SE 505 : Software Project Lab - 2

Mapping The World

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1 Introduction

General knowledge about the world helps us better understand the surroundings and the issues that affect it. Having a broad and diverse knowledge base can help us be well-rounded and culturally aware individuals. But in the current scenario, often students and common people find it monotonous to learn about these topics. Also there's not many existing learning apps which present all information collaboratively with beneficial features.

So, we introduce- "MappingTheWorld", a world-map based website that can help students learn more about the world, with quizzing and chatting features.

1.1 Purpose

The goal of this project is to develop an engaging and entertaining learning method for anyone who wants to learn about global geography, history and other topics. It is a stereotype of our country to go for the science domain at school level, and studying in the domain of humanities is sometimes regarded as inferior. Students therefore do not pursue courses in the humanities. By using our website, students will discover the fascinating aspects of the humanities domain at a very young age, developing a passion and possibly shattering the stereotype. Existing students who study geography, history, and international culture will also find it useful for their study purpose. In order to assist kids in rapidly and easily memorizing the facts, our project will provide the information in an interactive way. We believe this project will have a beneficial effect on society.

1.2 Intended Audience

Those who will greatly benefit from the website are -

- Students who want to have enhanced learning experiences
- Job seekers who prepare for interviews that require general knowledge evaluation

- Any knowledge thrusters or quizzer who want improved resources and practice platform for quiz as well
- Any eduTech organization who wants to give their students better learning perspectives on geography and general knowledge
- People with disabilities

1.3 Conclusion

This software requirement specification is more than helpful to identify the owner and stakeholder of the project. We believe that an educational website that uses a world map as its foundation will make learning more accessible, engaging, and convenient for everyone. As this document is addressed as the bible of the project, the document content may evolve with the passage of modification and enhancement of the software whenever it is necessary.

2 Inception of the Mapping The World System

Requirements Engineering starts with the Inception phase. Its goal is to identify parallel needs and conflicting requirements among the stakeholders of a project. The foundation was established by following the subsequent factors:

2.1 Identifying the clients of our project

First, we have identified the location from where we will start our expedition. The students who want to gain general knowledge will act as a stakeholder. But there are other things related to this as well. So, we have to go through a systematic approach in order to identify all stakeholders. But over all people from all ages are expected to be our clients. We have analyzed our requirements with the consent of all types of users.

2.2 Icebreaking

Icebreaking refers to the fact that to diminish the communication barrier between you and the other person. It is a crucial part since it denotes the acceptance of our proposal. We started this phase by talking with various students from universities and colleges with context free languages. The students informally expressed their expectations. The response from the potential users was positive and they look forward to using the applications.

2.3 Identifying the stakeholders of the project

Stakeholder refers to any person or group who will be affected directly or indirectly by the system. Stakeholders include end-users who interact with the system and everyone else in an organization who may be affected by its installation. The stakeholders of our system are given below:

- Students
- Job_seekers
- Quizzers

- TechEdu Organizations

2.4 Identifying multiple viewpoints of the stakeholders

Different stakeholders expect different benefits from the system as every person has his own point of view. So, we have to recognize the requirements from multiple viewpoints. Different viewpoints of the stakeholders about the expected software are given below:

Students Viewpoint:

- Fun and interactive platform to learn
- Opportunities to take quizzes and test their knowledge
- Connection buildup with people all over the world

Job seekers viewpoint:

- Easy way of learning
- Regular checking of preparation without spending money

Quizzers viewpoint:

- Opportunity to quiz with people all over the world
- Practice quizzes regularly without cost

TechEdu Organization's viewpoint:

- Give their students a better enhanced platform
- Make learning more fun and interesting

2.5 Working towards Collaboration

Every stakeholder has their own requirements. There are some common and conflicting requirements of our stakeholders. That's why we followed the following steps to merge these requirements -

- Find the common and conflicting requirements.
- Categorize them.
- List the requirements based on stakeholder's priority points.
- Make final decisions about requirements.

2.5 Conclusion

The Inception phase helped us to establish a basic understanding about the system, identify the stakeholders who will be benefited, define the nature of the system and the tasks done by the system, and establish a preliminary communication with our stakeholders.

In our project, we have established a basic understanding of the problem, the nature of the solution that is desired and the effectiveness of preliminary communication and collaboration between the stakeholders and the software team. More studies and communication will help both sides (developer and client) to understand the future prospect of the project. Our team believes that the full functioning document will help us to define that future prospect.

3 Elicitation of the Mapping The World System

This chapter specifies the Elicitation phase.

3.1 Introduction

Requirements Elicitation is a part of requirements engineering that is the practice of gathering requirements from the users, customers and other stakeholders. Many difficulties were faced, like understanding the problems, making questions for the stakeholders, limited communication with stakeholders due to a short amount of time and volatility. Though it is not easy to gather requirements within a very short time, these problems have been surpassed in an organized and systematic manner.

3.2 Eliciting Requirements

The main task of this phase is to combine the elements of problem solving, elaboration, negotiation and specification. The collaborative working approach of the stakeholders is required to elicit the requirements. The following tasks were done for eliciting requirements-

● Collaborative Requirements Gathering
● Quality Function Deployment
● Usage Scenarios
● Elicitation work products

3.2.1 Collaborative Requirements Gathering

We have met with some stakeholders in the Inception phase such as the teachers and examinees. These meetings created an indecisive state for us to elicit the requirements. To solve this problem, we have met with the stakeholders (who are playing a vital role in the whole process) again to elicit the requirements.

3.2.2 Quality Function Deployment

Quality Function Deployment (QFD) is a quality management technique that translates the needs of the clients into technical requirements for the software. The prime concern of the QFD is customer

satisfaction maximization. In order to ensure this, QFD enforces an understanding of what customers describe as 'valuable' and then deploys these values throughout the engineering process.
QFD defines three types of requirements:

● Normal Requirements
● Expected Requirements
● Exciting Requirements

3.2.2.1 Normal Requirements

Normal requirements are generally the objectives and goals that are stated for a product or system during meetings with the customer. The presence of these requirements fulfills customers' satisfaction. These are the normal requirements for our project.

- A world map will be shown with various options such as -
    - History
    - Culture
    - General Facts (Population, Capital, Official Language)

    The user will be able to choose an option and by clicking on a country, the information of that country will be shown on the screen.
- A world map will be displayed and the oceans and seas will be marked. Upon clicking on a particular sea or ocean, the user will be able to gain information about that.
- By clicking on the sports tab, the user will get two options.
    - Cricket
    - Football

    By clicking on any of the options, the cricket or football playing countries of the world will be marked on the world map and by clicking on any of the marked countries the user will be able to view information related to that country's sports.
- By clicking on the tab, users will be able to see the countries that follow communism or have an existing monarchy marked on the world map.
- By clicking this tab, the countries with most iconic tourist destinations will be marked and upon clicking on any of the countries, the user will be able to view information about those destinations.
- By clicking on this tab, the user will get some options like - SAARC, ASEAN, GCC etc and see those countries marked in the map.
- The user will be able to play two types of quizzes.
    - MCQ: Admin will set some predefined questions with 4 options. User needs to guess the correct answer.

- Gaming quiz: The user will see an unmarked map and a country name will be shown on the screen. The user has to click on the location of the country based on the name shown on the screen.
- Number of users active from a country will be shown in the map and by sending chat requests, different people from the world will be able to chat with each other.

3.2.2.2 Expected Requirements

The requirements that are implicit to the system might not be brought up during the meeting because of their fundamental nature. Despite not being explicitly mentioned, their presence must be ensured. Otherwise, the product will leave customers dissatisfied. These requirements are called expected requirements and these are stated below:

- Registered users can know other users' countries and can chat across the world.
- Two types of users can create accounts. Then users can login by providing correct information.
  - Admin - change informations
  - User - chat, play quiz
- Gamification in quiz system
- There will be an option for password recovery.

3.2.2.3 Exciting Requirements

These requirements are for features that go beyond the customer's expectations and prove to be very satisfying when present. Following are some exciting requirements of our project.

- A 3D country map, nation hero and 3D flag of the country will be shown using AR.
- Voice command implementation about information for each country in Bangla language for accessibility.

3.3 Usage Scenario

Mapping The World is a website with many features to learn all about the countries of the world including a real time chatting system, quiz, question answer forum for creating an interactive platform for anyone around the world.

The website consists of five major modules, which are :
1. Sign Up/ Login
2. Countries
3. Ocean & Seas
4. Quiz
5. Chat

After opening the application the user will be able to see the following tabs:

6. **Sign Up/ Login:** There will be two types of users for this application.
   a. Admin: Predefined account for admin will be created and admin will be able to change any information within the application and manage user profile.
   b. User: Firstly, the user needs to register with necessary information (Full Name, User Name, Email id, Country, Password). After registration, the user can login by providing the correct username and password.
   c. Password Recovery: Furthermore, there will be an option for password recovery. If the user forgets his password, an OTP will be generated and sent to the provided email address. By providing the correct OTP, the user can reset his password.

7. **Countries:** By clicking this tab, all types of users will find various options such as -
   a. **General facts:** (Population, Capital, Official Language)
   b. **History:** significant events related history
   c. **Culture:** literature, music
   d. **Sports:** By clicking on the sports tab, the user will be able to choose between popular sports such as football and cricket. Upon clicking an option, the user will be able to see the football and cricket playing nations marked on the map and by clicking on the marked nation the user will be able to see some information about that country's achievements in those sports or renowned players etc.
   e. **Forms of Government:** By clicking on the tab, users will be able to see the countries that follow communism or have an existing monarchy.
   f. **Travel:** By clicking this tab, the countries with most iconic tourist destinations will be marked and by clicking the marked countries, the user will be able to see the famous destination related information and some pictures.
   g. **Unions:** By clicking on this tab, the user will get some options like - SAARC, ASEAN, GCC, Nordic countries, Baltic countries etc and see those countries marked in the map.

   By clicking any of the options, the user will see a world map and by clicking any country the user will be able to see above information depending upon the option chosen.

8. **Ocean and Seas:** By choosing this option, all types of users will be able to click on any of the ocean or sea of the world and can view physiographic, geologic features and economic aspects about that particular choice.

9. **Quiz:** For using this feature, the user will have to sign up and login. The registered user can play two types of quizzes.
    a. **Multiple choice question:** Admin will set some predefined questions with 4 options. User needs to guess the correct answer.
    b. **Gaming quiz:** The user will see an unmarked map and a country will be shown on the screen. The user has to click on the location of the country based on the name shown on the screen and if the answer is correct, he will gain points and score will be updated.

    The quiz will be played in rounds and by completing each round there will be a level up. A leaderboard of the top scorer of the month will be shown on a dashboard.

10. **Chat:** For using this feature, the user will have to sign up and login and then will see the map and number of users active from a country will be shown in the map. Then users can send chat requests and users can accept or deny it. By accepting it, different people from the world will be able to send text messages to each other and chat.

4. Scenario Based Modeling

This chapter describes the Scenario Based Model for the "MappingTheWorld".

4.1 Introduction

When developing software, user satisfaction is given the highest priority. If we understand how end users (and other actors) want to interact with a system, our software team will be better able to properly characterize requirements and build meaningful analysis and design models. Thus, requirements begin with scenario generation in the form of use cases, activity diagrams and swimlane diagrams.

4.2 Definition of use case

A Use Case captures a contract that describes the system behavior under various conditions as the system responds to a request from one of its stakeholders. In essence, a Use Case tells a stylized story about how an end user interacts with the system under a specific set of circumstances. A Use Case diagram simply describes a story using corresponding actors who perform important roles in the story and makes the story understandable for the users.

The first step in writing a Use Case is to define that set of "actors" that will be involved in the story. Actors are the different people that use the system or product within the context of the function and behavior that is to be described. Actors represent the roles that people play as the system operators. Every user has one or more goals when using the system.

Primary Actor

Primary actors interact directly to achieve required system function and derive the intended benefit from the system. They work directly and frequently with the software.

Secondary Actor

Secondary actors support the system so that primary actors can do their work. They either produce or consume information.

4.3 Use case diagrams

Use case diagrams give the non-technical view of the overall system.

Level: 0
Name: MappingTheWorld
Primary Actor: Admin, Registered User, Non Registered User
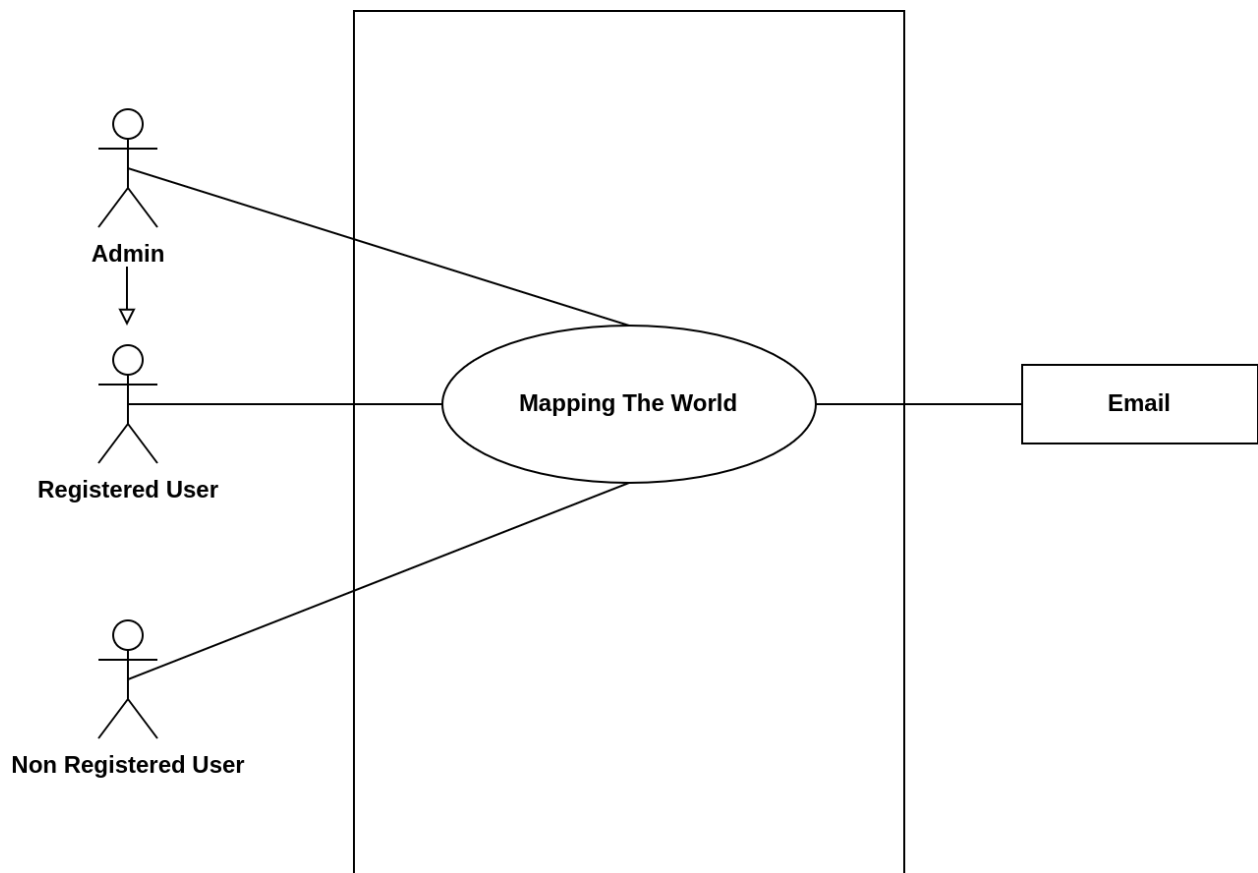Secondary Actor: Email

Figure1: MappingTheWorld

Level: 1
Name: MappingTheWorld (detailed)
Primary Actor: Admin, Registered User, Non Registered User
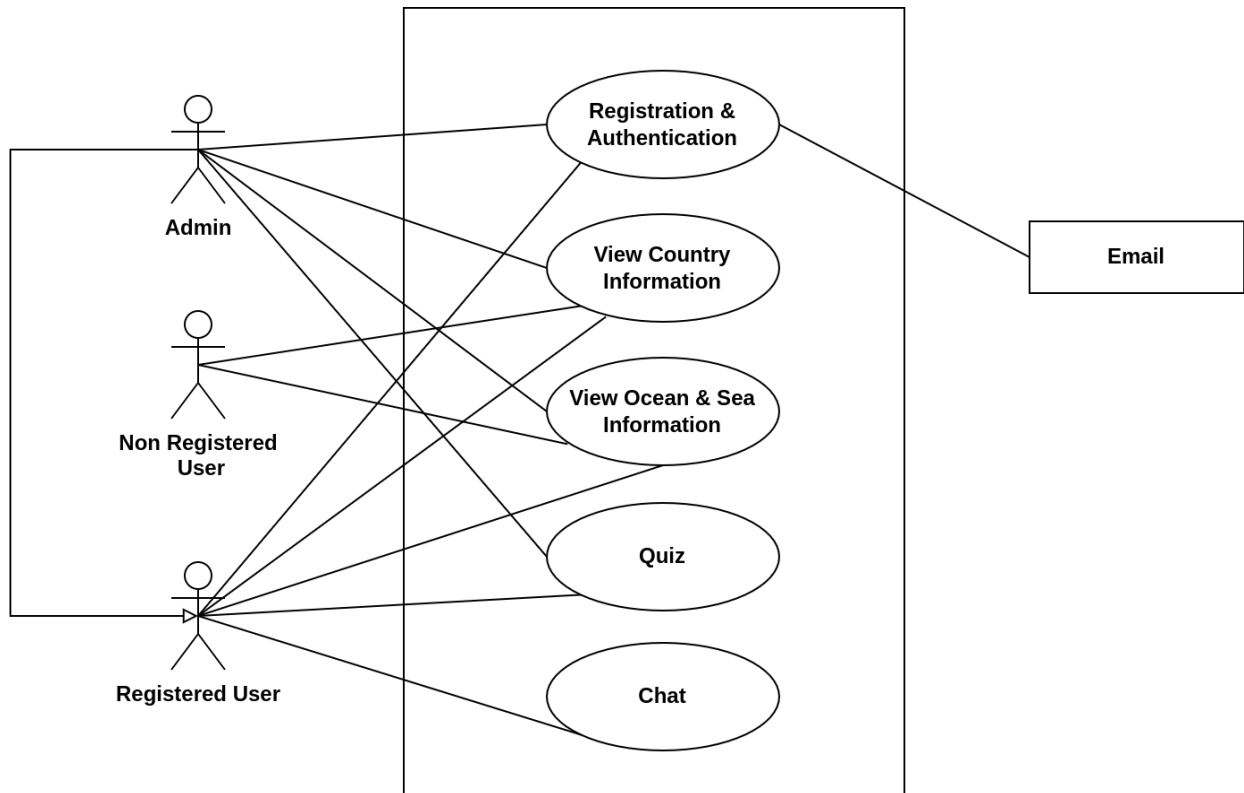Secondary Actor: Email

Figure2: MappingTheWorld

Description of Use Case Level 1

Registration & Authentication: There will be two types of users for this application. Admin and user. A predefined account for admin will be created and admin will be able to change any information within the application and manage user profile. The user needs to register with necessary information (Full Name, User Name, Email id, Country, Password). After registration, the user can login by providing the correct username and password. Furthermore, there will be an option for password recovery.

