

**Institute of Information Technology
University of Dhaka
Software Requirement and Specification Analysis
Of
Conserve The Deep: Marine life conservation platform**



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Elicitation of Conserve The Deep

The main task of the elicitation phase is to combine the elements of problem solving, negotiation and specification. The collaborative working approach of the stakeholders is required to elicit the requirements. The following tasks have been finished for eliciting requirements of Conserve The Deep:

- Collaborative Requirements Gathering
- Viewpoint of stakeholders
- Quality Function Deployment
- User Story

Collaborative Requirements Gathering

We have met with the stakeholders in the inception phase of our project. By talking to them several times, we were able to gather and negotiate their requirements.

The stakeholders are -

1. Admin
2. Platform Adventurer
3. Oceanography and Environmental Science Students
4. Marine Biologists and Researchers
5. Community Members

Viewpoints of stakeholders

Admin:

The admin plays a central role in managing various activities within Conserve the Deep application. They are responsible for user management, safety data verification, database management, route and safety information management, responding to user feedback, and sending notifications. Admins ensure the integrity and reliability of the app's information and features, enhancing user trust and satisfaction.

Platform Adventurers

Platform adventurers want to explore ocean layers and observe marine species interactively through the system. They want to engage with real-time environmental data, learning how factors like temperature, oxygen levels, salinity and pressure affect marine ecosystems. In the Shark Sprint game, they want to take part in a conservation challenge, cleaning pollutants while navigating underwater/Oceanic threats. Through these activities, adventurers want to immerse themselves in marine learning while actively contributing to environmental awareness in an engaging and enjoyable way.

Oceanography Students

Oceanography students want to collect data on species and real-time ocean conditions through the system. They want to understand key metrics such as temperature and oxygen levels with respect to different ocean depths, reflecting authentic ocean environments. This allows them to practice data collection and

share their findings with peers and experts, fostering collaboration. The system helps students develop skills in research and data handling while deepening their understanding of marine ecosystems.

Marine Biologists, Researchers, and Community Members

Marine biologists and researchers want to share their knowledge on ocean conditions, species, and the environmental challenges facing marine biodiversity through the system. They want to contribute valuable insights to a collective knowledge base that supports conservation efforts. Community members and environmental organizations also want to make use of the system's community space to exchange conservation resources and strategies, strengthening their efforts to protect marine life. The system serves as a hub for collaboration, where all users contribute to a shared mission of safeguarding marine ecosystems.

QFD(Quality Function Deployment)

Quality Function Deployment (QFD) is a technique that translates the needs of the customers into technical requirements for software. Ultimately the goal of QFD is to translate subjective quality criteria into objective ones that can be quantified and measured, and can then be used to design and manufacture the product. It is a methodology that concentrates on maximizing customer satisfaction from the software engineering process. So, we have followed this methodology to identify the requirements for the project. The requirements which are given below, are identified successfully by the QFD.

Normal Features:

Scroll-Based Ocean Exploration: Platform adventurers can explore different ocean depths through a smooth, scroll-based interface. As they dive, they encounter brief descriptions of species profiles on endangered and extinct species, including conservation status and threats, along with environmental data such as temperature, pH, and oxygen levels, offering valuable insights into marine ecosystems.

Shark Sprint – Clean and Escape Game: In this interactive game, platform adventurers take on the role of a diver cleaning pollutants from the ocean while avoiding sharks. The game combines fun with education, emphasizing the impact of pollution on endangered marine species and the urgent need for conservation.

Species Profiles: Oceanography students, marine biologists, and researchers contribute to a comprehensive directory of Bay of Bengal species, focusing on those at risk of extinction. Each profile includes species' description, geography, habitat, food, photos, population trend, population status, conservation status, and environmental threats, offering platform adventurers and the community a deeper understanding of marine biodiversity.

Expected Feature:

Registration and Authentication: All users, including platform adventurers, students, biologists, and community members, will register with their name, email, institution. This process ensures reliable contributions to species data and lets platform adventurers save their progress, enhancing their personalized experience.

Exciting Features:

Community: Environmental organizations, NGOs, marine biologists, researchers, and volunteers collaborate in a shared space to exchange insights and discuss conservation efforts. This community area promotes collective responsibility for marine preservation, encouraging users to learn from one another and contribute to ocean conservation initiatives.

Chatbot: This AI-powered assistant provides real-time guidance to all users, answering questions, offering conservation tips, and enhancing the learning experience by providing immediate support and insights on marine ecosystems and conservation practices.

User Story

Conserve the Deep aims to raise awareness about endangered marine life in the Bay of Bengal. Through interactive ocean exploration, species profiles, and conservation games, the project will educate users on the urgent threats to marine biodiversity, such as pollution and climate change. A dedicated community space will further engage users in sharing resources and insights, fostering a collective commitment to ocean preservation.

Registration and Login:

This feature allows users to register, saving their progress to personalize their learning experience and track milestones across the app. There are two types of users. General users and Admin. There will be a predefined admin id via which the admin will initialize the login. He will set up a password when he logs in for the first time. Later he can add a username and email. Oceanography Students, Biologists, Researchers, Platform adventurers, Non-Platform adventurers and Community Members hold different roles as the general users. They register by providing their name, email, role, institution ensuring the platform remains secure and contributions are credible. They will provide a username. Admins oversee this process, managing registrations and maintaining the integrity and security of user profiles.

Scroll-Based Ocean Exploration:

Through this interactive, scroll-based interface, Platform Adventurers explore different ocean layers, encounter endangered species, and engage with real-time environmental data, such as temperature, salinity, pH, and oxygen levels. This data reflects current ocean conditions, providing a realistic exploration experience. Oceanography Students contribute valuable environmental metrics to these profiles, while Admins manage and verify the accuracy of the data. Biologists and Researchers observe to ensure alignment with marine research and conservation standards, though they do not directly update the content.

Species Profiles:

Species profiles offer Platform Adventurers in-depth knowledge of endangered, vulnerable, threatened and extinct marine life, including species' description, geography, habitat, food, photos, population trend, population status,

conservation status, and environmental threats. Admins oversee and maintain the profile, ensuring reliability and accessibility. Biologists and Researchers provide oversight, ensuring the profiles meet marine conservation standards.

Shark Sprint – Clean and Escape Game:

In this game, Platform Adventurers take on an educational challenge, cleaning pollutants while avoiding underwater threats. Player's score is saved and added to leaderboard. It's an engaging way to learn about conservation issues and the impacts of pollution on marine ecosystems.

Community Space:

The community space is designed for Community Members to share experiences, resources, and conservation strategies, building a network of collaborative efforts for ocean preservation. Admins verify, approve, and monitor contributions to ensure safe and relevant discussions. Once posts are approved, members are notified. Biologists and Researchers participate in an observational role, maintaining a scientific perspective within discussions and promoting the exchange of conservation insights.

Chatbot:

An AI-powered chatbot provides Platform Adventurers, Students, Biologists, Researchers, and Community Members with real-time guidance on using the platform, answering questions, sharing tips, and offering conservation information. Admins oversee the chatbot's content and functionality to maintain accurate responses and improve user support.

