NEXT" button is clicked after clicking multiple units, the selected units will be shown as slides.

**The following image shows the unit selection**

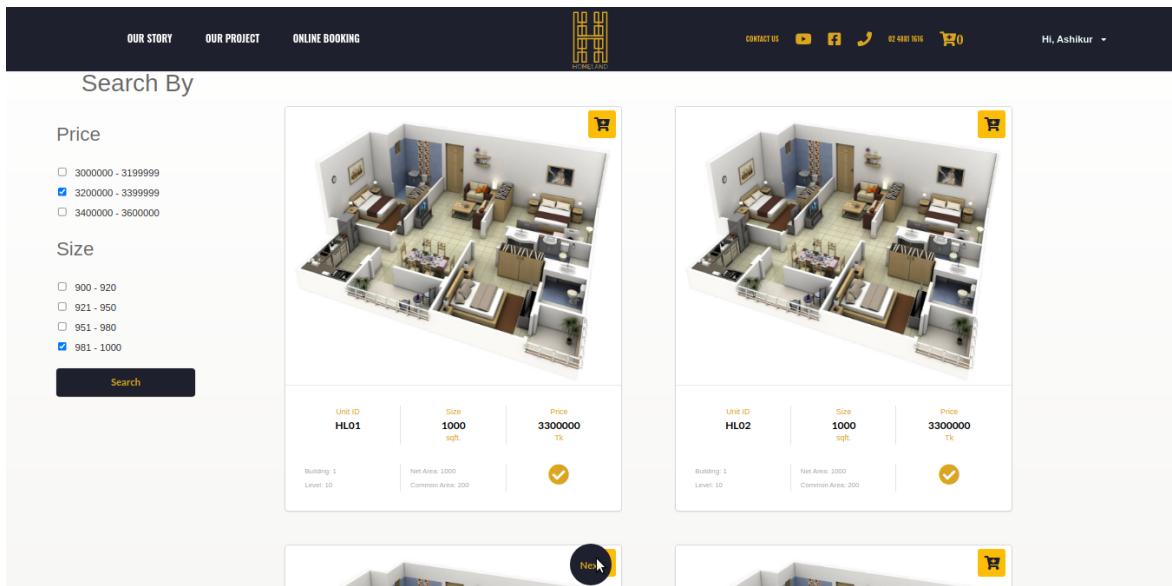


Figure 6.3: Map of the area

The units appear as a slideshow, from where these can added to the cart.

## Details of Selected Units

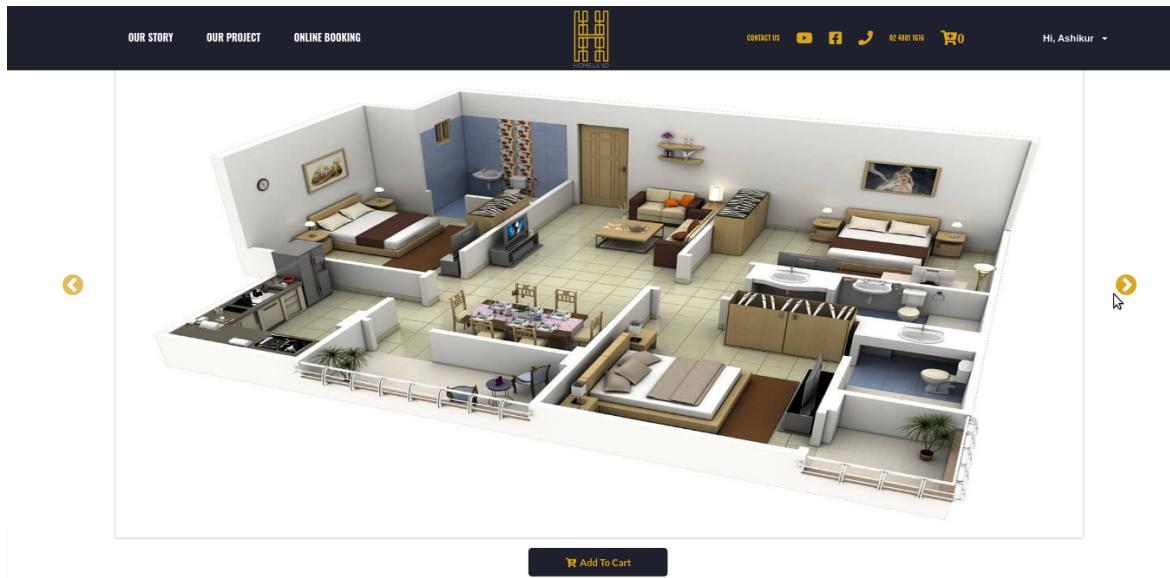


Figure 6.4: Selected units as slides

## The Cart

The items added to the cart shows all the necessary information such as, the total price, the number of units in the cart etc.