View Country Information: By clicking this tab, all types of users will find various options such as General facts, History, Culture, Sports, Forms of Government, Travel, Unions. By clicking any of the options, the user will see a world map and by clicking any country the user will be able to see above information depending upon the option chosen.

View Ocean & Sea Information: By choosing this option, all types of users will be able to click on any of the ocean or sea of the world and can view physiographic, geologic features and economic aspects about that particular choice.

Quiz: For using this feature, the user will have to sign up and login. The registered user can play two types of quizzes. Multiple choice question and gaming quiz.

Chat: For using this feature, the user will have to sign up and login and then will see the map and number of users active from a country will be shown in the map. Then users can send chat requests and by accepting it, different people from the world will be able to send text messages to each other.

Level: 1.1
Name: Registration & Authentication
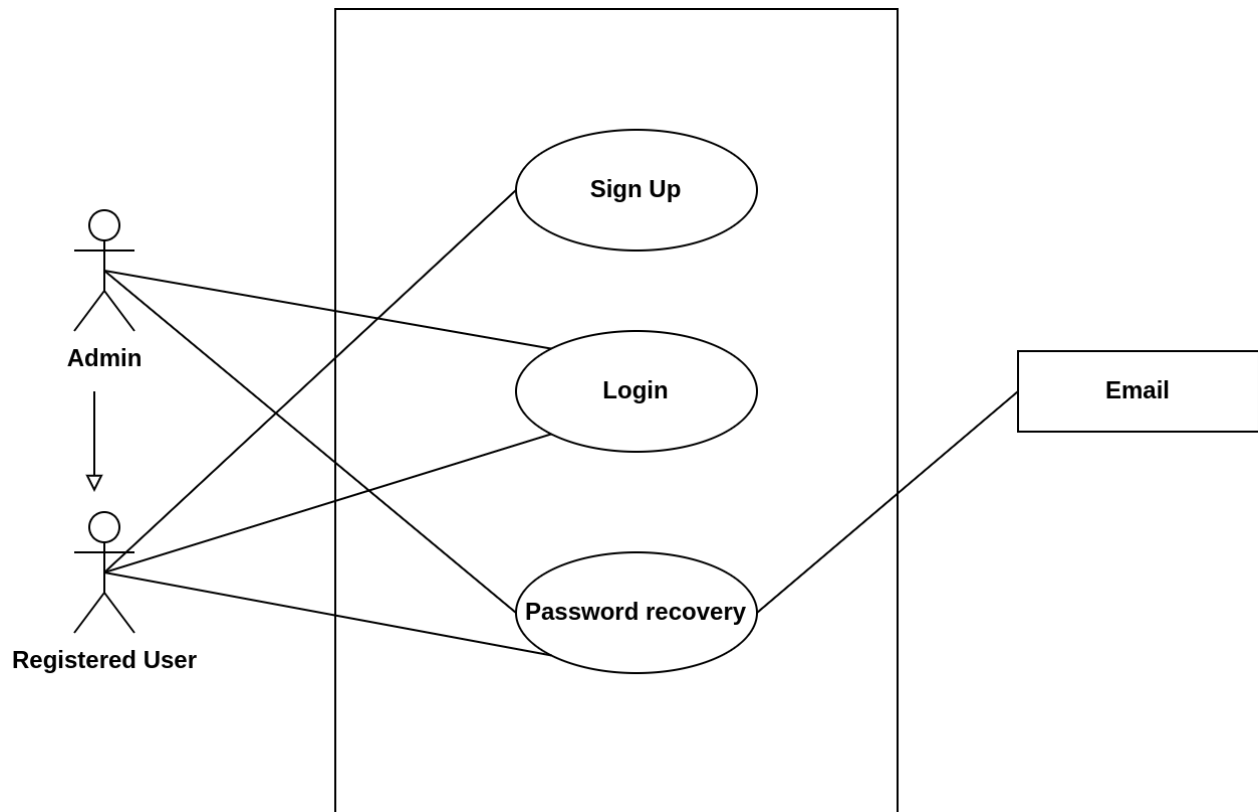Primary Actor: Admin, Registered User

Secondary Actor: Email

Figure3: Registration & Authentication

Description of Use Case Level 1.1:

Sign Up: To register in the system, the users need to sign up by providing information (Full Name, User Name, Email id, Country, Password)

Login: After registration, the user can login by providing the correct username and password.

Password Recovery: Furthermore, there will be an option for password recovery. If the user forgets his password, an OTP will be generated and sent to the provided email address. By providing the correct OTP, the user can reset his password.

Action & Reply:

Action1: Admin, Registered User provide name, username, country, email id, password.

Reply1: It stores in the system.

Action2: For login, Admin, Registered User provide name, username, country, email id, password.
Reply2: System matches info.

Action3: If the user forgets his password, an OTP will be generated and sent to the provided email address.
Reply3: By providing the correct OTP, the user can reset his password.

Level: 1.2
Name: View Country Information
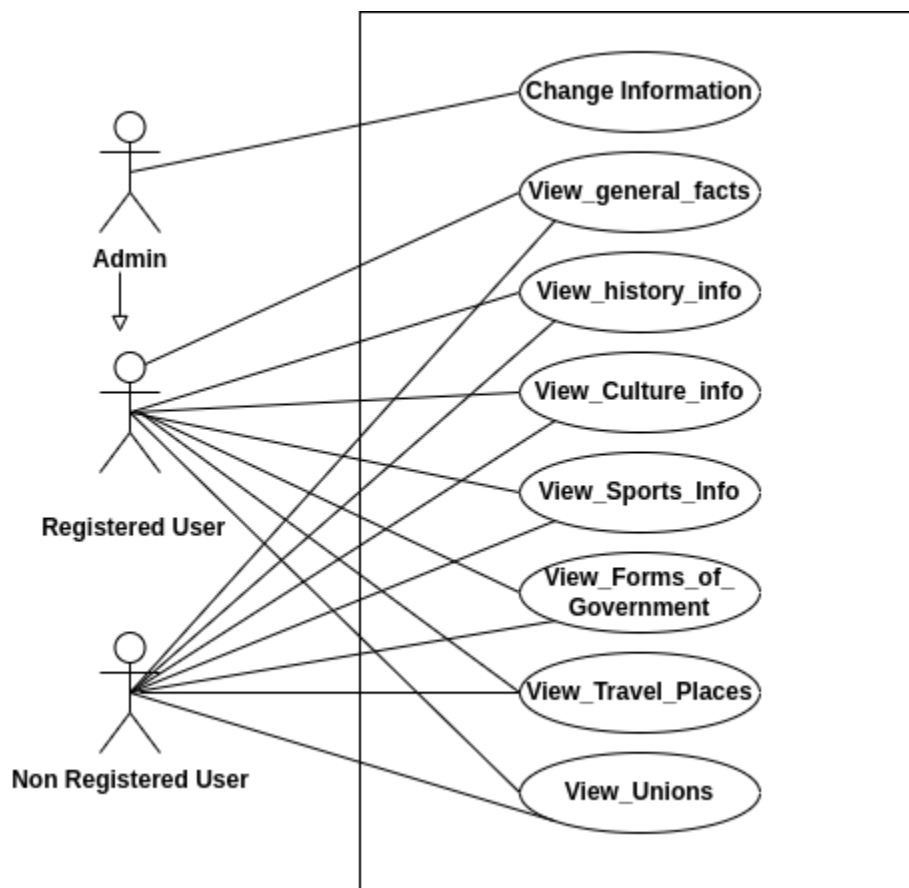Primary Actor: Admin, Registered User, Non Registered User

Figure4: View Country Information

Description of Use Case Level 1.2:

Change Information: Admin can change the information.

View General Facts: General facts (Population, Capital, Official Language) will be shown.

View History Info: Significant events related history information will be shown.

View Culture Info: literature, music related information will be shown.

View Sports Info: The user will be able to choose between popular sports such as football and cricket. Upon clicking an option, the user will be able to see the football and cricket playing nations marked on the map and by clicking on the marked nation the user will be able to see some information about that country's achievements in those sports or renowned players etc.

View Forms of Government: Users will be able to see the countries that follow communism or have an existing monarchy.

View Travel Places: The countries with most iconic tourist destinations will be marked and by clicking the marked countries, the user will be able to see the famous destination related information and some pictures.

View Unions: The user will get some options like - SAARC, ASEAN, GCC, Nordic countries, Baltic countries etc and see those countries marked in the map.

Action & Reply:

Action1: User clicks any of the options.
Reply1: System shows the required information.

Level: 1.3
Name: View Ocean & Sea Information
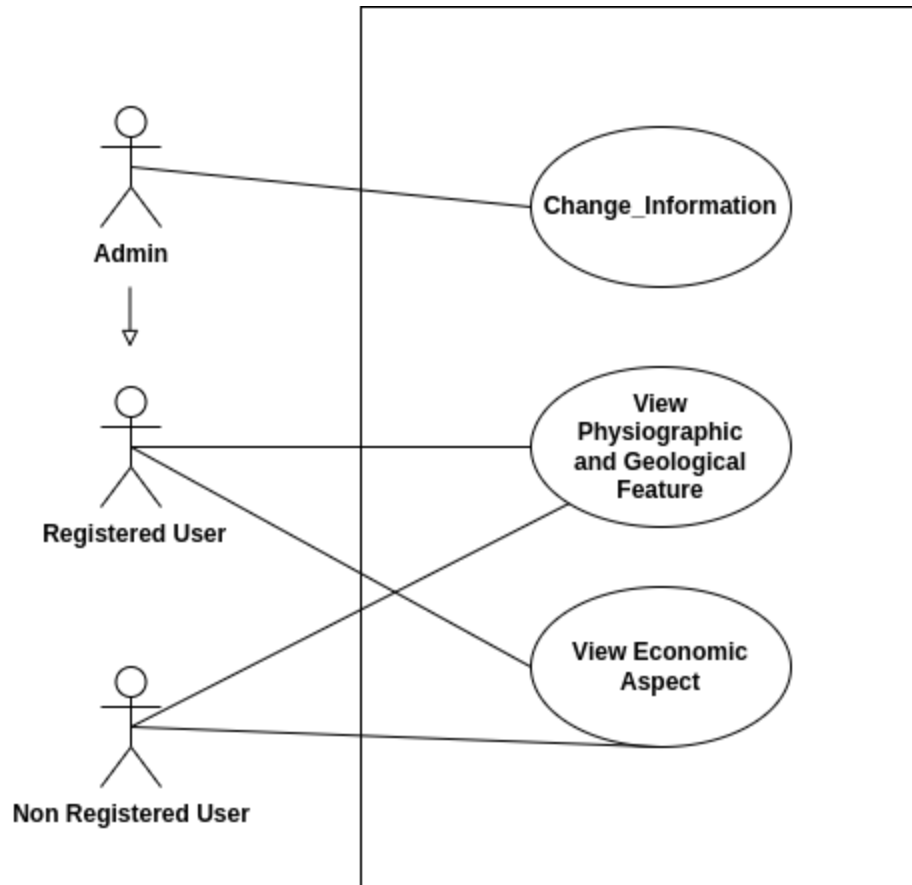Primary Actor: Admin, Registered User, Non Registered User

Figure5: View Ocean & Sea Information

Description of Use Case Level 1.3:

Change Information: Admin can change the information.

View Physiographic and Geological Info: Physiographic and geologic information will be shown.

ViewEconomic Aspect: Economic aspect related information will be shown.

Action & Reply:

Action1: User clicks any of the options.
Reply1: System shows the required information.

Level: 1.4
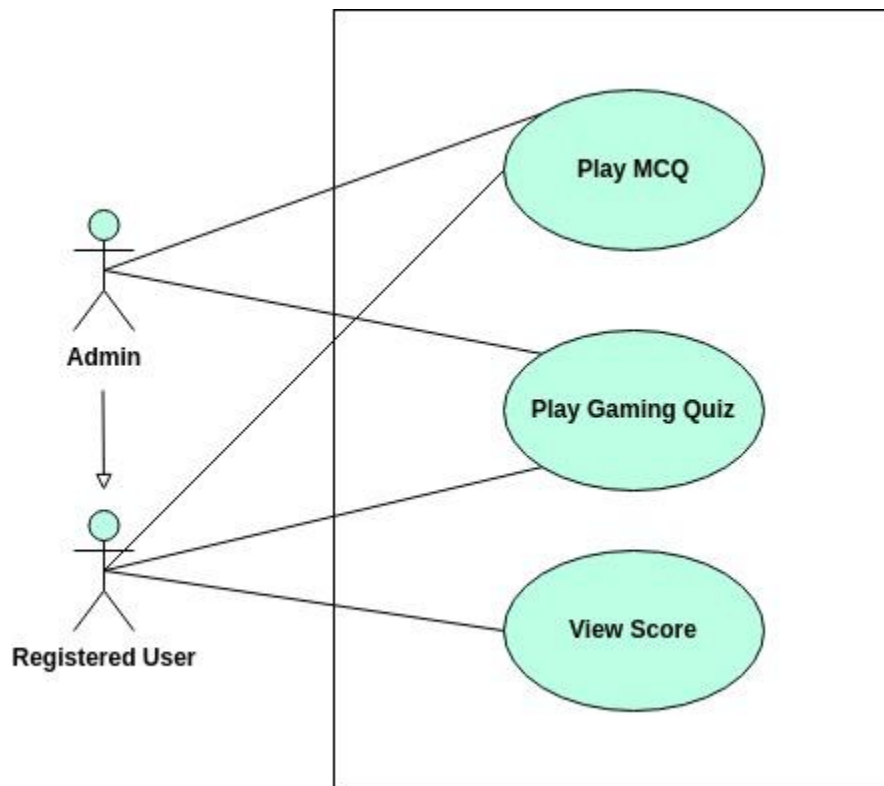
Name: Quiz
Primary Actor: Admin, Registered User

Figure6: Quiz

Description of Use Case Level 1.4:

Practice MCQ: Registered users and admin can practice mcq.

Play Gaming Quiz: Registered users and admin can play gaming quizzes.

View Score: Registered users can view their score.

Action & Reply:

Action1: Admin set questions and answers for multiple choice questions.
Reply1: It stores in the system.

Action2: Registered users see the questions and choose an option.
Reply2: System checks the answer.

Action3: Registered users see an unmarked map and click the location.
Reply3: System will check it.

Action4: Users want to view the score.
Reply4: System will view the score.

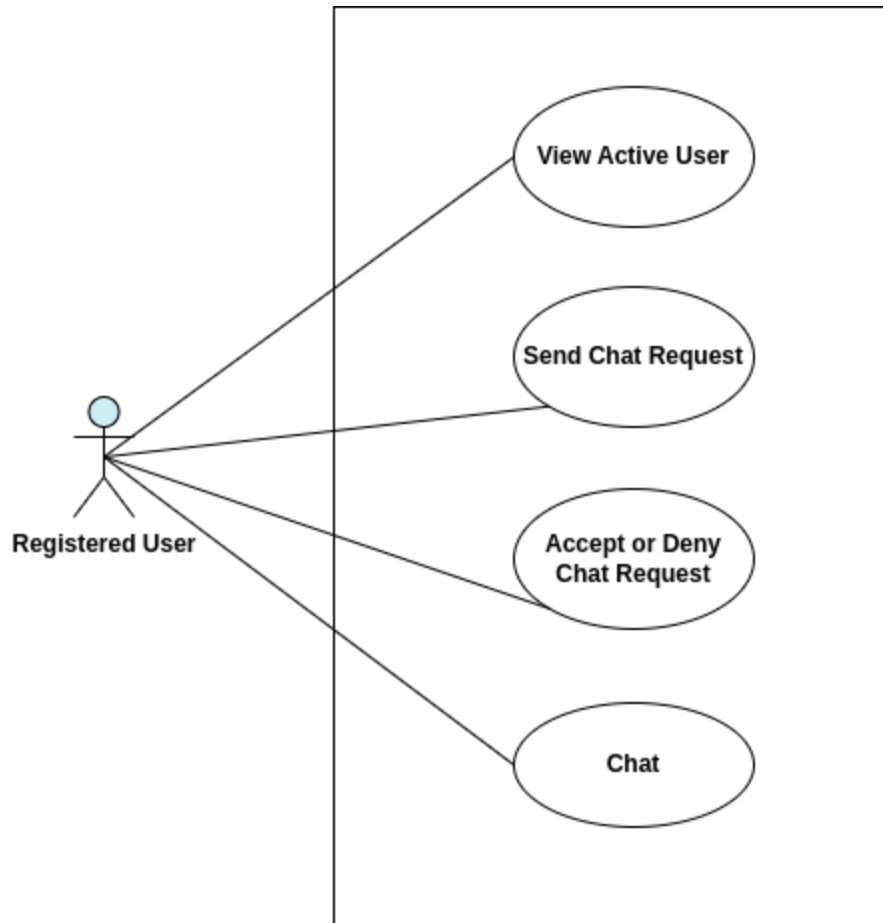## Level: 1.5
Name: Chat
Primary Actor: Registered User

Figure7: Chat

Description of Use Case Level 1.5:

View Active User: Registered users can see active users list.

Send Chat Request: Registered users can send requests for chat to registered users.

Accept or Deny Chat Request: User can accept or deny request.

Chat: After accepting the request, users can chat.

Action & Reply:

Action1: Users see active user list and send requests.
Reply1: If the receiver accepts it, they can chat.