Use Case Diagram of CD

Level :0

Name: Conserve the Deep (CD)

Primary Actor: Admin, Platform Adventurer, Non-platform Adventurers (Oceanography/Environmental Science Students), Marine Biologists, Researchers, Community members, Volunteers

Secondary Actor: Email, Chatbot, Database

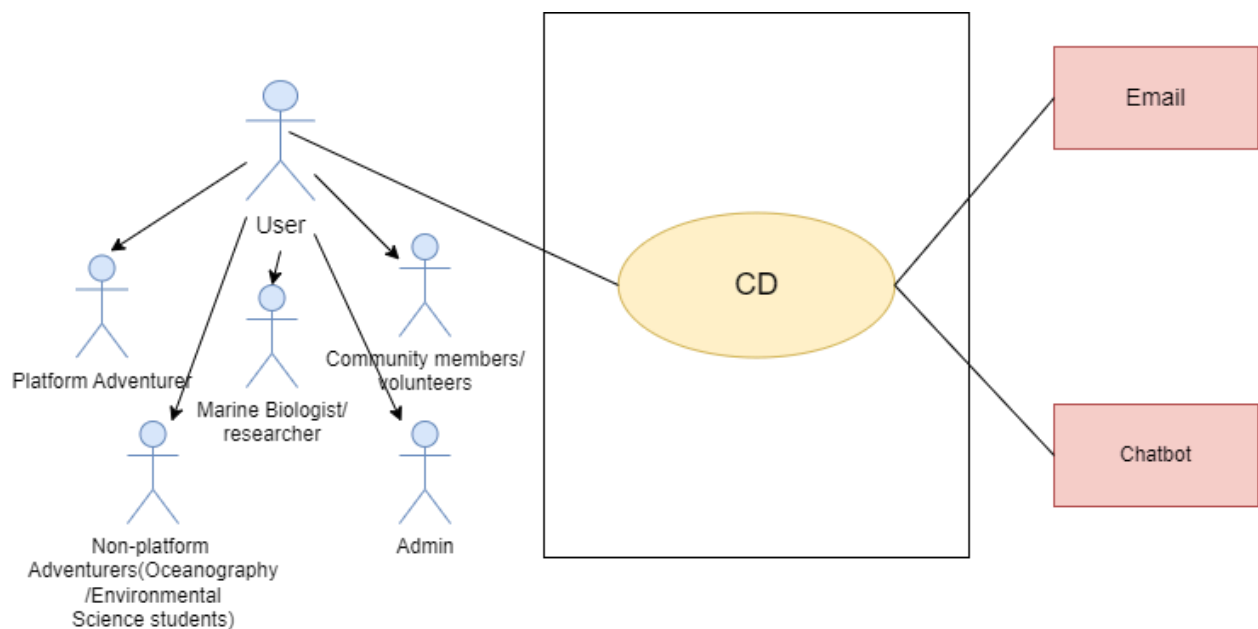


Fig 1: Use Case Diagram level 0

Level :1

Name: Conserve the Deep - Detailed

Primary Actor: Admin, Platform Adventurer, Non-platform Adventurers (Oceanography/Environmental Science Students), Marine Biologists, Researchers, Community members, Volunteers

Secondary Actor: Email, Chatbot, Database

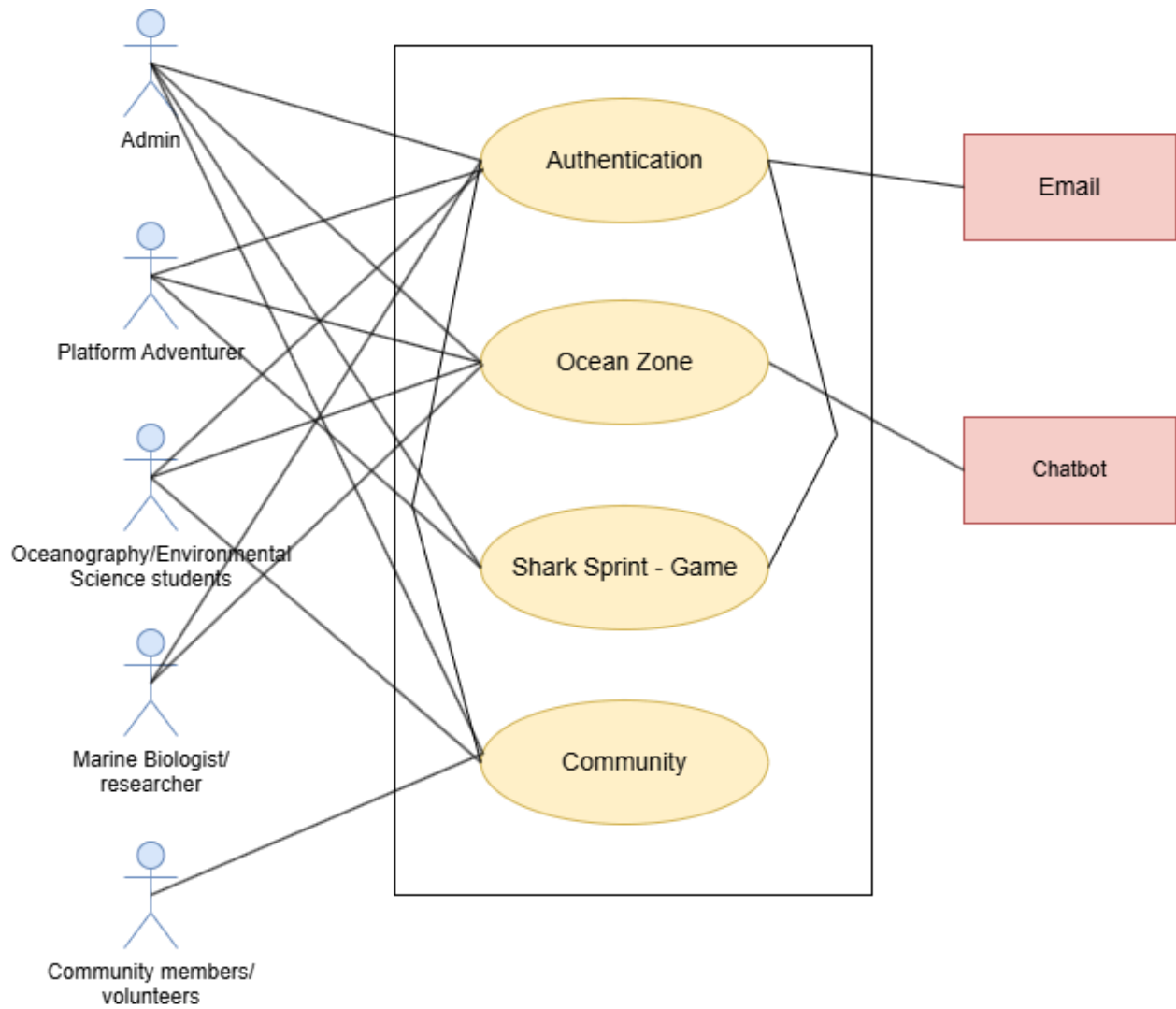


Fig 2: Use Case Diagram level 1

Use case level 1 description

1. Authentication

The **Authentication** section handles the registration and login process for all users, including:

- **Platform Adventurers** Can register and login to track milestones and save progress.
 - **Oceanography Students, Biologists, Researchers, and Community Members** Provide their name, email, institution during registration.
 - **Admin** will have a predefined Id with whom he will perform the registration process and then he has to setup a password .He will be sent a verification email afterwards to confirm his registration.
-

2. Ocean Zone

The **Ocean Zone** is the heart of the platform, allowing users to explore ocean ecosystems through interactive and educational tools:

Scroll-Based Ocean Exploration

- Users can scroll through various ocean depths to explore layers of the ocean and discover endangered species.
- Real-time environmental metrics, such as temperature, pH, and oxygen levels, provide an immersive and realistic experience. The data reflects current ocean conditions.
- **Admins** ensure the accuracy and integrity of the displayed information.
- **Biologists and Researchers** observe the data to ensure it aligns with marine conservation research and standards.

Species Profiles

- Provides detailed information on endangered and extinct marine species, including their habitats and the conservation challenges they face.
- **Admins** manage and maintain the accuracy and reliability of species profiles.
- **Biologists and Researchers** provide scientific oversight to ensure profiles meet marine conservation standards.