Upon confirmation, the ordered is placed and the buyer is given a limited amount of time to make the payment. If the payment time expires, the order will get canceled. This auto-cancellation feature has not yet been implemented.

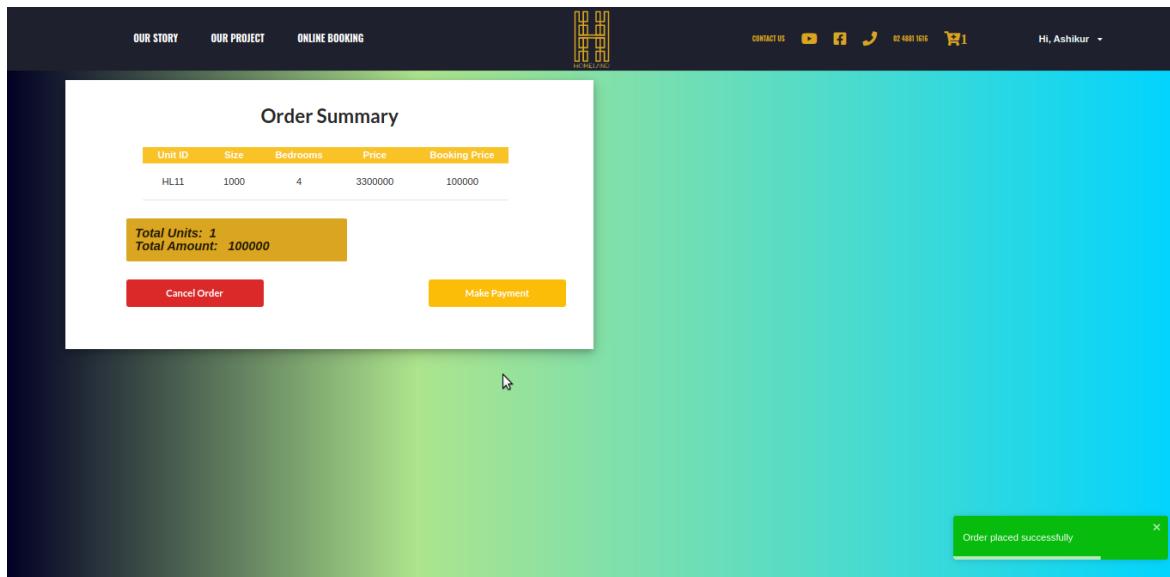


Figure 6.5: Order confirmed from cart page

# Chapter 7

## Project as Engineering Problem Analysis

### 7.1 Sustainability of the Project

The Homeland project was done with ReactJS. One of the most popular Javascript frameworks is React.js. It takes a long time to train developers in a new technology. React, on the other hand, is a breeze to pick up and utilize. The codes are comparable to the principles of Javascript. React components make it easy to create amazing front-end designs for users, ensuring that they have the best possible experience while using the app. The framework is also lightweight and allows pages to render quickly.

- **JSX and Components** - JSX is a JavaScript syntax extension that makes creating your own components a lot easier. It accepts HTML quoting and simplifies the rendering of subcomponents.

While JSX is frequently disputed, it can be useful in developing high-volume apps or custom components, preventing mistakes in massive tree structures, and making the conversion from HTML mockups to ReactElement trees easier. Additionally, it gives React developers with helpful warning and error signals, as well as aids in the prevention of code injections.

- **Faster Rendering** - When developing a high-load application, it's critical to think about how the structure will affect the app's overall performance. Because the DOM (document object model) is tree-structured, even tiny changes at the higher layer might generate severe ripples in the interface, even the most modern platforms and engines can't guarantee the absence of unpleasant bottlenecks. To address the problem, the Facebook development team invented Virtual DOM, which is today one of the advantages of adopting React for heavily loaded and dynamic software applications.

Because it is a virtual version of the document object model, all modifications are first applied to the virtual DOM, and then the smallest scope of necessary DOM actions is computed using the diff technique. Finally, the real DOM tree is updated to reflect the changes, ensuring that the time spent is minimal. This approach ensures a better user experience and improved app performance.

- **Stable code** - ReactJS solely employs downward data flow to ensure that even minor changes in the child structures do not affect their parents. When developers change an object's state, they simply make modifications, and only specific components are updated after that. This data binding pattern promotes code stability and consistent app performance.

When it comes to the advantages and disadvantages of React js, three adjectives come to mind: non-risky, responsive, and advanced. It enables developers to work with a virtual browser (DOM) that is far faster and more user-friendly than the real one. All of these benefits contribute to the project's long-term viability. This makes the project sustainable.