4.4 Activity Diagrams

Level: 1

Name: MappingTheWorld (detailed)
Reference: Use Case Level 1

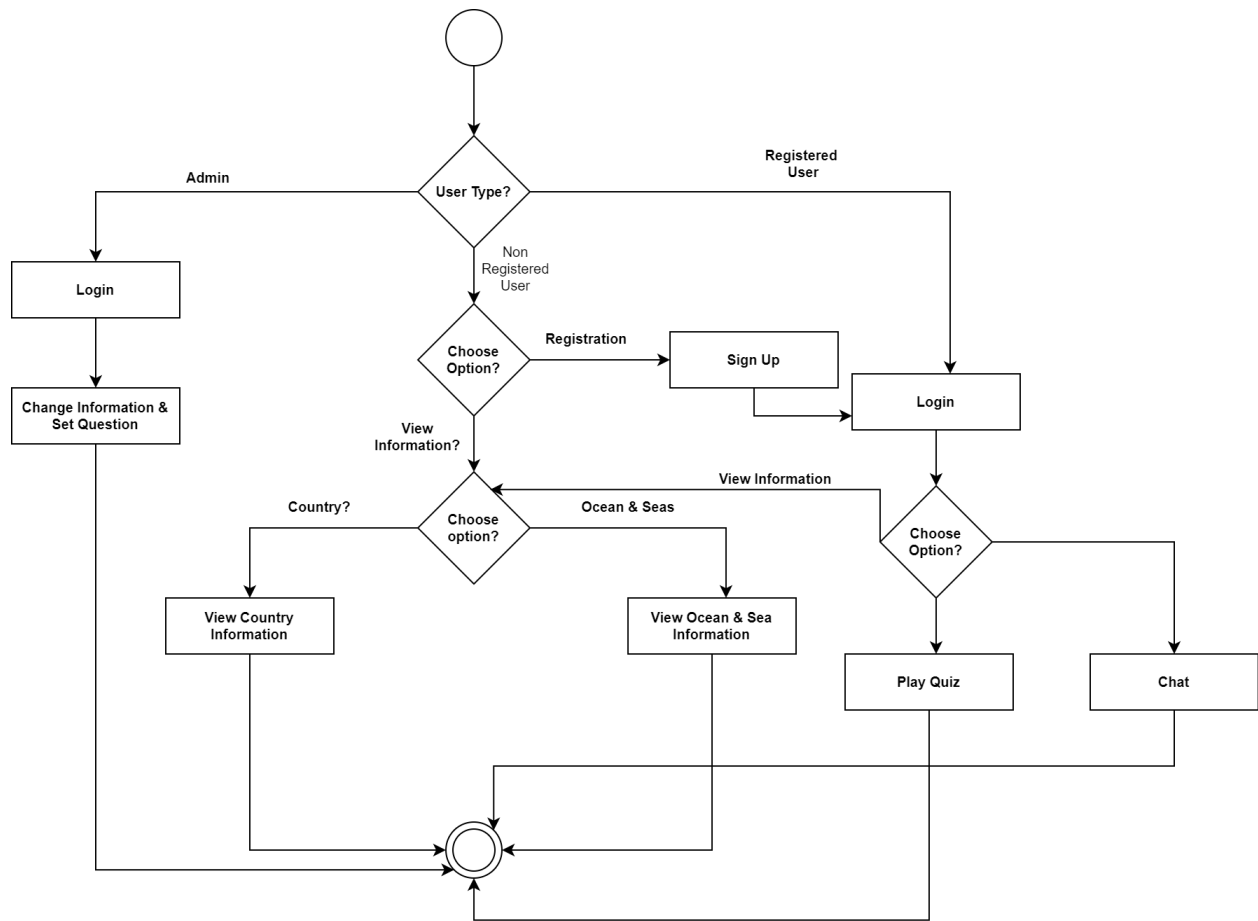Figure8: Activity diagram of level 1

Level: 1.1

Name: Registration & Authentication
Reference: Use Case Level 1.1

Figure9: Activity diagram of level 1.1

Level: 1.2

Name: View Country Information
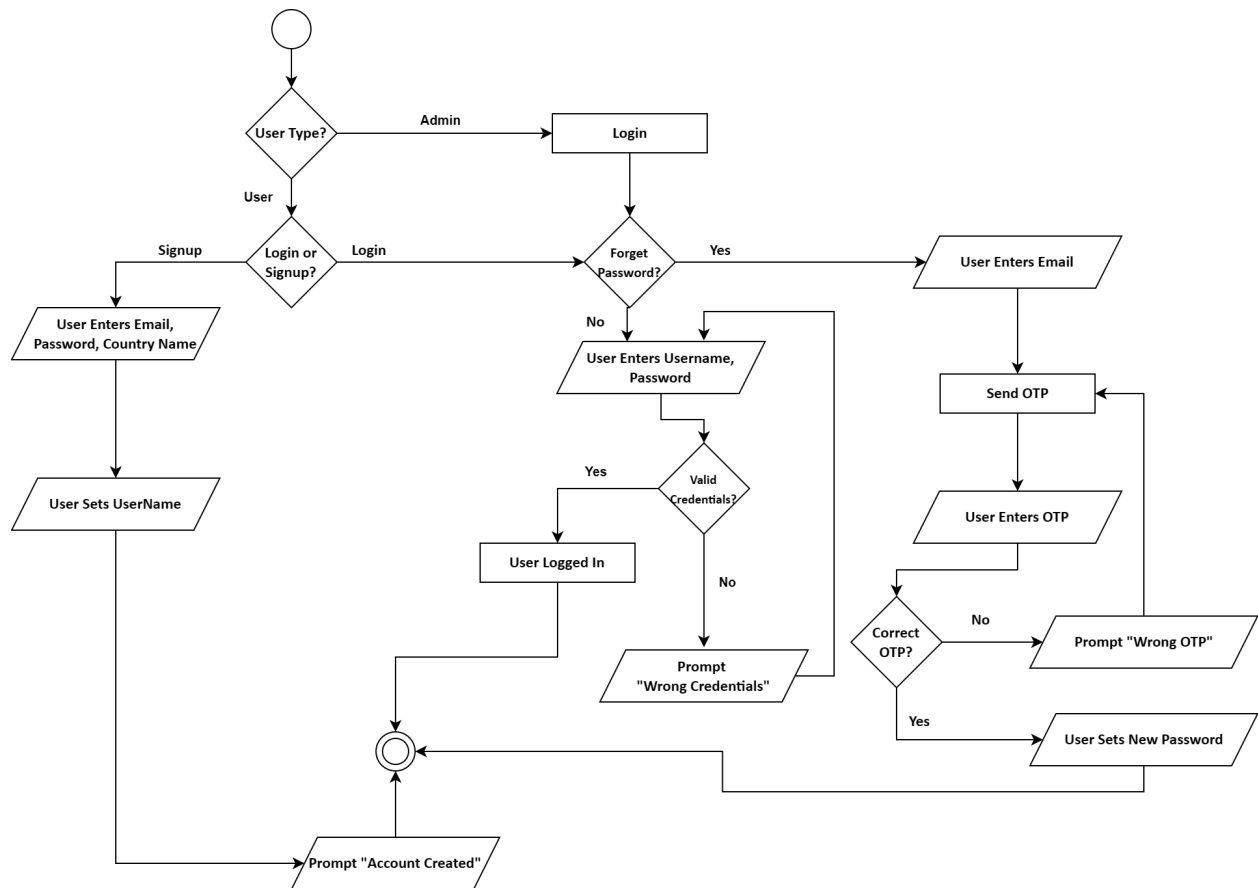Reference: Use Case Level 1.2
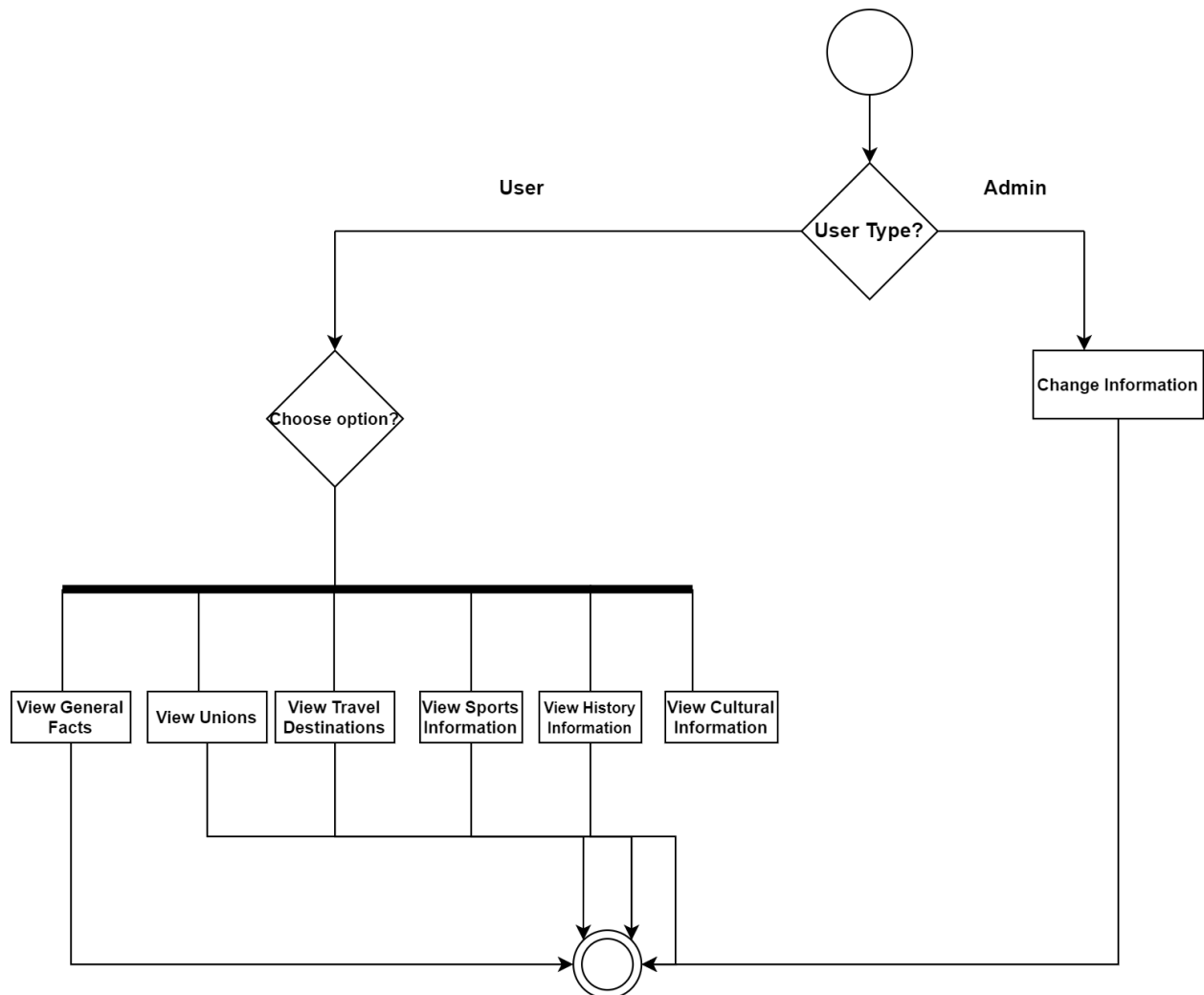
Figure10: Activity diagram of level 1.2

Level: 1.3
Name: View Ocean & Sea Information
Reference: Use Case Level 1.3
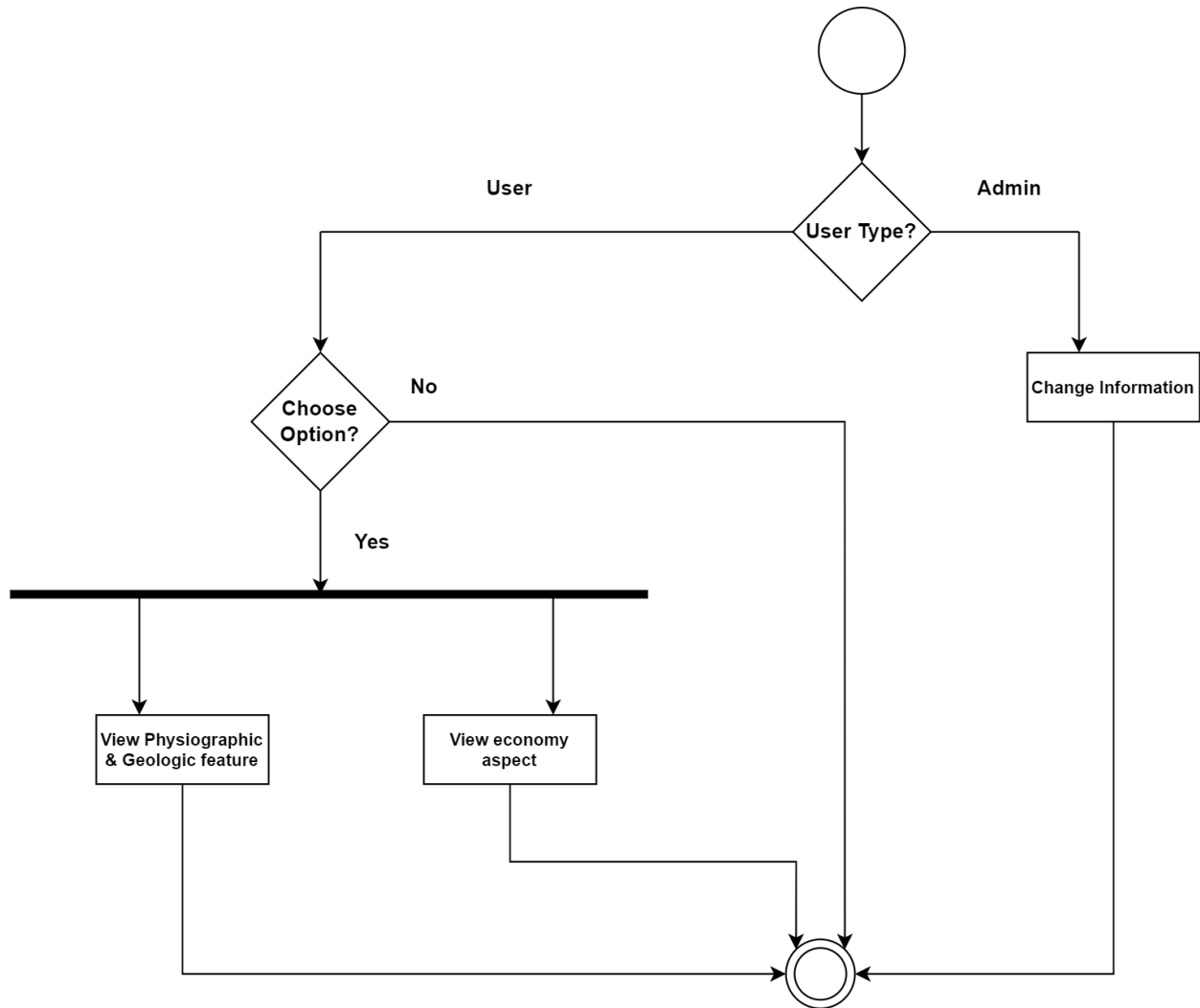
Figure11: Activity diagram of level 1.3

Level: 1.4

Name: Quiz
Reference: Use Case Level 1.4
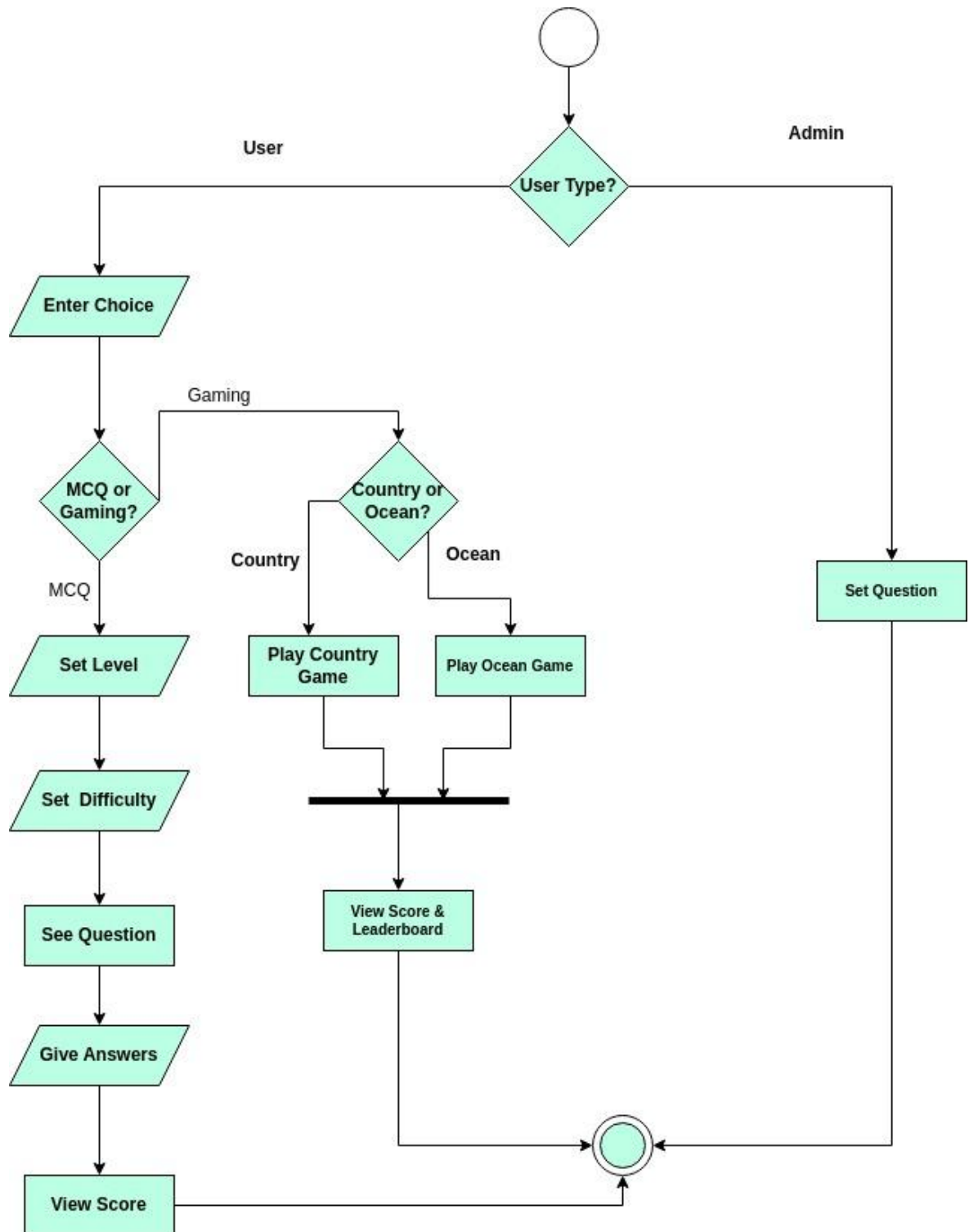
Figure12: Activity diagram of level 1.4

Level: 1.5

Name: Chat
Reference: Use Case Level 1.5
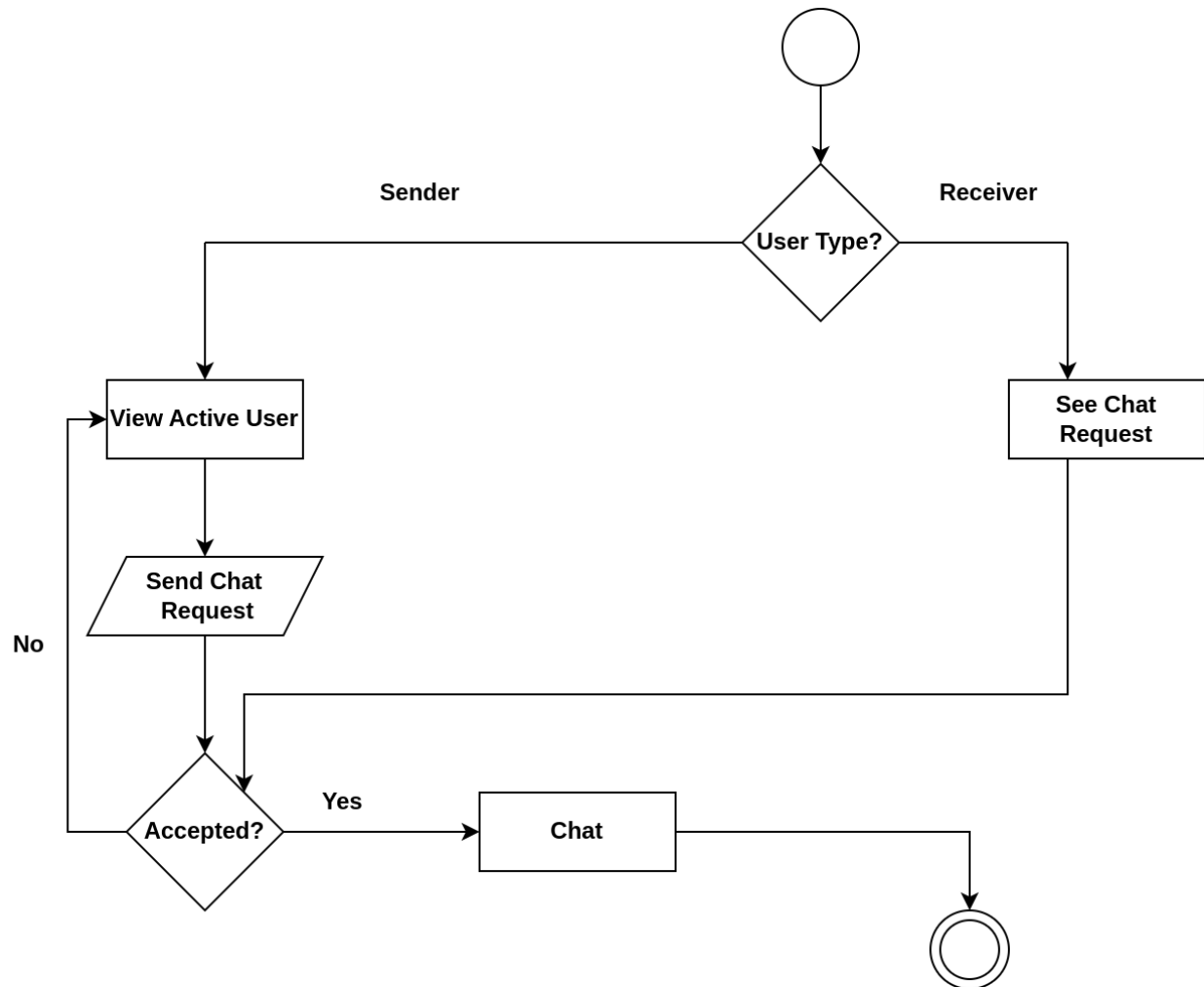
Figure13: Activity diagram of level 1.5