Chatbot

- An AI-powered chatbot assists all user roles, providing:
 - Real-time guidance on platform features.
 - Answers to questions about marine conservation and species information
 - Tips and insights into ocean preservation strategies.
 - **Admins** oversee the chatbot's content and functionality to ensure accurate and reliable responses.
-

3. Shark Sprint – Clean and Escape Game

This **educational game** is designed to engage users in ocean conservation efforts through an interactive and fun experience:

- **Platform Adventurers** clean up pollutants in the ocean while navigating threats like underwater predators and obstacles.
 - The game highlights the impacts of pollution and fosters an understanding of conservation challenges.
 - The game serves as a motivational tool for players to actively contribute to real-world conservation efforts.
-

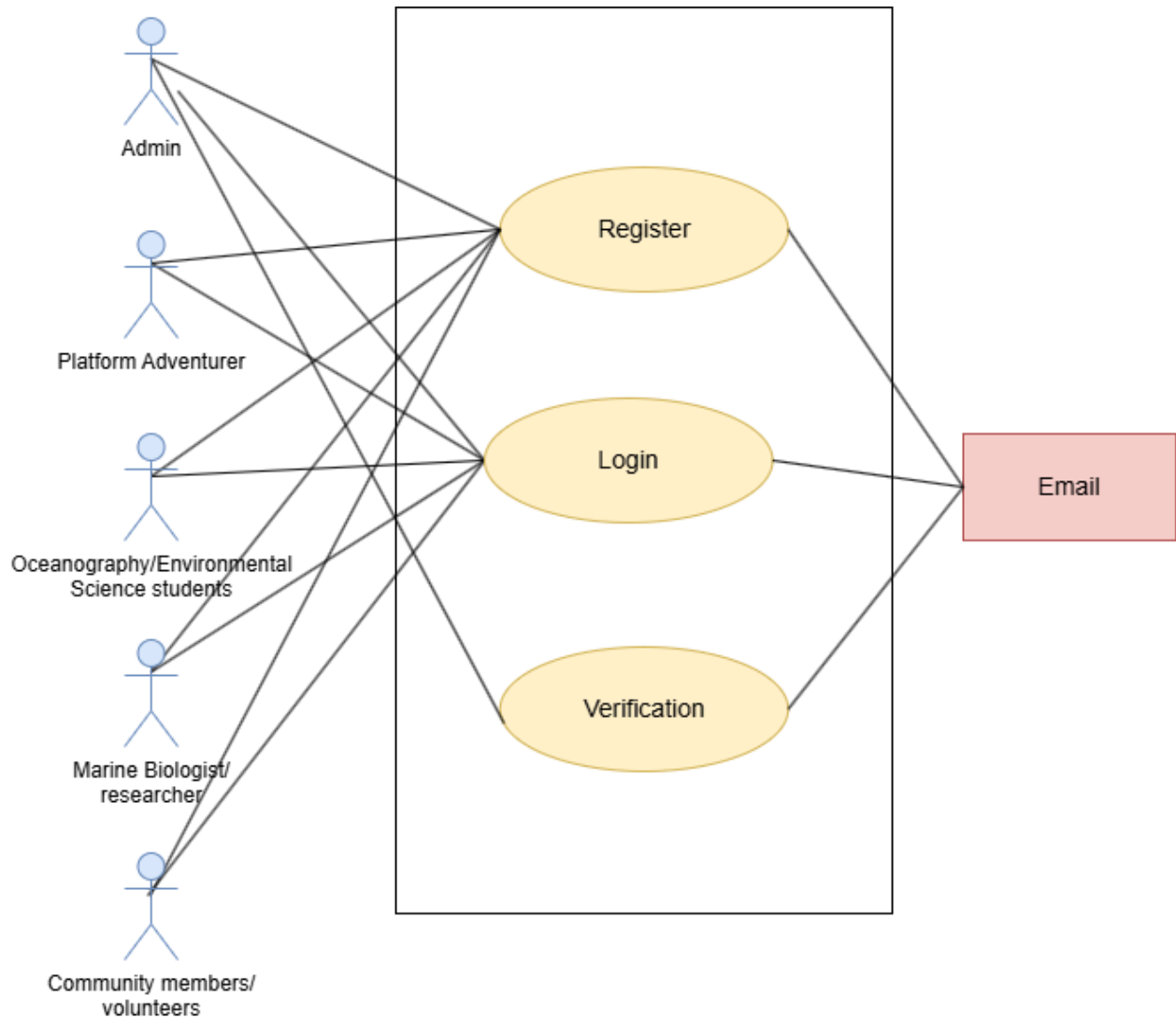
4. Community Space

The **Community Space** serves as a collaborative forum for users to share insights, resources, and experiences related to ocean conservation:

- **Community Members** can post stories, share sightings, and discuss strategies for preserving marine ecosystems.
 - Posts may include text, photos, and videos. After submission:
 - **Admins** verify and approve posts for safety and relevance before publishing.
 - Members are notified once their contributions are approved.
 - **Biologists and Researchers** participate in discussions with a scientific perspective, promoting data-driven and research-based insights.
-

Interactions Between Features

- Users access different features of the platform based on their roles, as shown by the connections in the diagram:
 - **Platform Adventurers:** Primarily interact with all sections, especially the Ocean Zone and Shark Sprint game.
 - **Oceanography Students, Biologists, and Researchers:** Focus on providing and validating data, maintaining scientific accuracy, and observing conservation efforts.
 - **Community Members:** Actively engage in discussions and resource sharing within the Community Space.
 - **Admins:** Oversee all activities to ensure security, accuracy, and smooth functionality.

Level :1.1**Name:** Authentication**Primary Actor:**Admin, Platform Adventurer,Non-platform Adventurers(Oceanography/Environmental Science Students),Marine Biologists,Researchers,Community members,Volunteers**Secondary Actor:**Email**Fig 3:** Use Case Diagram level 1.1

Action & reply:

Action:Admin gives admin ID and sets up password.

Reply: System registers the admin and redirects him to admin profile.

Action:Platform adventurers provide email and set up password.

Reply: System registers them and redirects them to homepage.

Action:Oceanography Students, Biologists, Researchers, and Community Members Provide their name, email, institution, and verification credentials during and set up a password.

Reply: System creates account and redirect them to homepage.

Action:Users log in using saved credentials.

Reply: System verifies and signs them in if verified.

Action:Users click forgot password for password recovery.

Reply: System sends recovery email and then verifies OTP.

Level :1.2

Name: Ocean Zone

Primary Actor:Admin, Platform Adventurer

Secondary Actor:Non-platform Adventurers(Oceanography/Environmental Science Students),Chatbot