## 7.2 Social and Environmental Effects and Analysis

Homeland makes the lives of buyers easier because they will be able to buy properties without having to be present at the location of the purchase. This also means they can make a purchase anytime without disrupting their routine of daily activities. The service is available 24/7.

By doing an online purchase, environment pollution is also avoided as the buyer does not have to go the site physically. As going there would require the buyer to travel by a motor vehicle (depending on the distance) which affects the environment, eliminating the need for this affects the environment positively.

The majority of businesses generate paper waste. When information is exchanged digitally, it eliminates the need for physical paper in the workplace. By decreasing (or eliminating) paper waste, an organization's carbon footprint can be reduced. Paperless business models have several advantages and can be implemented with the help of e-commerce skills.

## 7.3 Addressing Ethics and Ethical Issues

We spend plenty of time discussing topics that help us grow our business, such as SEO and data analysis. However, most people who take their business online overlook some of the most basic ethical concerns.

The sellers, on the other hand, have a duty to their buyers. They must ensure that data theft or security breaches do not occur as a result of their transactions. Customers provide us with a great deal of personal information in order to complete a transaction, such as:

- Personal information
- Credit card numbers
- Email addresses and a password, which they may share across many accounts

With that information, hackers may cause a lot of harm to customers. We don't want to jeopardize your consumers' confidence. Here are some of the things that should be considered:

- Use HTTPS/SSL, especially on pages that collect sensitive information
- Add further levels of security, such as a web application firewall
- Only keep the customer information that is needed
- For financial transactions, data storage, and other purposes, use trustworthy platforms

# Chapter 8

## Lesson Learned

Through this project I learned a lot of new technologies and methods. The most important things that I learned are:

- **Github** - To work efficiently with other co-workers, using platforms like github is a must. It is important to know the essential commands of github in order to increase productivity.
- **Axios** - Axios is a promise-based HTTP Client for node.js and the browser. It is used to make api calls. It has easier syntax and better error handling than JavaScript's out-of-the-box fetch function.
- **Mobx** - Mobx is a JavaScript library that makes state management in a React app simple and scalable. It makes it simple to connect the reactive data of your application with the UI.

### 8.1 Problems Faced During this Period & their Solutions

A feature that the client specifically asked for was selecting multiple units and view the selected units in a slide. However, this introduced a bug. In the "details" page of a unit or multiple units, if the page is reloaded the states reset and there are no units to show. The `selectedUnits` array becomes empty.

To resolve this issue, I saved the `selectedUnits` array into the browser's **localStorage**. This makes the array persist even on reload. The localStorage and the array gets cleared when unmounting the "details" component.

I also positioned the add-to-cart button and added a notification toast system which notifies the user of every interaction whether it is successful or not. The client also wanted the cart to be cleared automatically every 5 minutes, which could be done with a javascript `setTimeout` function.

# Chapter 9

## Future Work & Conclusion

### 9.1 Future Works

The Homeland project has plans to extend its user support and increase its user base. Better ways need to be discovered to reduce the cost of the owner organization and simultaneously improve the user experience. Some of our future works include:

1. **User support chat system** - Customers will be able to communicate directly with the management party without having the need to call them. A real-time chat system implemented with **SignalR** will provide the users an easy way of communication with the sellers.
2. **Cloud migration** - As a result of the worldwide pandemic, more and more organizations are moving to the cloud, redefining their products, and becoming more cost-effective, flexible, and inventive in their operations.
3. **Switch to Next.js** - Next.js is a React framework that allows you to create single-page Javascript apps. This framework has several advantages, both for our clients' applications and for our development team. We have decided to use Next.js for a number of reasons; focusing mainly on speed and performance. Next.js makes the **Server-Side-Rendering (SSR)** very easy.
4. **Discount on transfer** - This feature has been requested by Shukran, which involves giving the customer a discount based on the unit he/she transfers to another user. The percentage discount will be applied the next time he/she makes a purchase.

## **9.2 Conclusion**

Working as an intern with Avenir Solutions was a fantastic experience. My work with my coworkers has taught me a lot. They made me feel completely at ease working with technologies about which I knew very nothing. Despite the fact that I was having so many issues completing my project work, the others attempted to assist me as much as they could. The organization assisted me in developing confidence and professionalism, allowing me to smoothly transition into my professional job.

Homeland is Bangladesh's first online flat booking platform. Working on such a project has been a tremendous privilege for me.

The project taught me how to read and write codes while collaborating with others. I am currently thinking about pursuing a career as a React.js developer.

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