4.5 Swimlane Diagram

Level: 1
Name: MappingTheWorld(detailed)
Reference: Activity Diagram Level 1

Figure14: Swimlane diagram of level 1

Level: 1.1

Name: Registration & Authentication
Reference: Activity Diagram Level 1.1

Figure15: Swimlane diagram of level 1 .1

Level: 1.2

Name: View Country Information
Reference: Activity Diagram Level 1.2
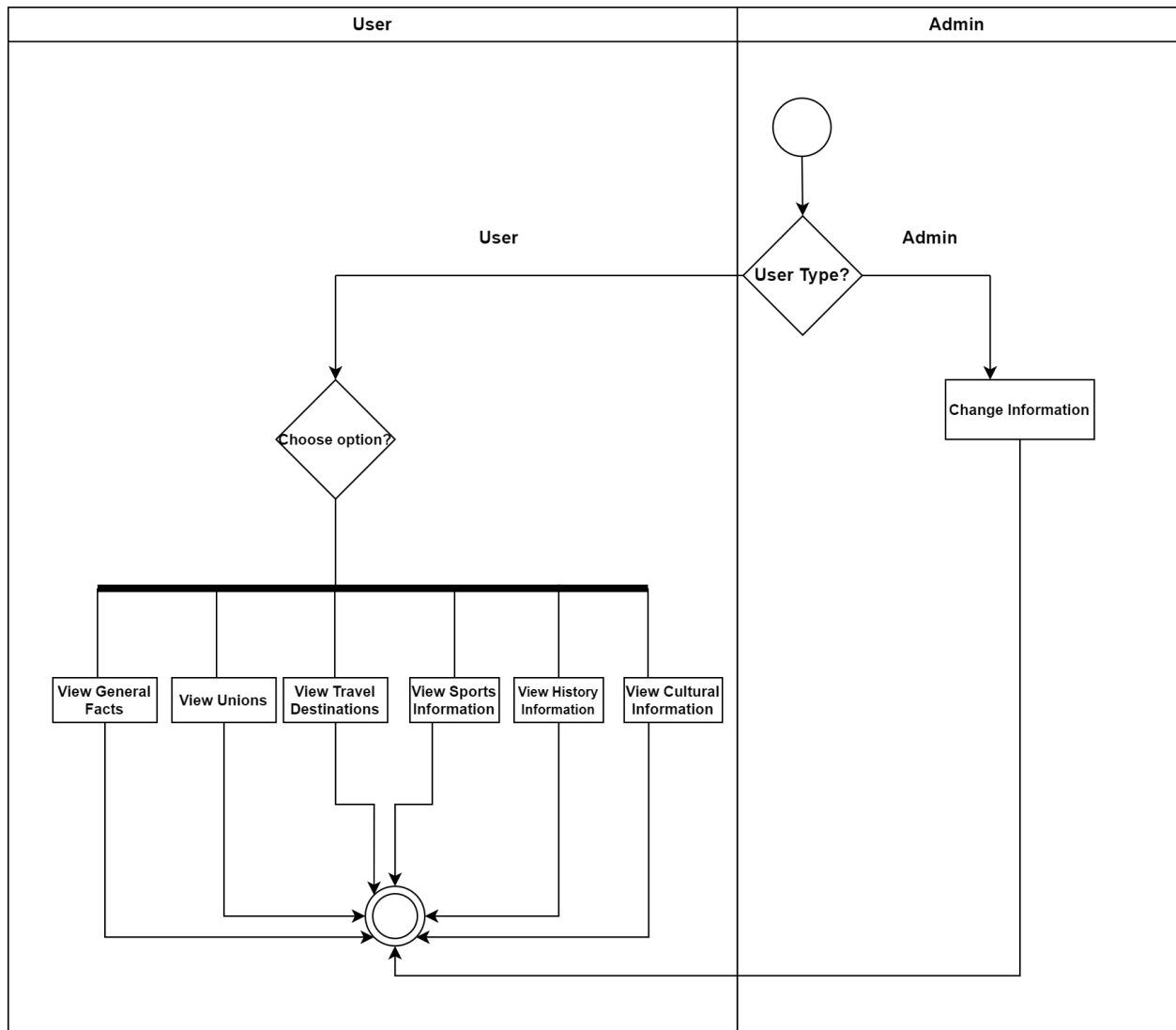
Figure16: Swimlane diagram of level 1 .2

Level: 1.3

Name: View Ocean & Sea Information
Reference: Activity Diagram Level 1.3
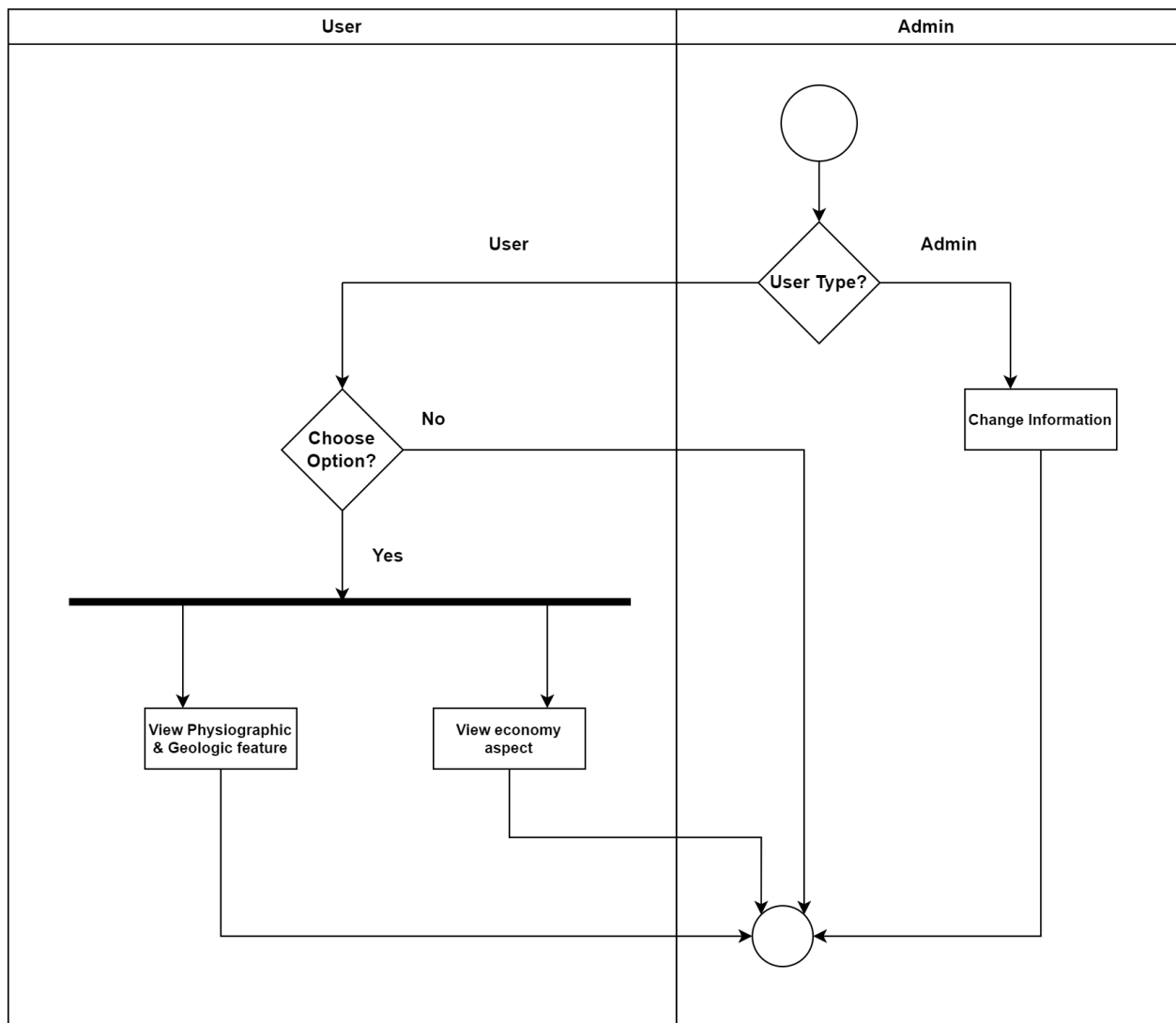
Figure17: Swimlane diagram of level 1 .3

Level: 1.4

Name: Quiz

Reference: Activity Diagram Level 1.4
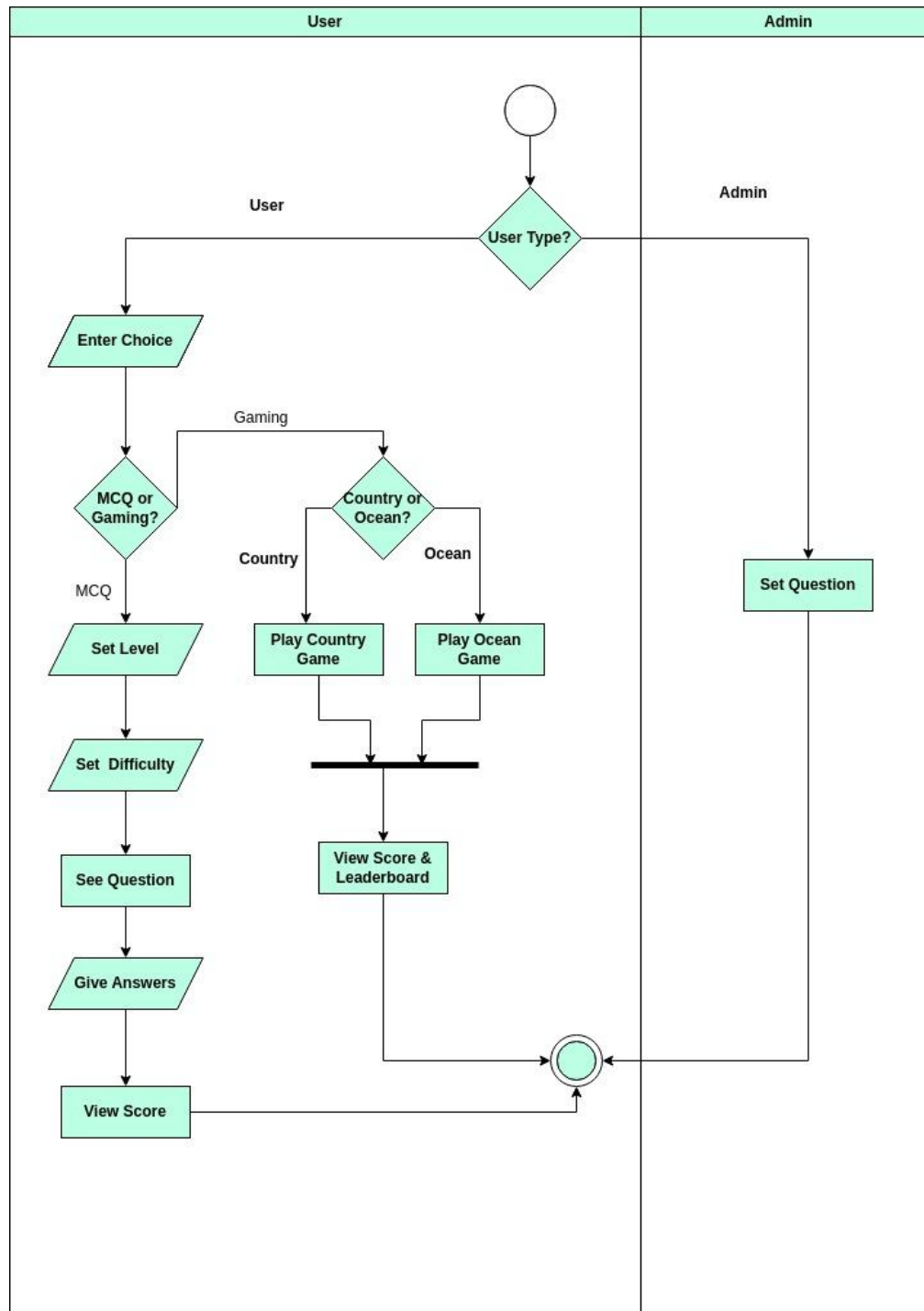
Figure18: Swimlane diagram of level 1 .4

Level: 1.5
Name: Chat
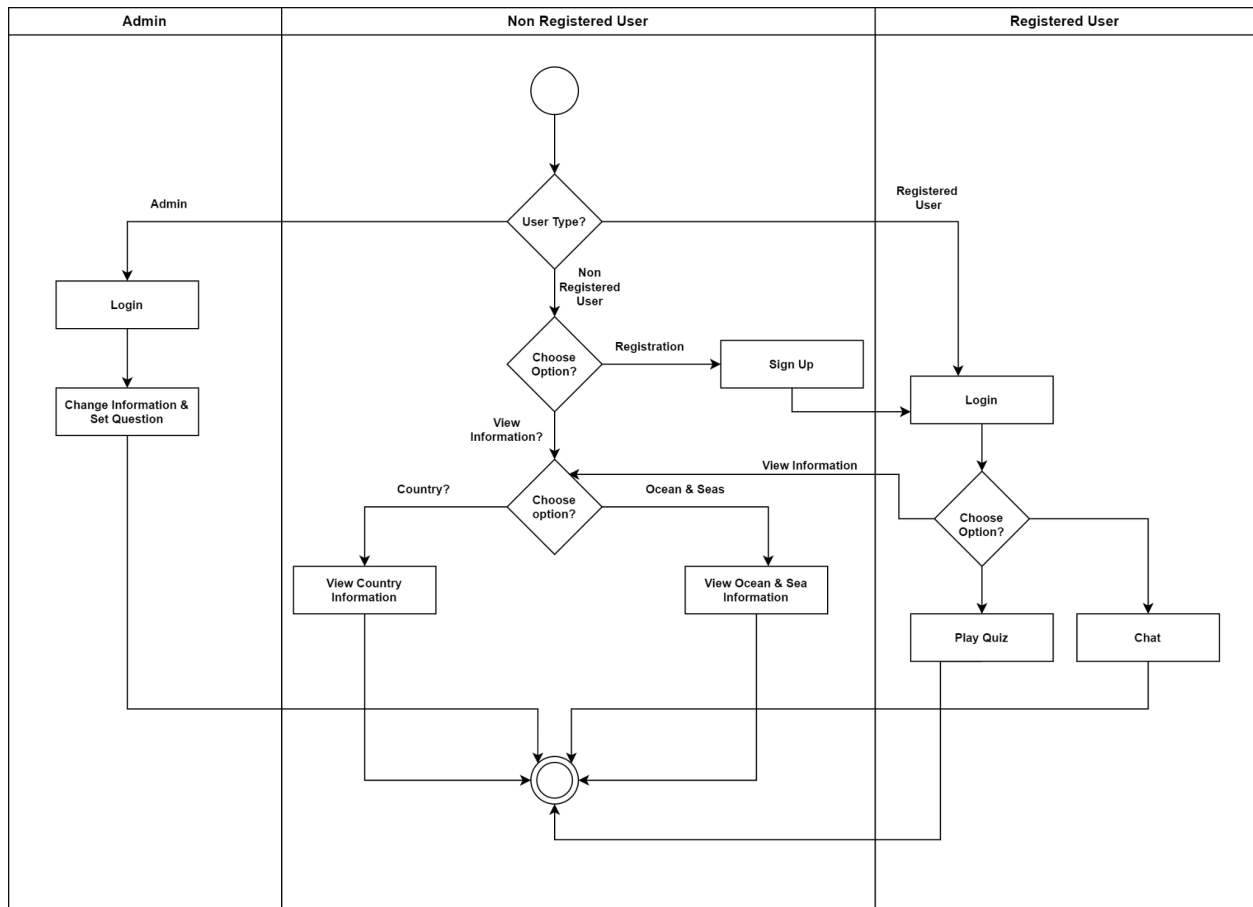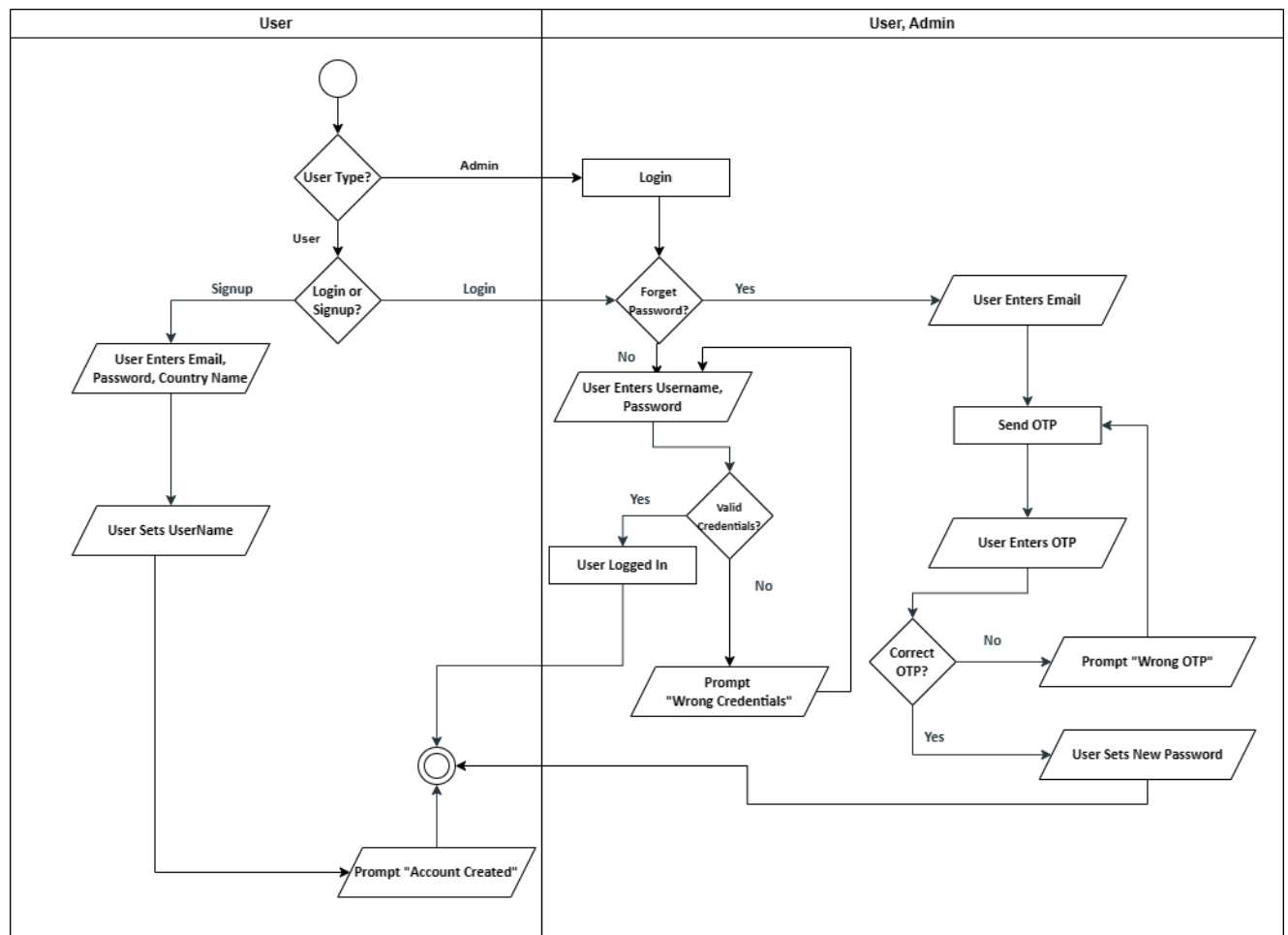Reference: Activity Diagram Level 1.5
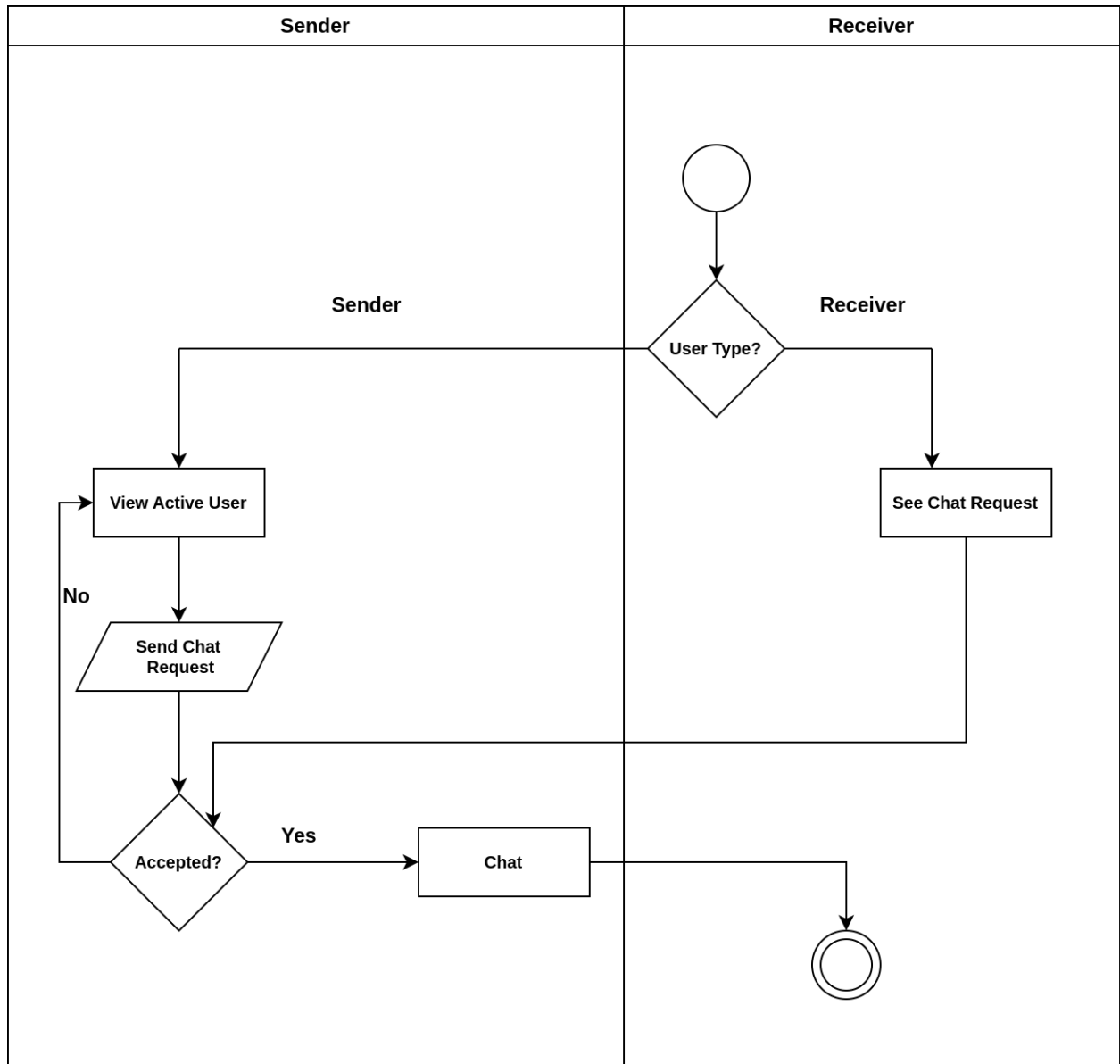
Figure19: Swimlane diagram of level 1 .5