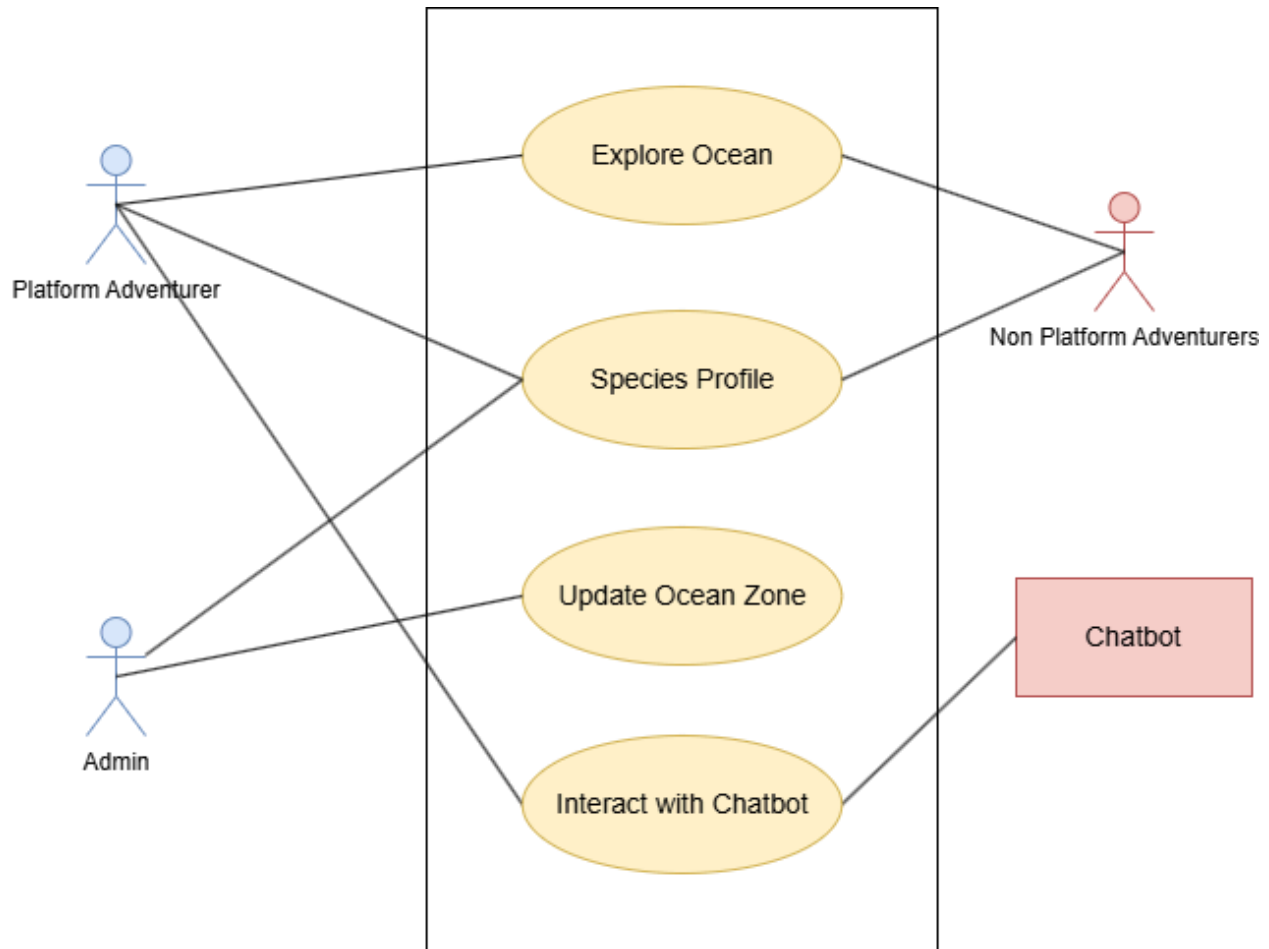


Fig 4: Use Case Diagram level 1.2

Action & reply:

Action:Platform adventurers and Non-platform adventurers scroll through the depths of ocean layers

Reply: System interacts through 3D models of different species.

Action:Users click on species profile.

Reply:A new page opens up with vast species details.

Action:Admin updates ocean zone .

Reply: System is updated accordingly.

Action:Users ask the chatbot about ocean layers and species.

Reply:The chatbot responds to the questions.

Level :1.3

Name: Shark Sprint game

Primary Actor: Platform Adventurer

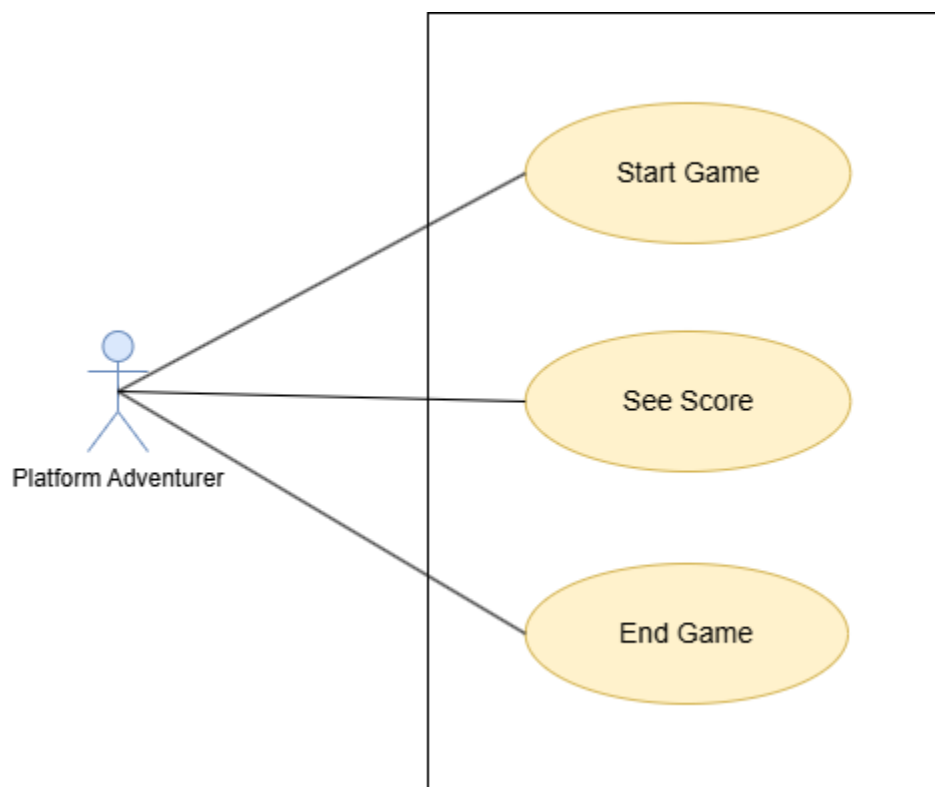


Fig 5: Use Case Diagram level 1.3

Action & reply:

Action: Player clicks on “start game”.

Reply: Game starts

Action: Players clicks on “see score”.

Reply: Player score and leaderboard is shown.

Action: Player clicks on “exit game” .

Reply: The game is quit.

Level :1.4

Name: Community

Primary Actor: Community members,Volunteers,Admin

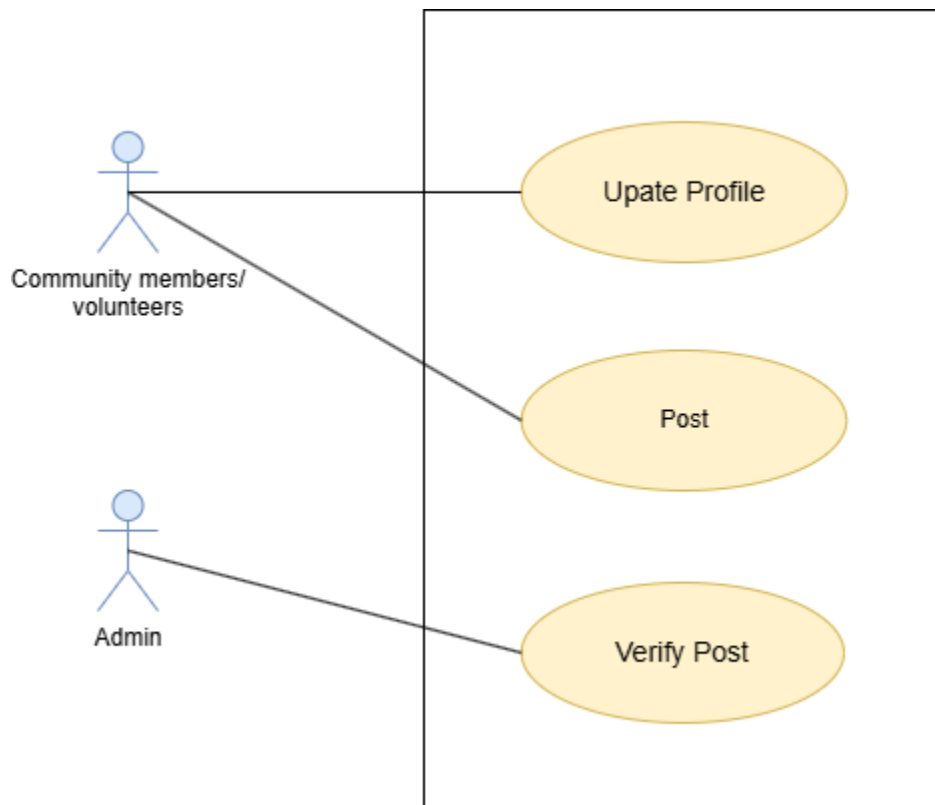


Fig 6: Use Case Diagram level 1.4

Action & reply:

Action: User updates profile information.