5. Data Based Modeling

5.1 Data Modelling Concept

If software requirements include the necessity to create, extend or interact with a database or complex data structures need to be constructed and manipulated, then the software team chooses to create data models as part of overall requirements modeling. The entity relationship diagram (ERD) defines all data objects that are processed within the system, the relationships between the data objects and the information about how the data objects are entered, stored, transformed and produced within the system.

5.2 Data Objects

A data object is a representation of composite information that must be understood by the software. Here, composite information means information that has a number of different properties or attributes. A data object can be an external entity, a thing, an occurrence, a role, an organizational unit, a place or a structure.

5.2.1 Data object identification :

Serial No	Noun	Problem/ Solution Space	Attribute
1.	Website	s	
2.	Features	s	
3.	World	s	
4.	Real time chatting system	s	
5.	Quiz	s	54, 67, 68

6.	Platform	s	
7.	Modules	s	
8.	Countries	s	27, 31, 32, 35, 37, 40, 42
9.	Ocean & Seas	s	49, 50, 51
10.	Chat	s	
11.	Application	s	
12.	Tabs	s	
13.	User	s	19, 20, 21, 22, 23, 26
14.	Account	s	
15.	Admin	s	
16.	Information	s	
17.	Registration	s	
18.	User information	s	
19.	Full Name	s	
20.	User Name	s	
21.	Email id	s	
22.	Country	s	
23.	Password	s	
24.	Option	s	
25.	Password recovery	p	
26.	OTP	s	
27.	General facts	s	
28.	Population	s	
29.	Capital	s	
30.	Official Language	s	

31.	History	s	
32.	Culture	s	
33.	Literature	s	
34.	Music	s	
35.	Sports	s	
36.	Football	s	
37.	Forms of Government	s	
38.	Communism	s	
39.	Monarchy	s	
40.	Tourist destinations	s	
41.	Pictures	s	
42.	Unions	s	
43.	SAARC	s	
44.	ASEAN	s	
45.	GCC	s	
46.	Nordic countries	s	
47.	Baltic countries	s	
48.	Unmarked map	p	
49.	Physiographic	s	
50.	Geologic features	s	
51.	Economic aspects	s	
52.	Multiple choice question	s	53, 54, 55
53.	Predefined questions	s	
54.	Options	s	
55.	correct answer	s	

56.	Gaming quiz	s	
57.	Location	p	
58.	Screen	s	
59.	XP Points	s	
60.	Rounds	s	
61.	Leaderboard	s	
55.	Cricket	s	
56.	Playing nations	s	
57.	Map	s	
58.	Achievements	s	
59.	Top scorer	s	
60.	Sports players	s	
61.	Month	s	
62.	Dashboard	s	
63.	Active users	s	
64.	Text messages	s	
65.	Registered user	s	
66.	Active status	s	
67.	Level	s	
68.	Score	s	
75.	Web scraping	s	

5.2.2 Selected Data Objects:

1. User
2. Countries
3. Ocean & Sea
4. Quiz
5. Multiple Choice Question

Analysis

We can see that there is a many to many relationship between user and quiz. So, there will be another data object named "user_plays_quiz" and attributes will be email, quiz_id and total score.

There is one to many relationship between quiz and mcq. So quiz_id will be foreign key in mcq.

So, final data objects are:
1. User
2. Countries
3. Ocean & Sea
4. Quiz
5. Multiple Choice Question
6. Plays

5.3 ER Diagram
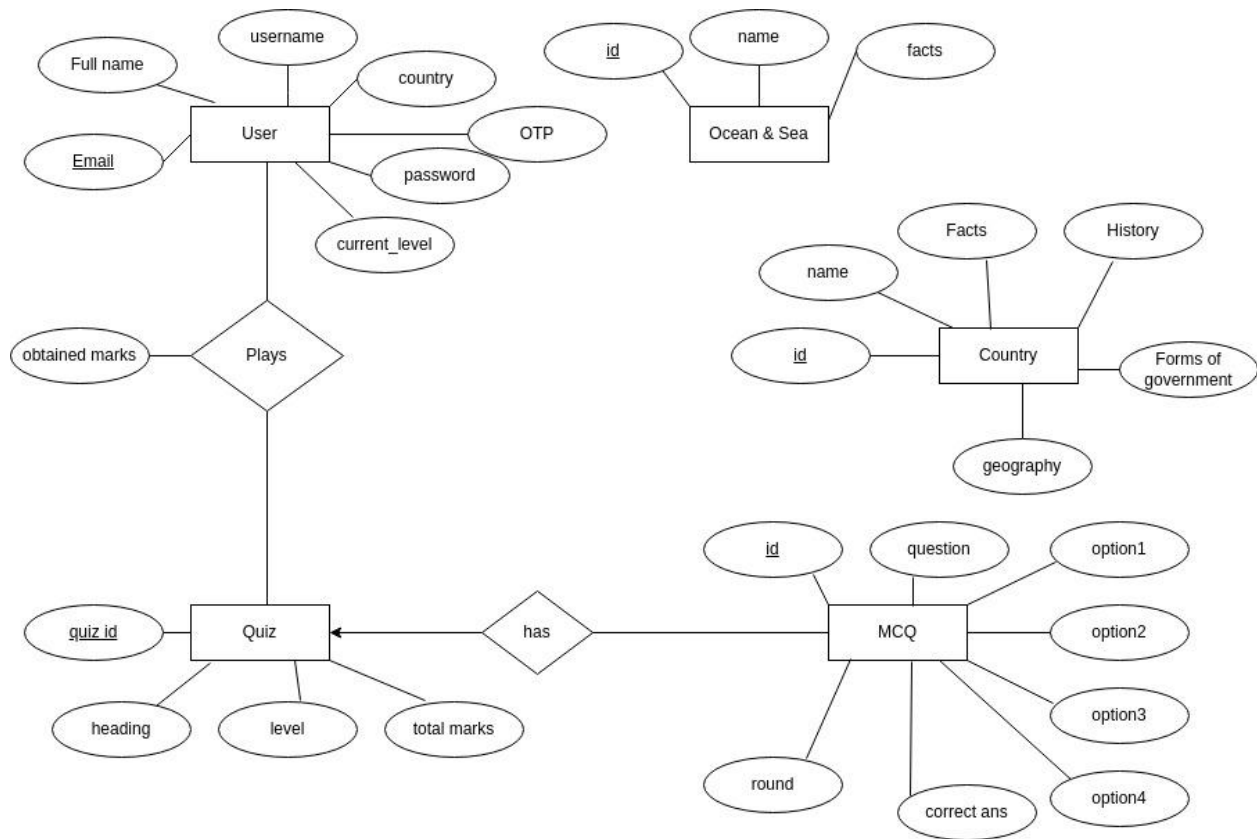
Fig20: ER Diagram

5.4 Schema Table

User		
Attributes	Type	Size
1. Email 2. Full name 3. Username 4. Country 5. Password 6. Current_level 7. OTP	String String String String String Int int	200 200 200 200 200 8 8

Quiz		
Attributes	Type	Size
1. Quiz_id	int	8
2. Heading	String	200
3. Level	int	8
4. Total marks	int	8

MCQ		
Attributes	Type	Size
1. Id	int	8
2. Question	String	200
3. Option1	String	200
4. Option2	String	200
5. Option3	String	200
6. Option4	String	200
7. Correct answer	int	8
8. Round	int	8
9. Level	int	8
10. quiz_id	int	8

Country		
Attributes	Type	Size
Id	int	8
Name	String	200
History	Text	
Facts	Text	
Forms of Government	Text	

Geography	Text	

Ocean & Sea		
Attributes	Type	Size
1. Id 2. Name 3. facts	int String Text	8 200

plays		
Attributes	Type	Size
1. Email 2. quiz_id 3. Obtained marks	string int int	200 8 8

6 Class Based Modeling

6.1 Class Based Modelling Concept

Class-based modeling represents the objects that the system will manipulate, the operations that will be applied to the objects, relationships between the objects and the collaborations that occur between the classes that are defined.

6.2 Identifying analysis classes

Classes are identified by underlining each noun or noun phrase and plotting it into a simple table. If the class (noun) is required to implement a solution, then it becomes a part of the solution space. Otherwise if the noun is used only to describe a solution, it is regarded as a part of the problem space. Once all the nouns have been isolated, General classification and Selection is done.

Identified Noun:

Serial No	Noun
1.	Website
2.	Features
3.	Countries
4.	World
5.	Real time chatting system
6.	Quiz
7.	Platform
8.	Modules
9.	Countries
10.	Ocean & Seas
11.	Chat
12.	Application
13.	Tabs
14.	User
15.	Account
16.	Admin
17.	Information

18.	Registration
19.	User information
20.	Full Name
21.	User Name
22.	Email id
23.	Country
24.	Password
25.	Option
26.	Password recovery
27.	OTP
28.	General facts
29.	Population
30.	Capital
31.	Official Language
32.	History
33.	Culture
34.	Literature
35.	Music
36.	Sports
37.	Football
38.	Forms of Government
39.	Communism
40.	Monarchy
41.	Tourist destinations
42.	Pictures

43.	Unions
44.	SAARC
45.	ASEAN
46.	GCC
47.	Nordic countries
48.	Baltic countries
49.	Unmarked map
50.	Physiographic
51.	Geologic features
52.	Economic aspects
53.	Multiple choice question
54.	Predefined questions
55.	Options
56.	Gaming quiz
57.	Location
58.	Screen
59.	XP Points
60.	Rounds
61.	Leaderboard
62.	Cricket
63.	Playing nations
64.	Map
65.	Achievements
66.	Top scorer
67.	Sports players

68.	Month
69.	Dashboard
70.	Active users
71.	Text messages
72.	Registered user
73.	Active status
74.	Level
75.	Score

Identified Verb:

Serial No	Verb
1.	consist
2.	offer
3.	include
4.	learn
5.	register
6.	provide
7.	reset
8.	find
9.	click
10.	see

11.	choose
12.	mark
13.	show
14.	follow
15.	see
16.	play
17.	guess
18.	click
19.	gain
20.	complete
21.	Level up
22.	send
23.	accept
24.	sign_up
25.	login
26.	chat
27.	deny
28.	set

Serial No	Noun
29.	generate
30.	update

List of Nouns in Solution Space:

Serial No	Noun
1.	Website
2.	Application
3.	User
4.	Registered User
5.	Account
6.	Admin
7.	Information
8.	Profile
9.	Registration
10.	Option
11.	Password
12.	OTP
13.	Email
14.	General facts
15.	Population
16.	Capital
17.	Official Language
18.	History

19.	Culture
20.	Literature
21.	Music
22.	Sports
23.	Football
24.	Cricket
25.	Nations
26.	Map
27.	Achievements
28.	Players
29.	Forms of Government
30.	Communism
31.	Monarchy
32.	Travel
33.	Tourist Destinations
34.	Pictures
35.	Unions
36.	SAARC
37.	ASEAN
38.	GCC
39.	Nordic countries
40.	Baltic countries
41.	Ocean

42.	Sea
43.	Geologic Features
44.	Economic Aspects
45.	Multiple-Choice Question
46.	Predefined Questions
47.	Gaming Quiz
48.	Location
49.	Country
50.	Screen
51.	Points
52.	Rounds
53.	Leaderboard
54.	Top Scorer
55.	Month
56.	Dashboard
57.	Chat
58.	Active Users
59.	Text Messages
60.	Account

6.3 General Classification

Candidate classes are categorized based on the seven general classification. The analysis classes manifest themselves in one of the following ways:
1. External entities
2. Things
3. Occurrences or events

4. Roles
5. Organizational units
6. Places
7. Structures

A candidate class is selected for special classification if it fulfills three or more characteristics.

Serial No	Noun	General Classification
61.	Website	2, 7
62.	Application	2,7
63.	User	4,5,7
64.	Registered User	4,5,7
65.	Account	2,7
66.	Admin	4,5,7
67.	Information	2
68.	Profile	2
69.	Registration	2
70.	Option	2,7
71.	Password	2,7
72.	OTP	2,7
73.	Email	1
74.	General facts	2,7
75.	Population	2,7
76.	Capital	2,7
77.	Official Language	2,7
78.	History	2,7

79.	Culture	2,7
80.	Literature	2,7
81.	Music	2,7
82.	Sports	2,7
83.	Football	2,7
84.	Cricket	2,7
85.	Nations	2,7
86.	Map	2,7
87.	Achievements	2,7
88.	Players	4,5,7
89.	Forms of Government	7
90.	Communism	7
91.	Monarchy	7
92.	Travel	7
93.	Tourist Destinations	6
94.	Pictures	2
95.	Unions	7
96.	SAARC	7
97.	ASEAN	7
98.	GCC	7
99.	Nordic countries	7
100.	Baltic countries	7
101.	Ocean	2,6,7

102.	Sea	2,6,7
103.	Geologic Features	2
104.	Economic Aspects	2
105.	Multiple-Choice Question	2,7,3
106.	Predefined Questions	2
107.	Gaming Quiz	2,3,7
108.	Location	6
109.	Country	2,6,7
110.	Screen	2
111.	Points	2
112.	Rounds	2
113.	Leaderboard	2
114.	Top Scorer	4,5,7
115.	Month	2
116.	Dashboard	2
117.	Chat	2,3,7
118.	Active Users	4,5,7
119.	Text Messages	2
120.	Account	2,7

Potential Classes after general classification

1. User
2. Registered User
3. Admin
4. Email
5. Ocean

6. Sea
7. Multiple Choice Question
8. Gaming Quiz
9. Country
10. Top Scorers
11. Chat
12. Active Users

6.4 Selection Criteria

The candidate classes are then selected as classes by six Selection Criteria. A candidate class generally becomes a class when it fulfills around three characteristics.

1. Retain information
2. Needed services
3. Multiple attributes
4. Common attributes
5. Common operations
6. Essential requirements

Potential general classified nouns to become a class after selection criteria :

Serial No	Noun	Selection Criteria
1.	User	1,2,3,4,5
2.	Registered User	1,2,3,4,5
3.	Admin	1,2,3,4,5
4.	Email	6
5.	Ocean	1,2,3,4,5
6.	Sea	1,2,3,4,5
7.	Multiple Choice Question	1,2,3,4,5
8.	Gaming Quiz	1,2,3,4,5

9.	Country	1,2,3,4,5
10.	Top Scorers	1,2,3,4,5
11.	Chat	1,2,3,4,5
12.	Active Users	1,2,3,4,5

Selected Classes

1. User
2. Registered User
3. Admin
4. Email
5. Ocean
6. Sea
7. Multiple Choice Question
8. Gaming Quiz
9. Country
10. Top Scorers
11. Chat
12. Active Users

6.5 List of objects

Class: User	
Attributes	Methods
	+ view_physiographic_geologic_feature() + view_economic_aspect() + view_general_facts() + view_history_info() + view_culture_info() + view_sports)info()

	Methods
	+ show_forms_of_government() + view_travel_place() + view_unions()

Class: Registered User

Attributes	Methods
- Username - Country - email_id - Password - active_status	+ view_physiographic_geologic_feature() + view_economic_aspect() + view_general_facts() + view_history_info() + view_culture_info() + view_sports)info() + show_forms_of_government() + view_travel_place() + view_unions() + sign_up() + login() + reset_password() + chat() + play_game() + play_mcq()

Class: Top Scorer

Attributes	Methods
- Username - Country - email_id - password	+ sign_up() + login() + view_information() + reset_password() + play_quiz() + send_request() + accept_or_deny_request() + set_level()

Class: Active users Account

Attributes	Methods
- Username - Country - email_id - Password - active_status	+ sign_up() + login() + view_information() + reset_password()

Class: Admin

Attributes	Methods
- Username - Country - email_id - password	+ login() + view_information() + reset_password() + change_information() + set_question()

Class: Email

Attributes	Methods
- OTP	+ generate_OTP() + send_OTP()

Class: chat

Attributes	Methods
- list_of_registered_users	+ see_active_user() + +make_active_user_list() + send_request() + accept_or_deny_request() + do_chat()

Class: Ocean

Attributes	Methods
- name	+ show_physiographic_geologic_feature() + show_economic_aspect()

Class: Sea

Attributes	Methods
- name	+ show_physiographic_geologic_feature() + show_economic_aspect()

Class: Country

Attributes	Methods
- name	+ show_general_facts() + show_history() + show_culture() + show_sports() + show_forms_of_government() + show_travel_place() + show_unions()

Class: Multiple Choice Question

Attributes	Methods
- Level - score	+ show_question() + update_score()

Class name: Gaming Quiz

Attributes	Methods
- option - unmarked _map	+ show_unmarked_map() + show_question()

- leaderboard - Level - XP_points	+ update_XP_points() + update_leaderboard() + update_level_of_player()

6.6 Analysis

From the list of objects we see User, Top Scorer, Active Users Account objects have the same methods.

So, we merge User, Top Scorer, Active Users Account and make User class.

Also we use User as a super class of Registered User and Registered User as a superclass of Admin to introduce inheritance and for better understanding and design.

So Admin extends Registered User and Registered User extends User class.

User:

Method: view_physiographic_geologic_feature(), view_economic_aspect(), view_general_facts(), view_history_info(), view_culture_info(), view_sports)info(), show_forms_of_government(), view_travel_place(), view_unions()

Registered user:

Attribute: username, country, email_id, password

Method: sign_up(), login(), reset_password(), play_quiz(), set_level() send_request(), accept_or_deny_request()

Admin:

Method: change_information(), set_question()

From the list of objects we also see Ocean, Sea objects have the same methods. So, we merge Ocean,

Sea and make Ocean & Sea class

like:

Ocean & Sea:

Attribute: name

Method: show_physiographic_geologic_feature(), show_economic_aspect()

Final List of Class

1. User

2. Registered User

3. Admin

4. Email

5. Chat

6. Ocean & Sea

7. Country

8. Multiple Choice Question

9. Gaming Quiz

6.7 CRC(Class-Responsibility-Collaboration) Card

Class-responsibility-collaboration (CRC) cards are a brainstorming tool used in the design of
object-oriented software. CRC cards are a great tool by which multiple alternative interactions may be

quickly devised, as they avoid a great deal of drawing and erasing. CRC card sessions may be followed by the creation of State Transition diagrams to capture interactions that are identified.

CRC cards are frequently employed during the design phase of system and software development to transition use-case descriptions into class diagrams, allowing a smoother transition with a greater overview and permitting developers to implement solutions with low binding and high cohesion.

Class: User	
Attributes	**Methods**
	+ view_physiographic_geologic_feature() + view_economic_aspect() + view_general_facts() + view_history_info() + view_culture_info() + view_sports_info() + show_forms_of_government() + view_travel_place() + view_unions()
Responsibilities	**Collaborator**
1. View country info, ocean & sea info, leaderboard	1. Country, Ocean & Sea

Class: Registered User	
Attributes	**Methods**
- Username - Country - email_id - Password	+ sign_up() + login() + recover_password() + chat()

- Active_users - Top_scorer - Active_status	+ play_game() + play_mcq()
Responsibilities	**Collaborator**
1. Reset password 2. View country info, ocean & sea info, leaderboard	1. Email 2. Country, Ocean & Sea, Chat, Multiple Choice Question, Gaming Quiz

Class: Admin

Attributes	Methods
- Username - Country - email_id - password	+ change_information() + set_question() + set_level()
Responsibilities	**Collaborator**
1. Change information regarding Country, Ocean & Sea 2. Set predefined questions 3. Manage user profile	1. Country, Ocean & Sea 2. Multiple Choice Question 3. User

Class: Email

Attributes	Methods
- OTP	+ generate_OTP() + send_OTP()
Responsibilities	Collaborator

1. Send OTP	1. Registered User, Admin

Class: Country

Attributes	Methods
- name	+ show_general_facts() + show_history() + show_culture() + show_sports() + show_forms_of_government() + show_travel_place() + show_unions()
Responsibilities	**Collaborator**
1. Show general facts. 2. Show history related information. 3. Show culture based information. 4. Show sports related information. 5. Show forms of government marked on the map. 6. Show famous travel destinations. 7. Show unions of the world.	1. User

Class: Ocean & Seas

Attributes	Methods
- name	+ show_physiographic_geologic_feature() + show_economic_aspect()
Responsibilities	**Collaborator**

1. Show physiographic geological feature of the ocean & seas 2. Show economic aspects of the sea	1. User

Class: Multiple choice question	
Attributes	**Methods**
- Level - score	+ show_question() + answer_question() + update_score()
Responsibilities	**Collaborator**
1. Showing questions to the user. 2. Updating the score board.	1. Registered User

Class: Gaming quiz	
Attributes	**Methods**
- option - unmarked _map - leaderboard - Level - XP_Points	+ show_unmarked_map() + show_question() + answer_question() + update_XP_points() + update_leaderboard() + update_level_of_player()
Responsibilities	**Collaborator**
1. Showing an unmarked map. 2. Show questions on the screen. 3. Update XP points. 4. Update leaderboard. 5. Update the level of the player.	1. Registered User

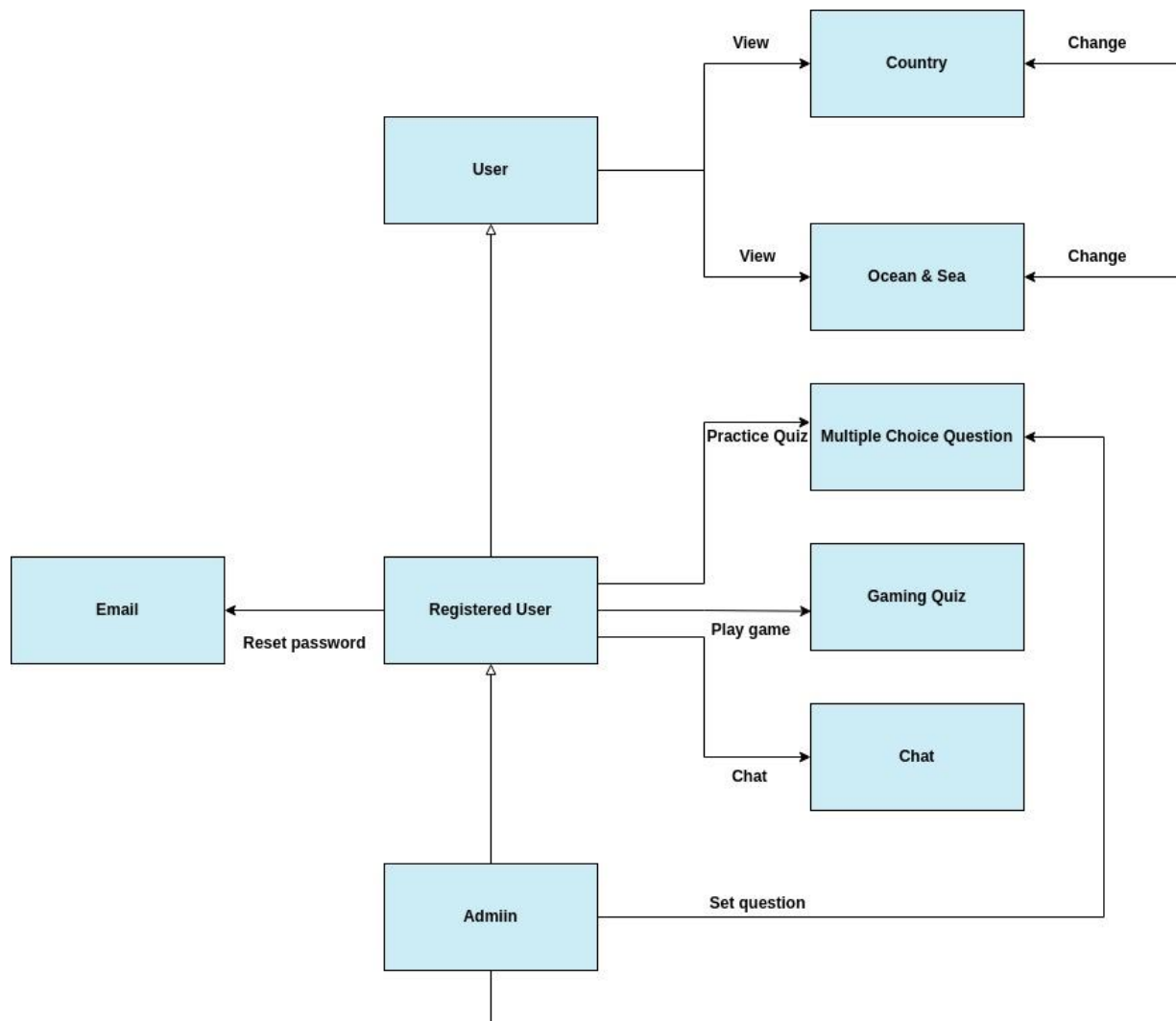| Class: Chat	
Attributes	Methods
- list_of_registered_user	+ make_active_user_list() + send_request() + accept_or_deny_request() + do_chat() + view_active_user()
Responsibilities	Collaborator
1. Make active user list 2. Send chat request 3. Accept or deny chat request 4. Chatting	1. Registered User

6.8 CRC Diagram

Fig21: CRC Diagram

6   Behavioural Modelling

7.1 State Transition Diagram

State diagram represents active states for each class of events (triggers). For this we identified all the events, their initiators and collaborators.

7.1.1 Identifying events

Serial	Event	Event Name	Initiator	Collaborator
1.	Sign up	sign_up	User	
2.	User login	login	Registered_User	
3.	Password Recover	recover_password	Registered_User	Admin
4.	View general facts of country	view_general_facts	User	Country
5.	View historical facts of country	view_historical_facts	User	Country
6.	View cultural facts of country	view_cultural_facts	User	Country
7.	View sports facts of country	view_sports_facts	User	Country
8.	View forms of government of country	view_forms_of_government	User	Country
9.	View travel facts of country	view_travel_facts	User	Country
10.	View unions of country	view_union_facts	User	Country
11.	View physiographic geological feature of the ocean & seas	view_physiographic_feature	User	Ocean & Sea
12.	View economic aspects of ocean & seas	view_economic_aspects	User	Ocean & Sea
13.	View multiple choice question	view_mcq_questions	Registered_User	Multiple Choice Questions
14.	Choose option	choose_option	Registered_User	Multiple Choice Questions
15.	View unmarked map	view_unmarked_map	Registered_User	Gaming quiz
16.	Click on correct option	click_on_correct_option	Registered_User	Gaming quiz

17.	View active user	view_active_user	Chat	Registered_User
18.	Send chat request	send_chat_request	Chat	Registered_User
19.	Accept or deny chat request	accpet_deny_chat_request	Chat	Registered_User
20.	Chat	chat	Registered_User	Chat
21.	Generate OTP	generate_OTP	Email	
22.	Send OTP	send_OTP	Email	Registered_User, Admin
23.	Set Question	set_question	Admin	Multiple choice question
24.	Set Level	set_level	Admin	Multiple choice question
25.	Change information	change_info	Admin	Registered_User, Country, Ocean & Seas, Multiple choice question
26.	Make active user list	make_active_user_list	Chat	Registered_User
27.	Show physiographic geological feature of the ocean & seas	show_physiographic_geologic_feature	Ocean & Seas	User
28.	Show economic aspects of the seas & oceans	show_economic_aspect	Ocean & Seas	User
29.	Show general facts	show_general_facts	Country	User
30.	Show history related information.	show_history	Country	User
31.	Show culture based information	show_culture	Country	User
32.	Show sports related	show_sports	Country	User

	information			
33.	Show forms of government marked on the map	show_forms_of_government	Country	User
34.	Show famous travel destinations	show_travel_place	Country	User
35.	Show unions of the world	show_unions	Country	User
37.	Showing questions to the user	show_question	Multiple choice question	Registered_User
38.	Updating the scoreboard	update_score	Multiple choice question	Registered_User
39.	Showing an unmarked map.	show_unmarked_map	Gaming Quiz	Registered_User
40.	Show questions on the screen	show_question	Gaming Quiz	Registered_User
41.	Update XP points.	update_XP_points	Gaming Quiz	Admin
42.	Update leaderboard.	update_leaderboard	Gaming Quiz	Admin
43.	Update the level of the player.	update_level_of_player	Gaming Quiz	Admin

7.1.2 State Transition Diagrams

ID-1

Name: User
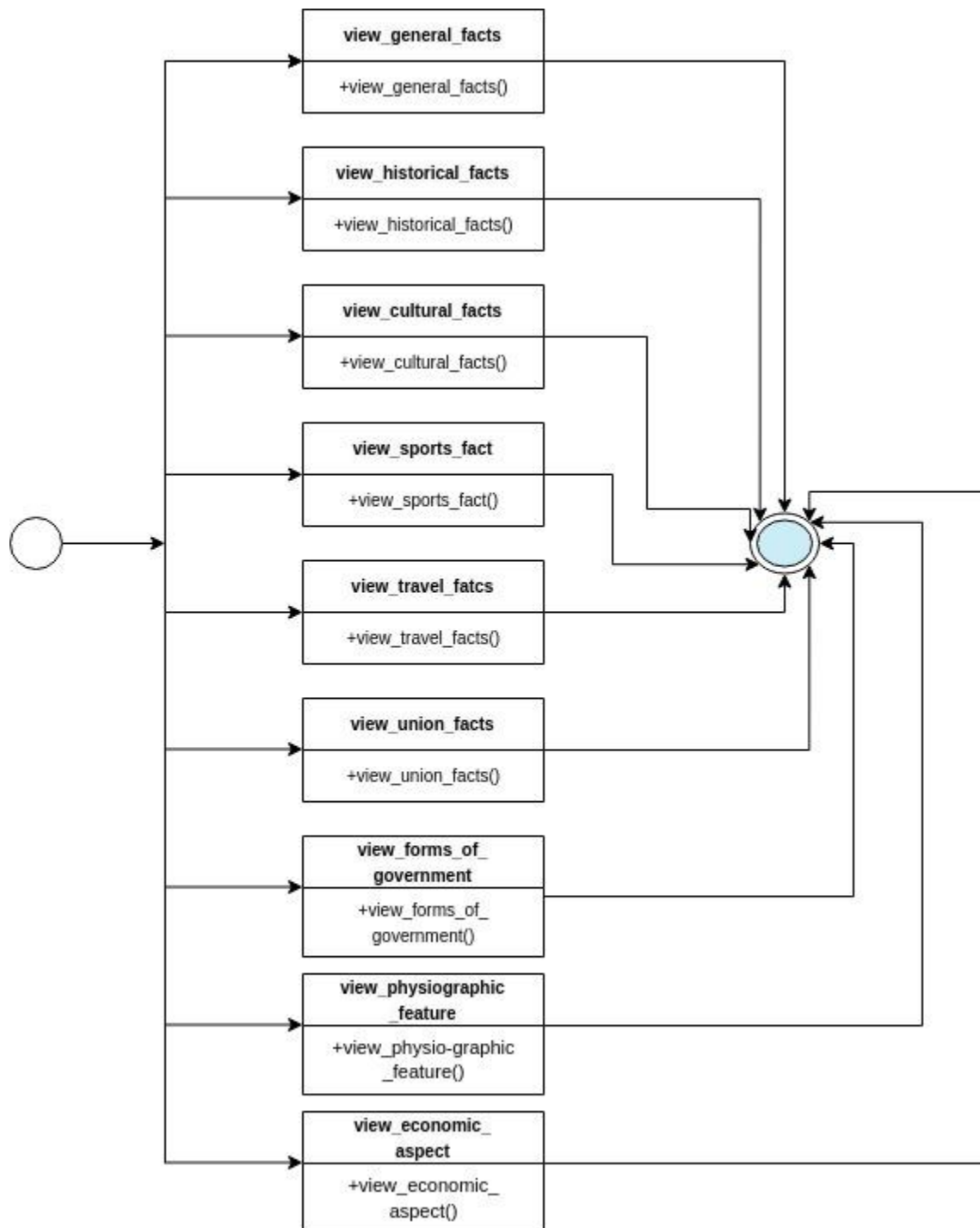
Fig22: User

ID-2
Name: Registered User
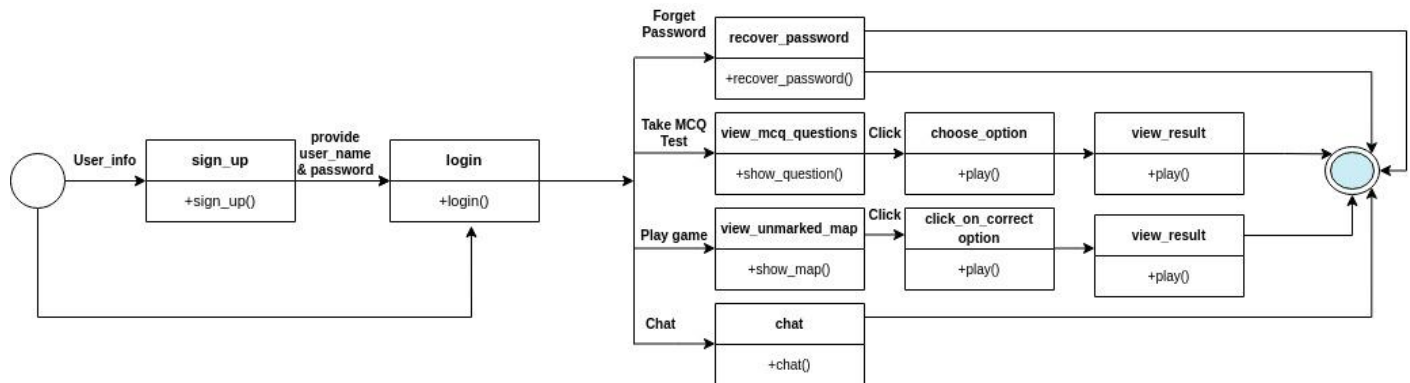
Fig23: Registered User