Reply: Profile information is updated accordingly

Action:User posts on the community wall.

Reply:An unverified post is shown on the wall.System sends a notification to admin for verification.

Action:Admin verifies post.

Reply:The post is shown verified .

Activity Diagram of CD

Level :1

Name: Conserve the Deep-Detailed

Reference: Use Case Diagram level - 1

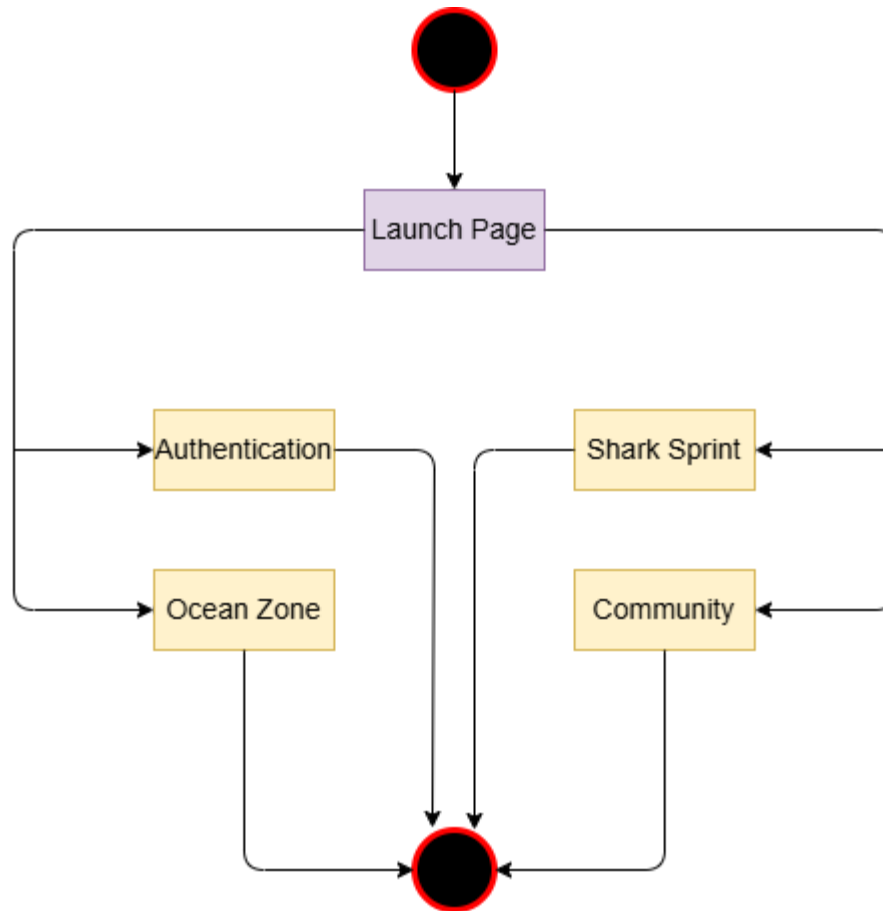


Fig 7: Activity Diagram level 1

Level :1.1

Name: Authentication

Reference: Use Case Diagram level - 1.1

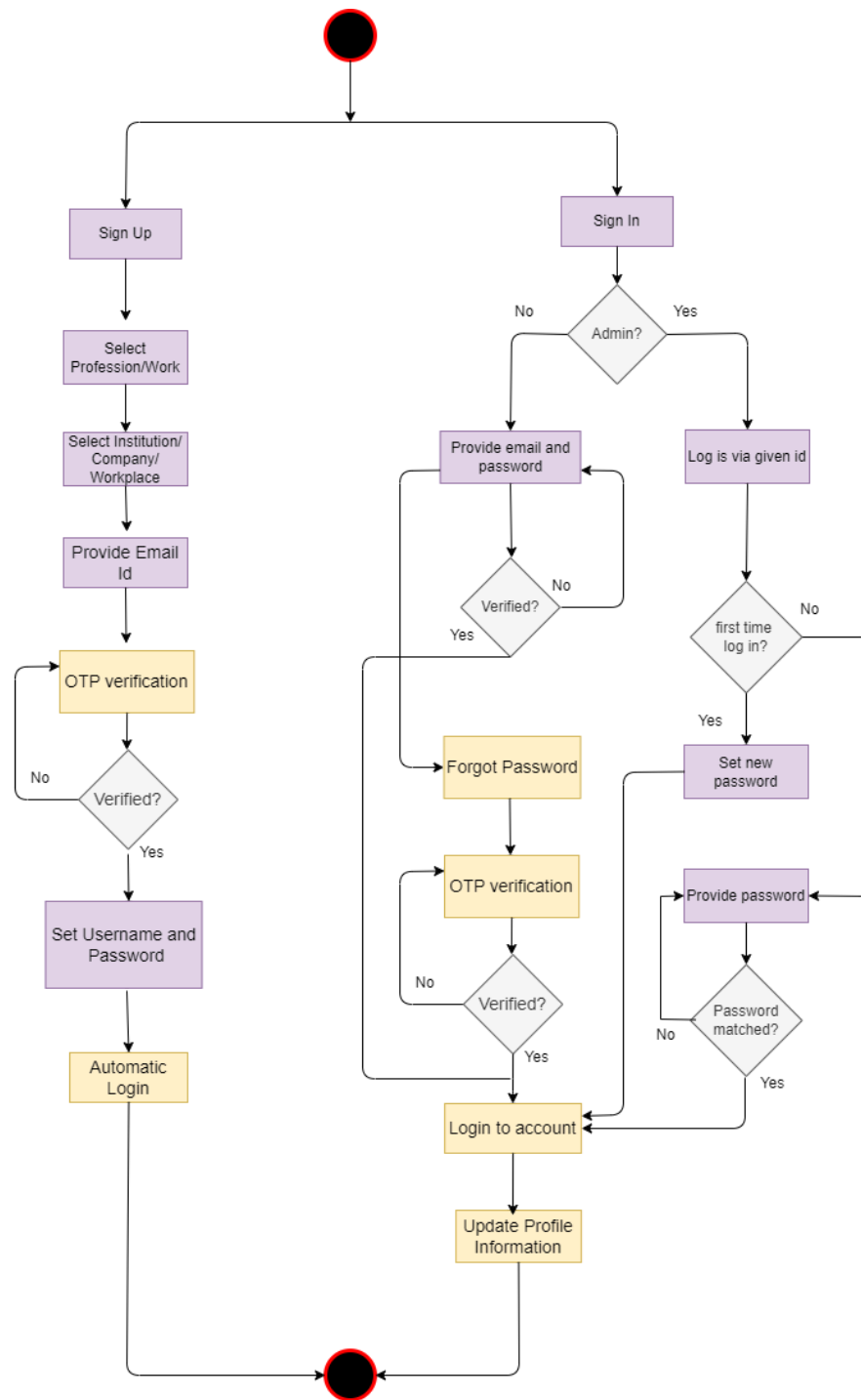
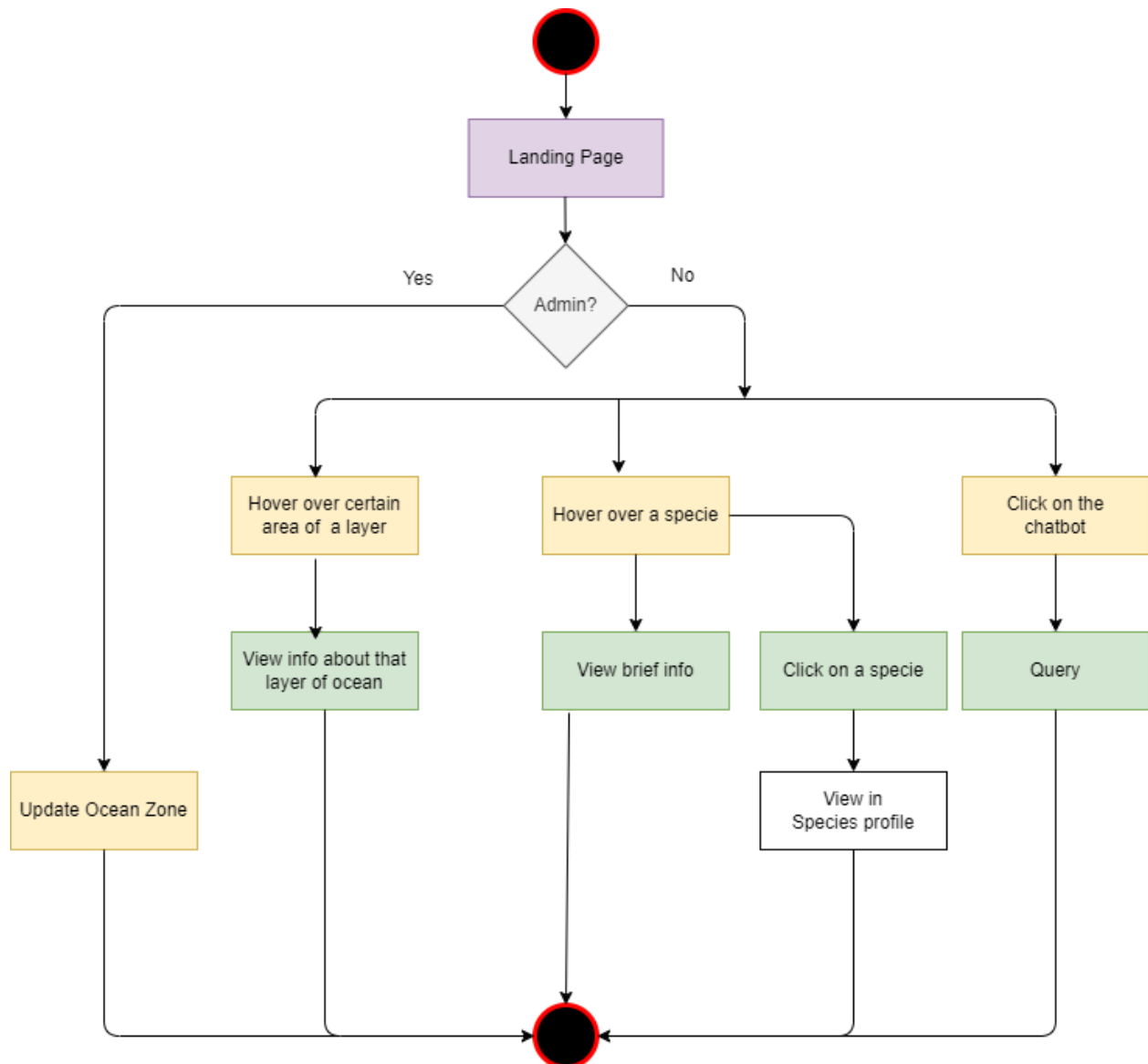
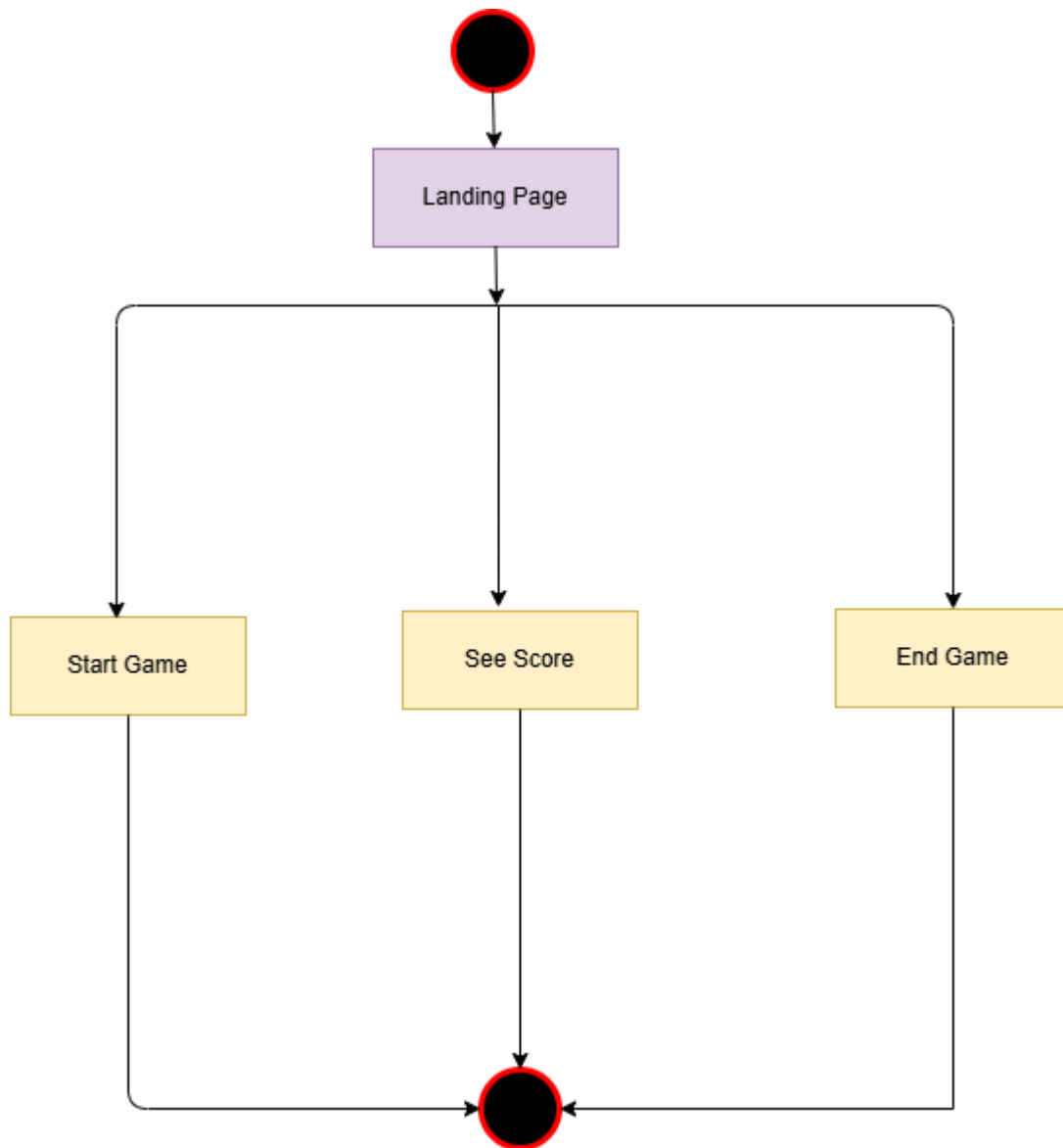
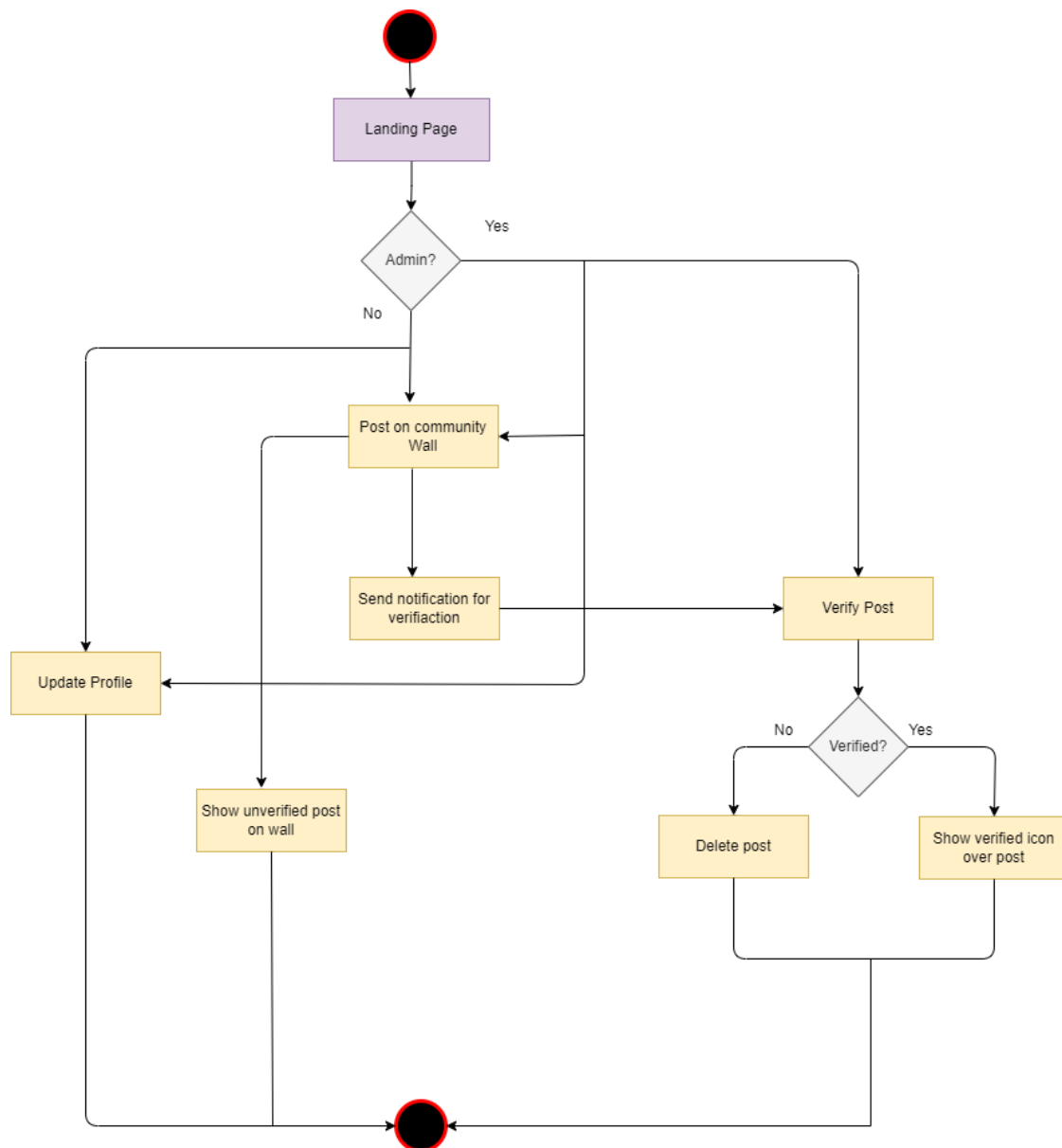