ID-3
Name: Admin

Fig24: Admin

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ID-4
Name: Country
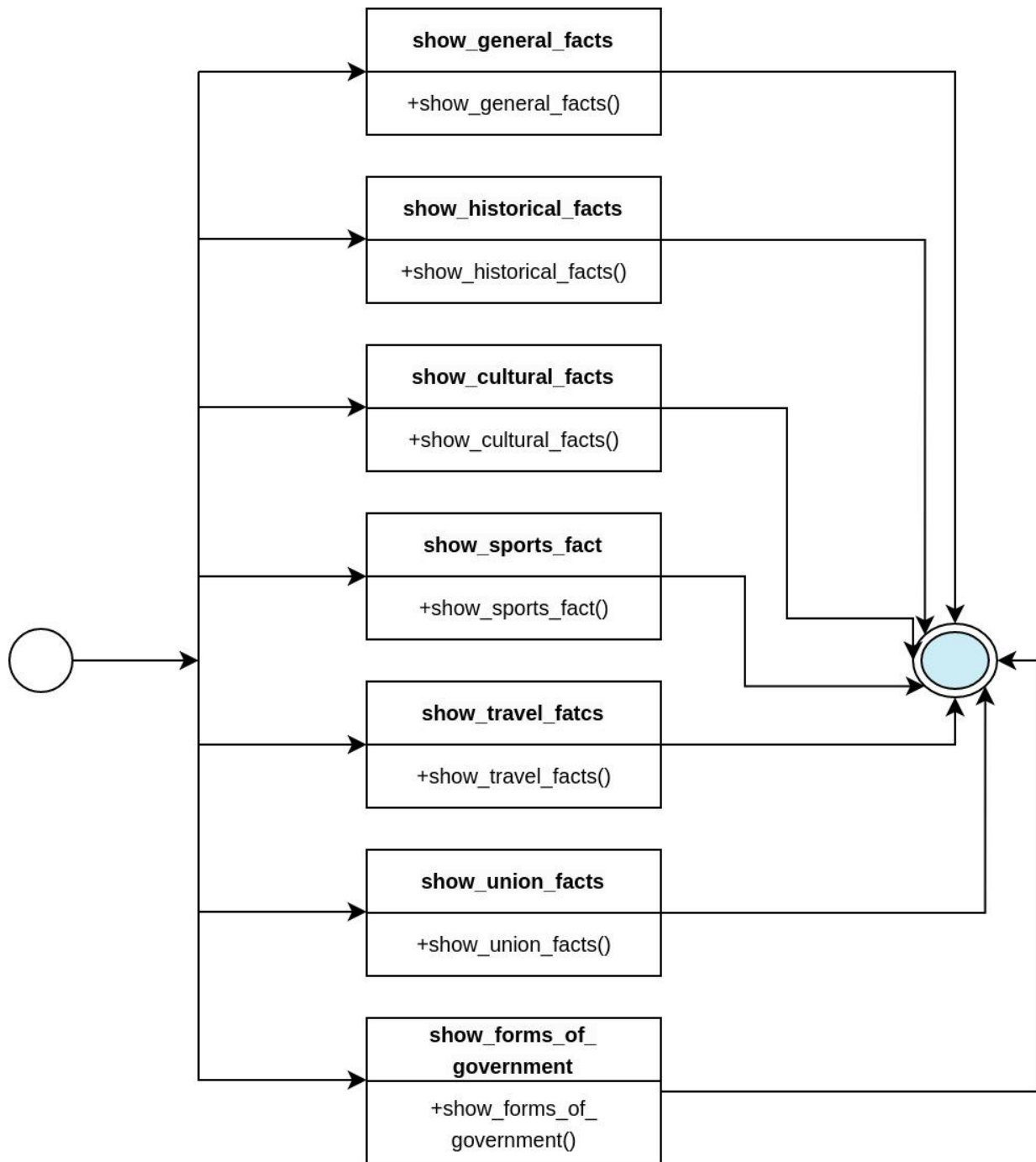

show_general_facts

+show_general_facts()

show_historical_facts

+show_historical_facts()

show_cultural_facts

+show_cultural_facts()

show_sports_fact

+show_sports_fact()

show_travel_fatcs

+show_travel_facts()

show_union_facts

+show_union_facts()

show_forms_of_
government

+show_forms_of_
government()
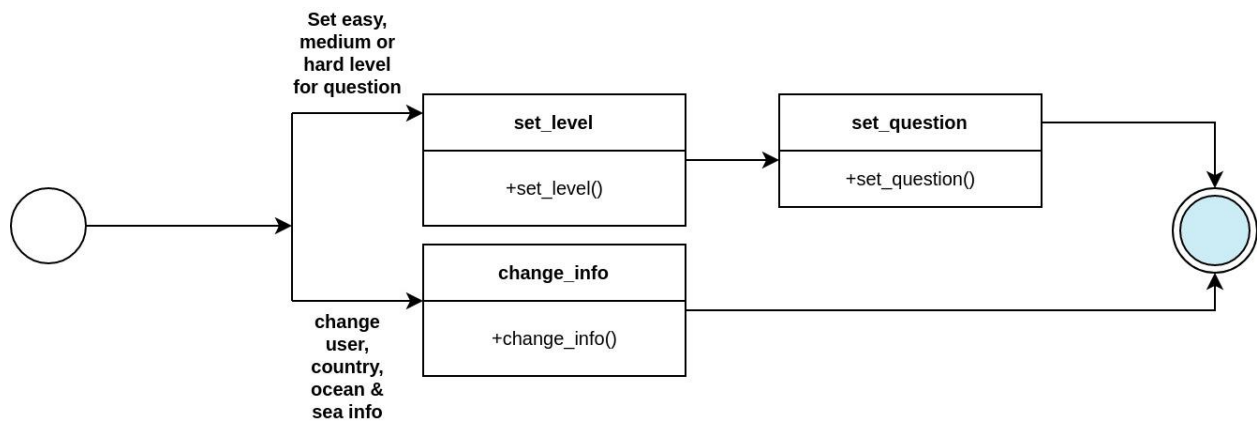
ID-5
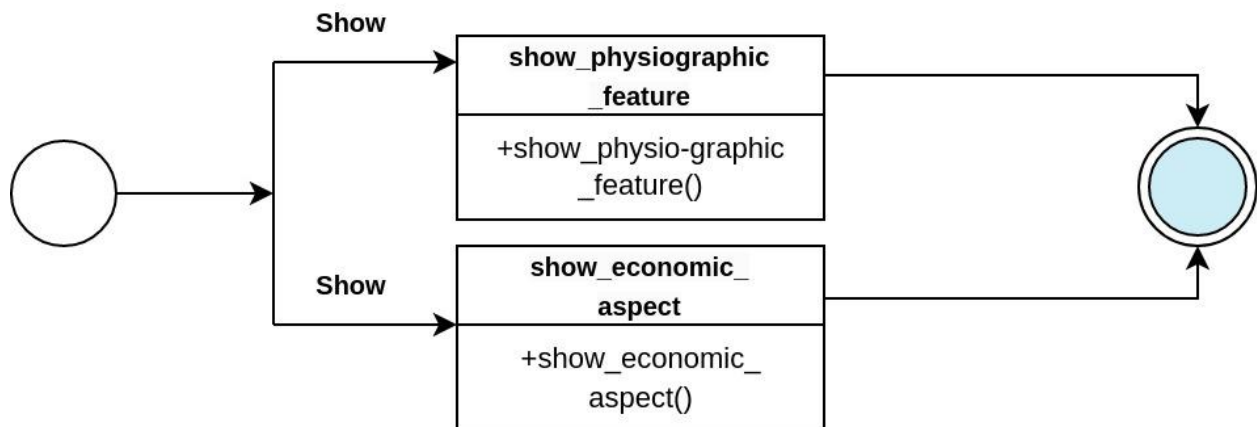
Name: Ocean & Sea

Fig26: Ocean & Sea

ID-6

Name: Multiple Choice Question
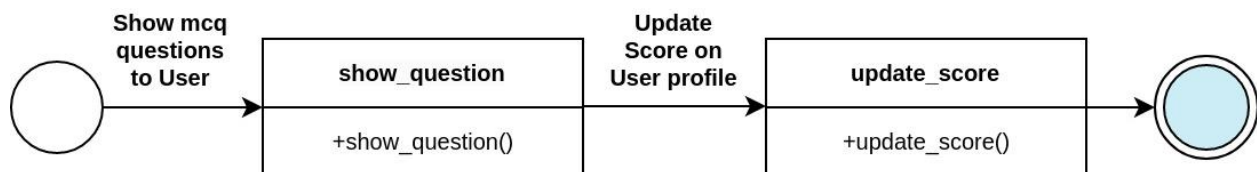
Fig27: Multiple Choice Question

ID-7

Name: Gaming Quiz
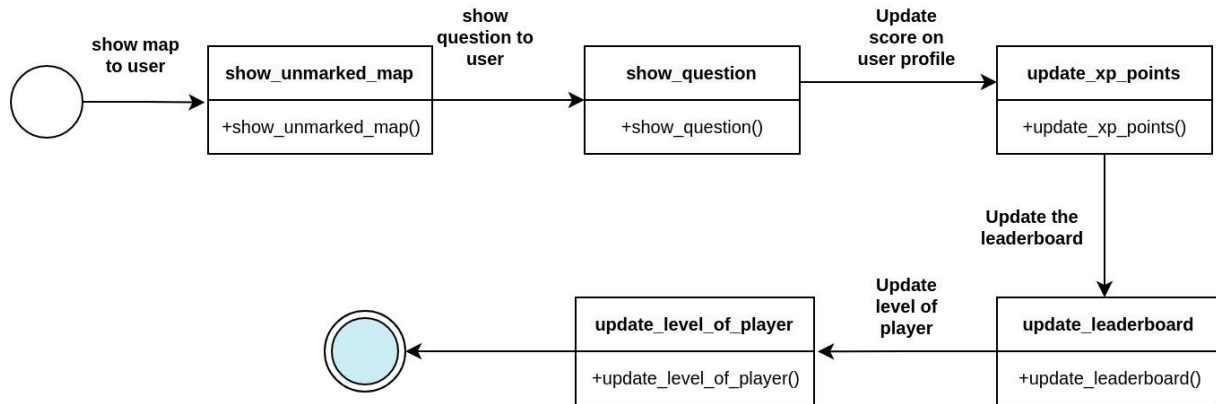
Fig28: Gaming Quiz

ID-8
Name: Email
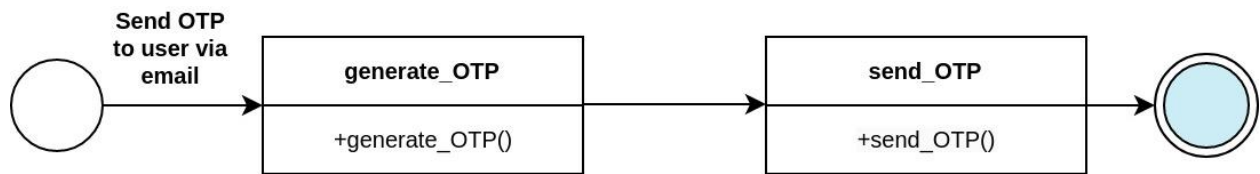
Fig29: Email

ID-9
Name: Chat
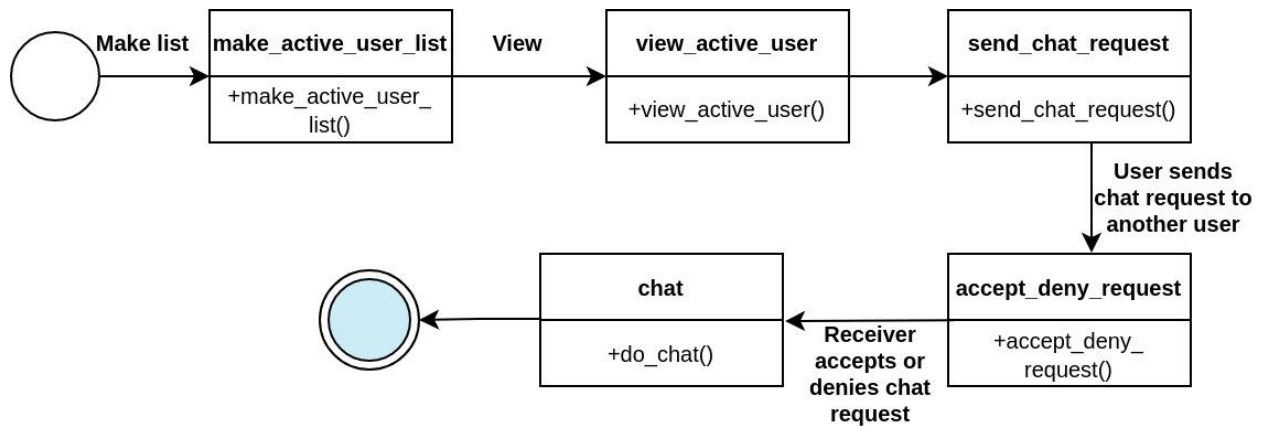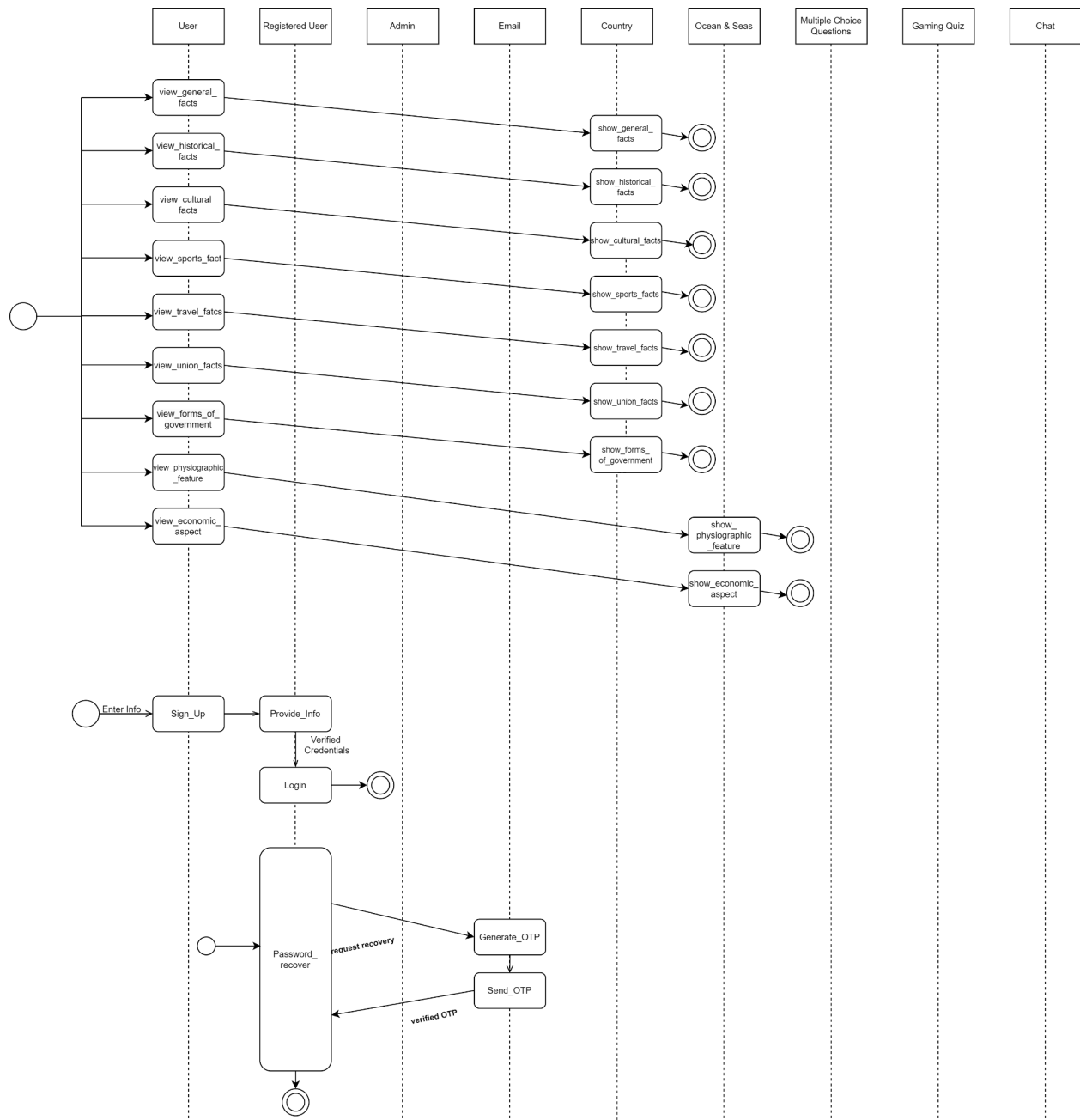

Fig30: Chat

7.2 Sequence Diagram

Lifelines: User | Registered User | Admin | Email | Country | Ocean & Seas | Multiple Choice Questions | Gaming Quiz | Chat

User:
- view_general_facts → show_general_facts
- view_historical_facts → show_historical_facts
- view_cultural_facts → show_cultural_facts
- view_sports_fact → show_sports_facts
- view_travel_fatcs → show_travel_facts
- view_union_facts → show_union_facts
- view_forms_of_government → show_forms_of_government
- view_physiographic_feature → show_physiographic_feature
- view_economic_aspect → show_economic_aspect

Enter Info → Sign_Up → Provide_Info
Provide_Info → Login (Verified Credentials)

Password_recover → Generate_OTP (request recovery)
Generate_OTP → Send_OTP
Send_OTP → Password_recover (verified OTP)

Fig31: Sequence Diagram

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8. Data Flow Diagram

ID 0

Figure 32: Data Flow Diagram - Level 0

ID 1
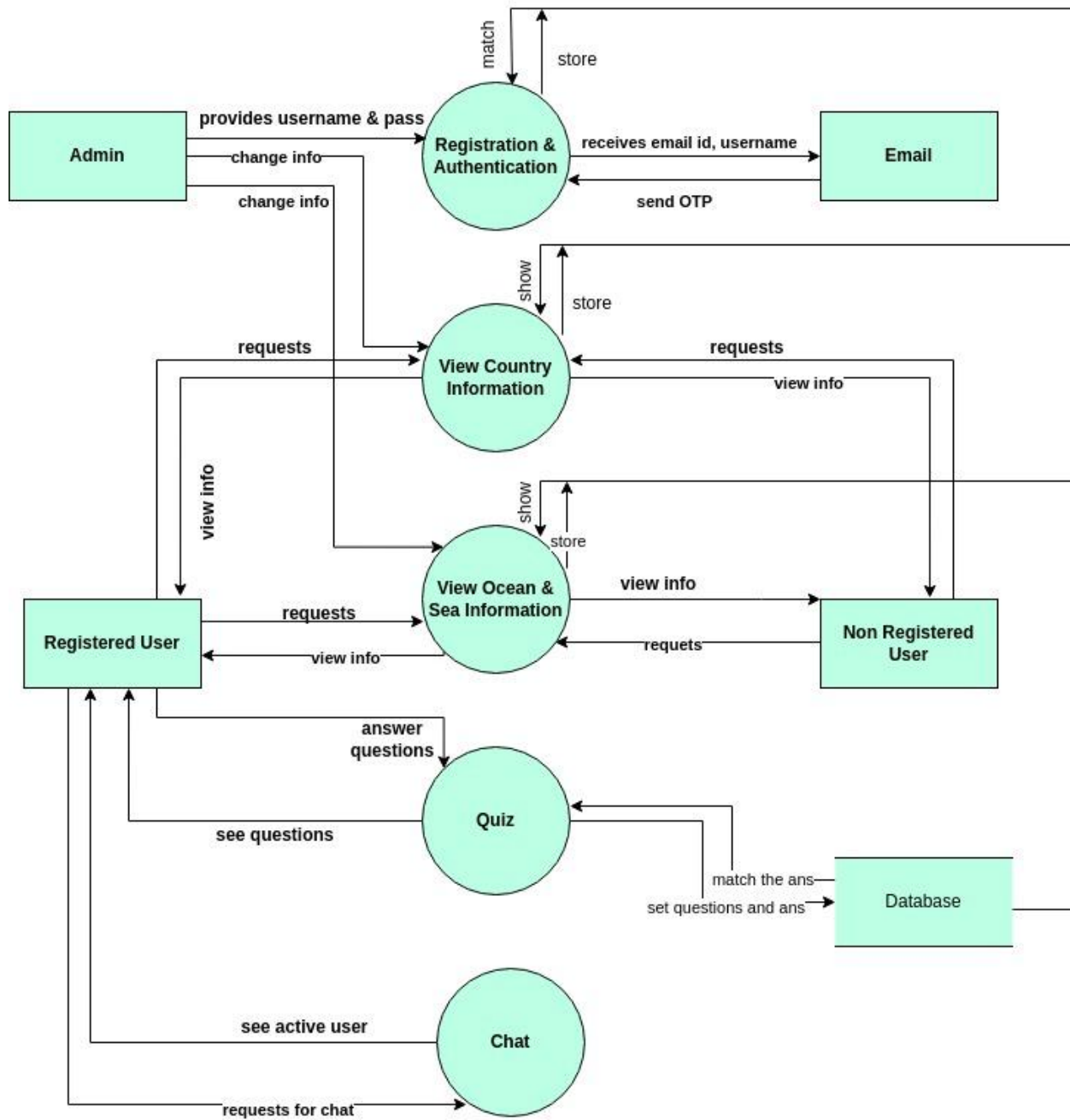
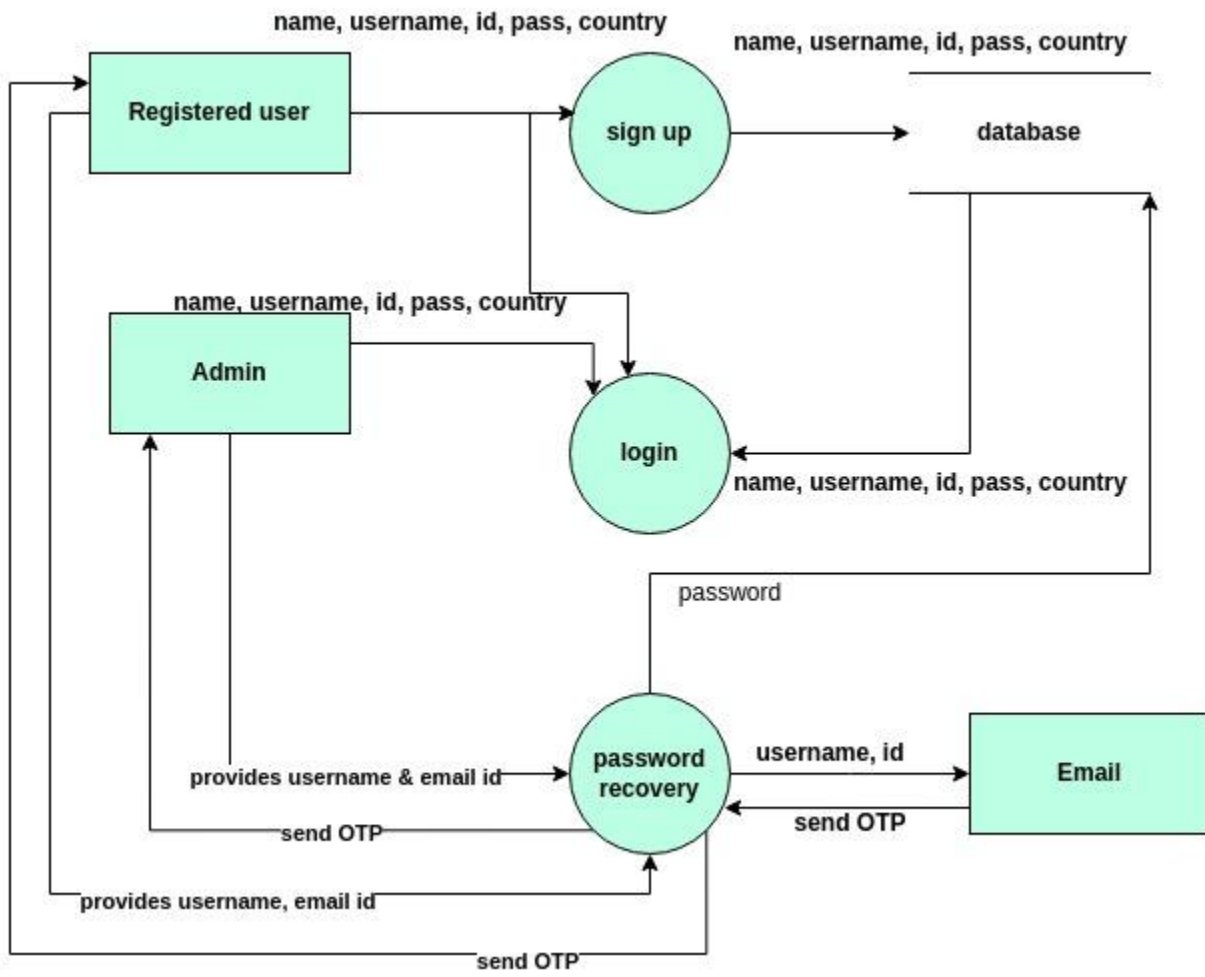Figure 33: Data Flow Diagram - Level 1

ID 2

Figure 34: Data Flow Diagram - Registration & Authentication
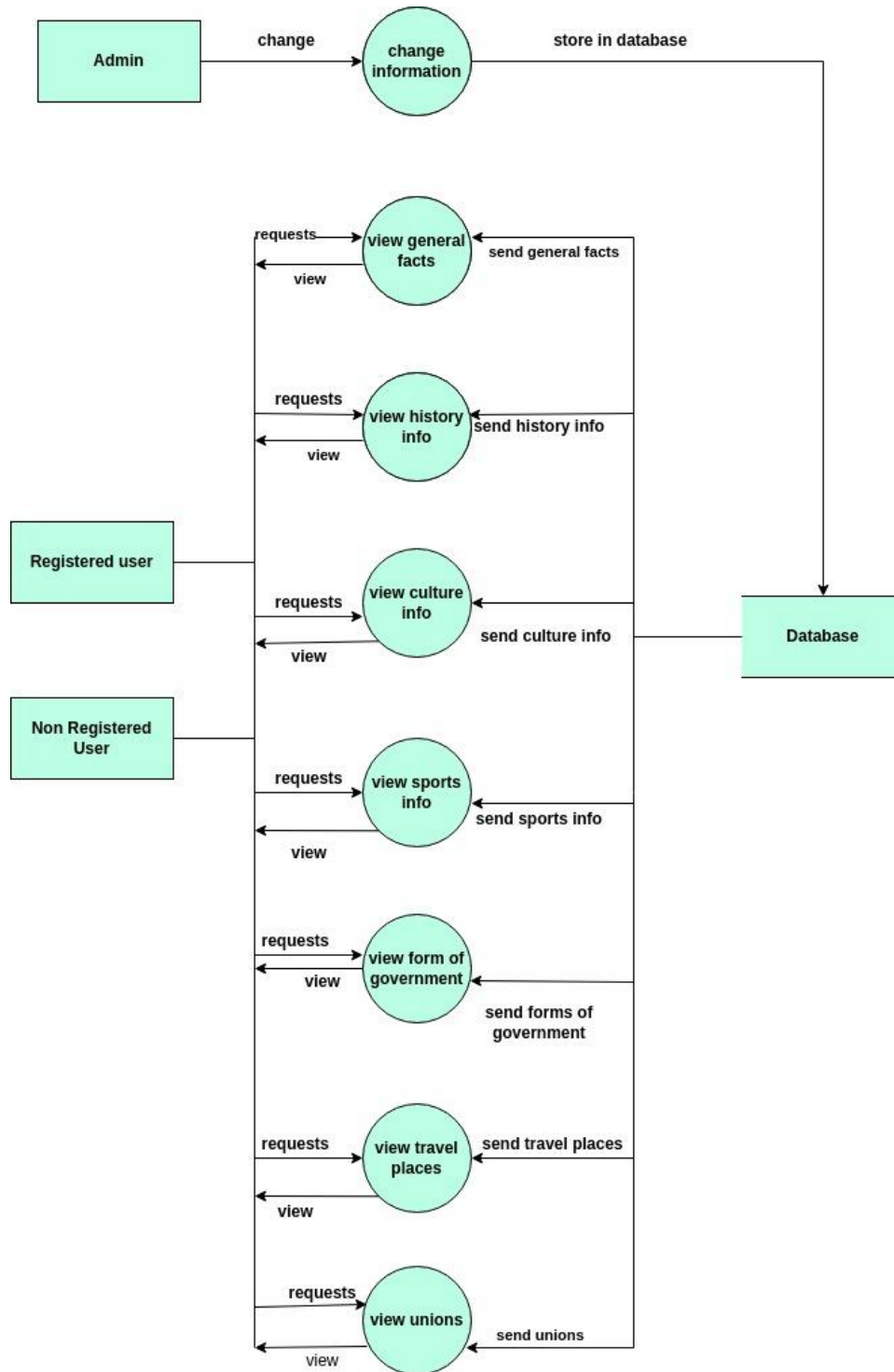
ID 3

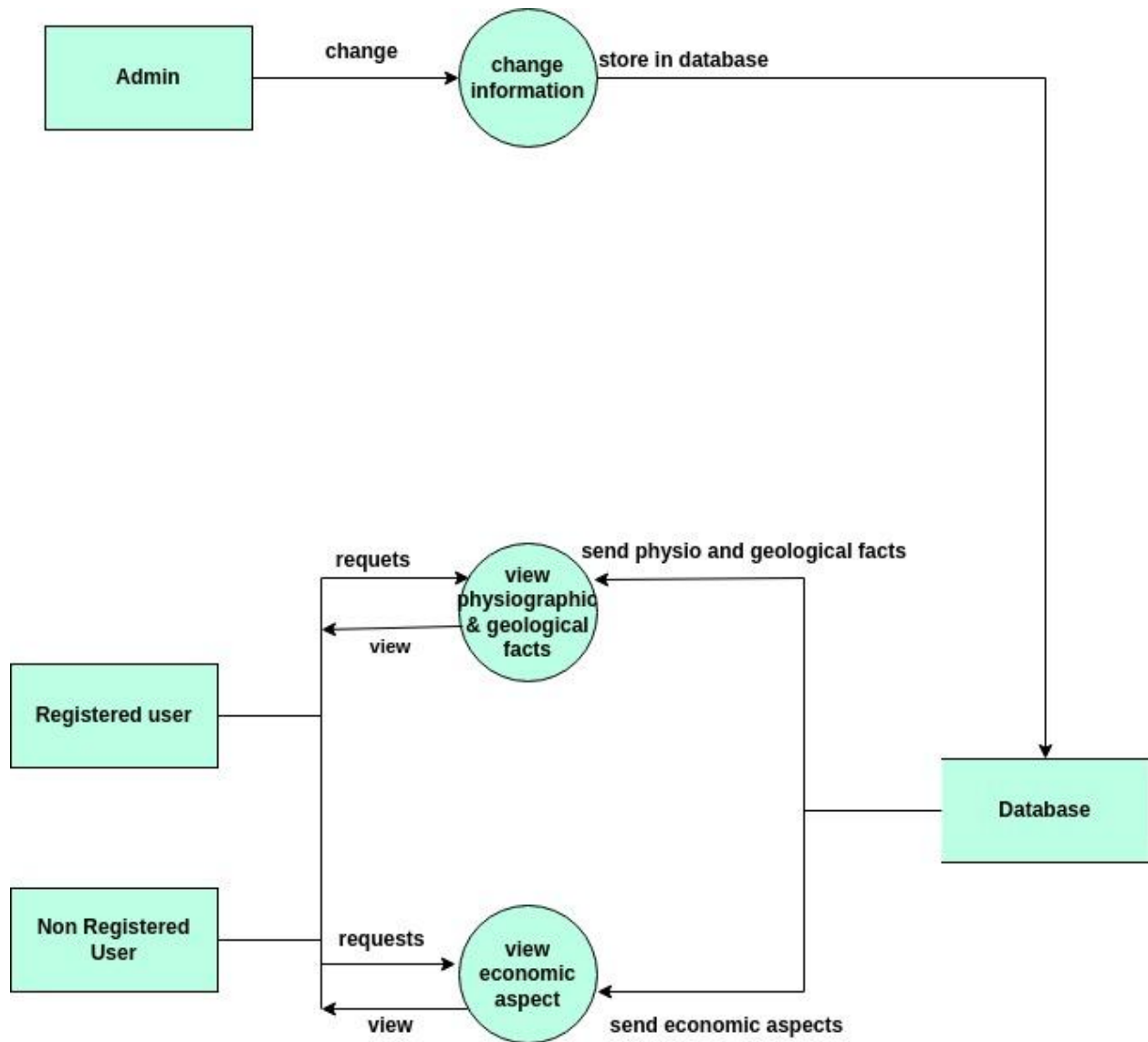Figure 35: Data Flow Diagram - View Country Information

ID 4

Figure 36: Data Flow Diagram - View Ocean & Sea Information
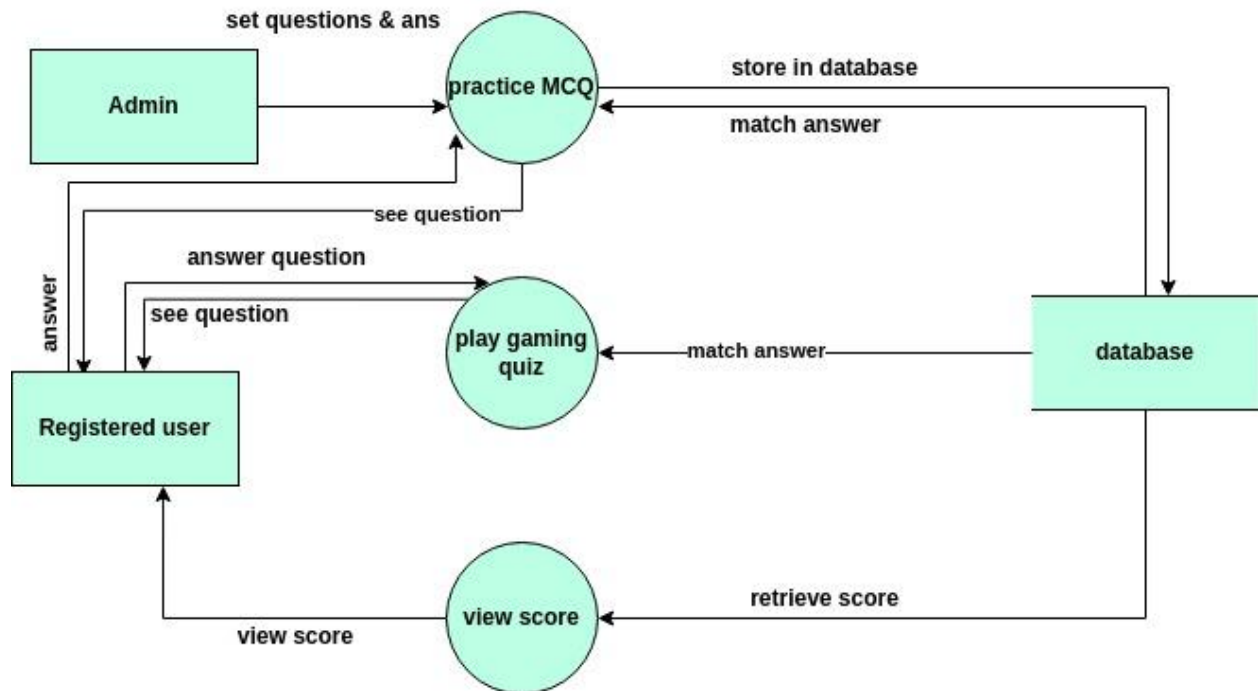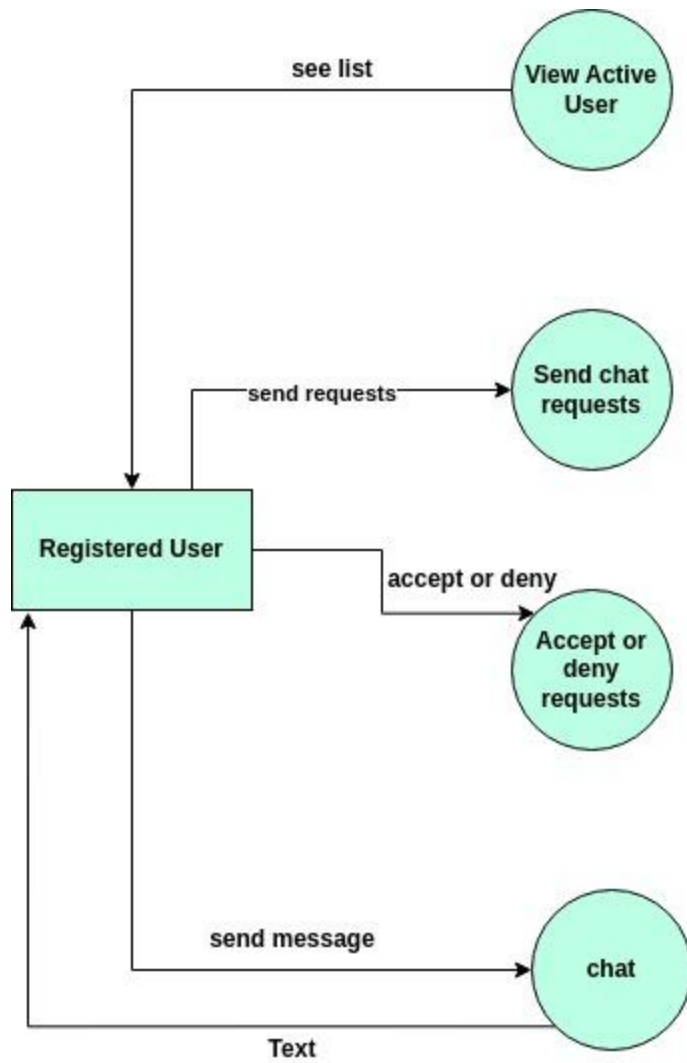
ID 5

Figure 37: Data Flow Diagram - Quiz

ID 6

Figure 38: Data Flow Diagram - Chat