Fig 8: Activity Diagram level 1.1

Level :1.2**Name:** Ocean Zone**Reference:** Use Case Diagram level - 1.2**Fig 9:** Activity Diagram level 1.2

Level :1.3**Name:** Shark Sprint game**Reference:** Use Case Diagram level - 1.3**Fig 10:** Activity Diagram level 1.3

Level :1.4**Name:** Community**Reference:** Use Case Diagram level - 1.4**Fig 11:** Activity Diagram level 1.4

Swimlane Diagram of CD

Definition :

A swimlane diagram is a type of flowchart that delineates who does what in a process. Using the metaphor of lanes in a pool, a swimlane diagram provides clarity and accountability by placing process steps within the horizontal or vertical “swimlanes” of a particular employee, workgroup, or department. It shows connections, communication and handoffs between these lanes, and it can serve to highlight waste, redundancy and inefficiency in a process.

SID(Swimlane ID) : 1

Name: CD

Reference: Use Case and Activity Diagram level - 1

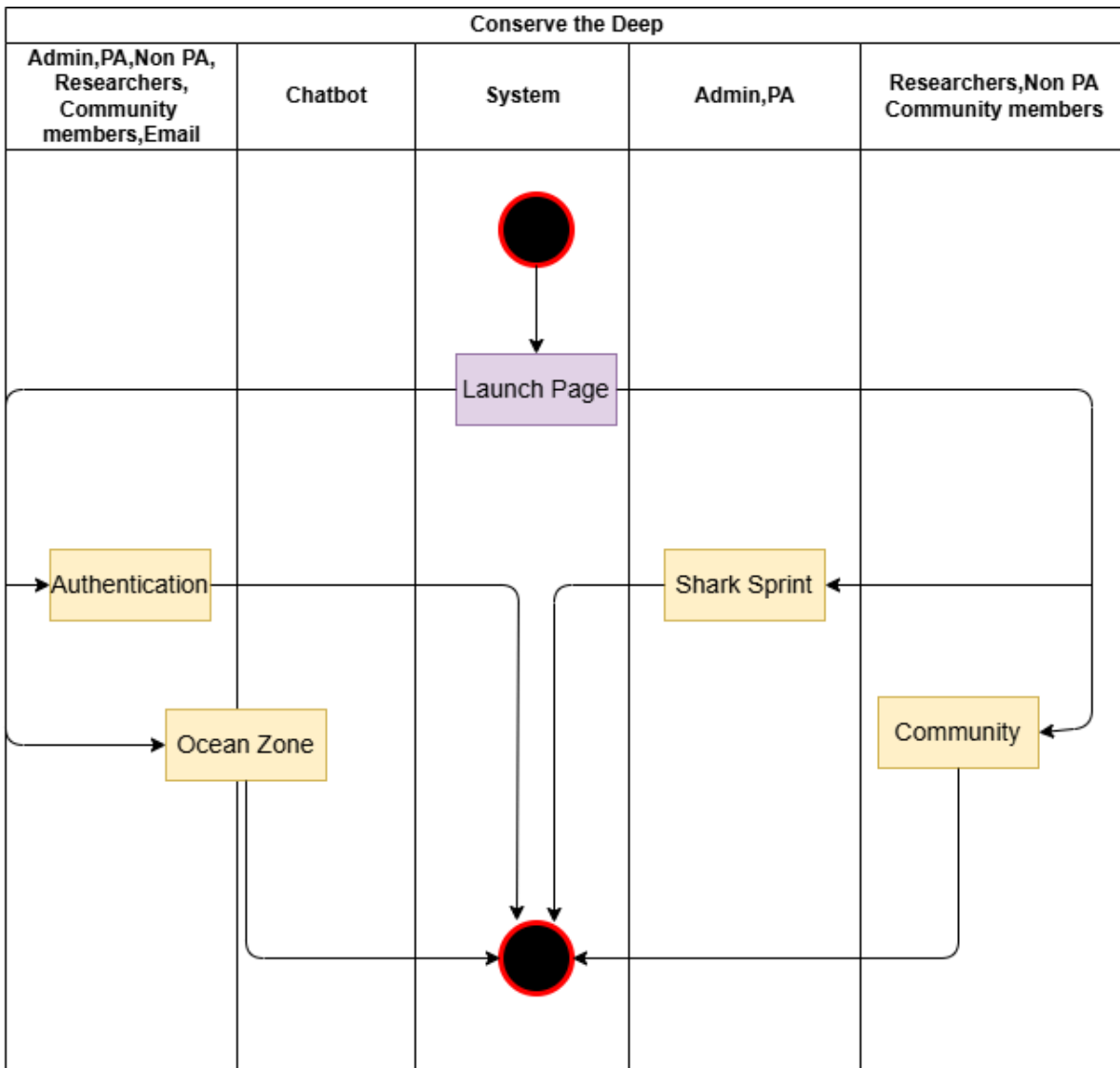


Fig 12: Swimlane 1

SID(Swimlane ID) : 1.1

Name: Authentication

Reference: Use Case and Activity Diagram level - 1.1

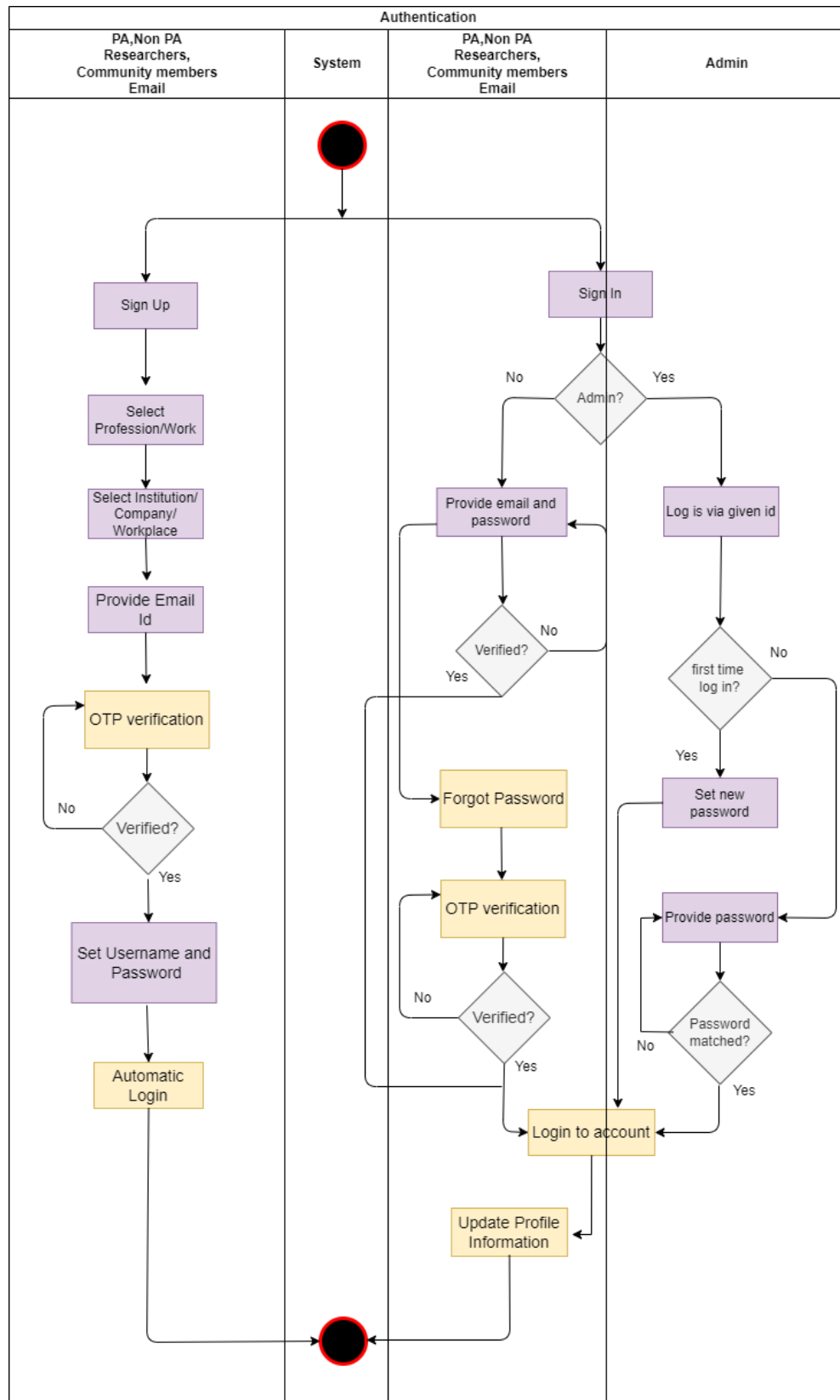
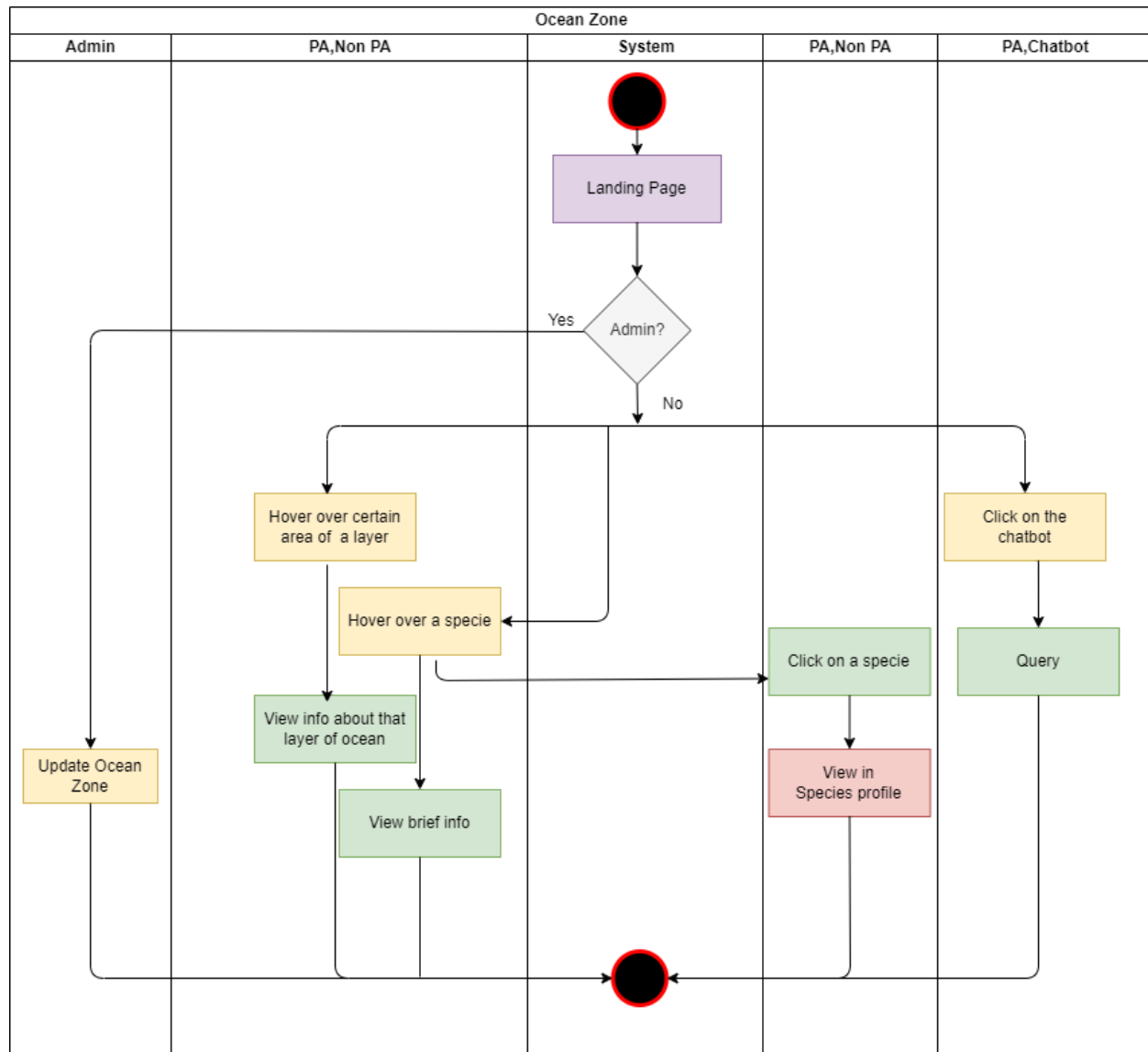


Fig 13: Swimlane 1.1

SID(Swimlane ID) : 1.2**Name:** Ocean zone**Reference:** Use Case and Activity Diagram level - 1.2**Fig 14:** Swimlane 1.2

SID(Swimlane ID) : 1.3

Name: SharkSprint game

Reference: Use Case and Activity Diagram level - 1.3

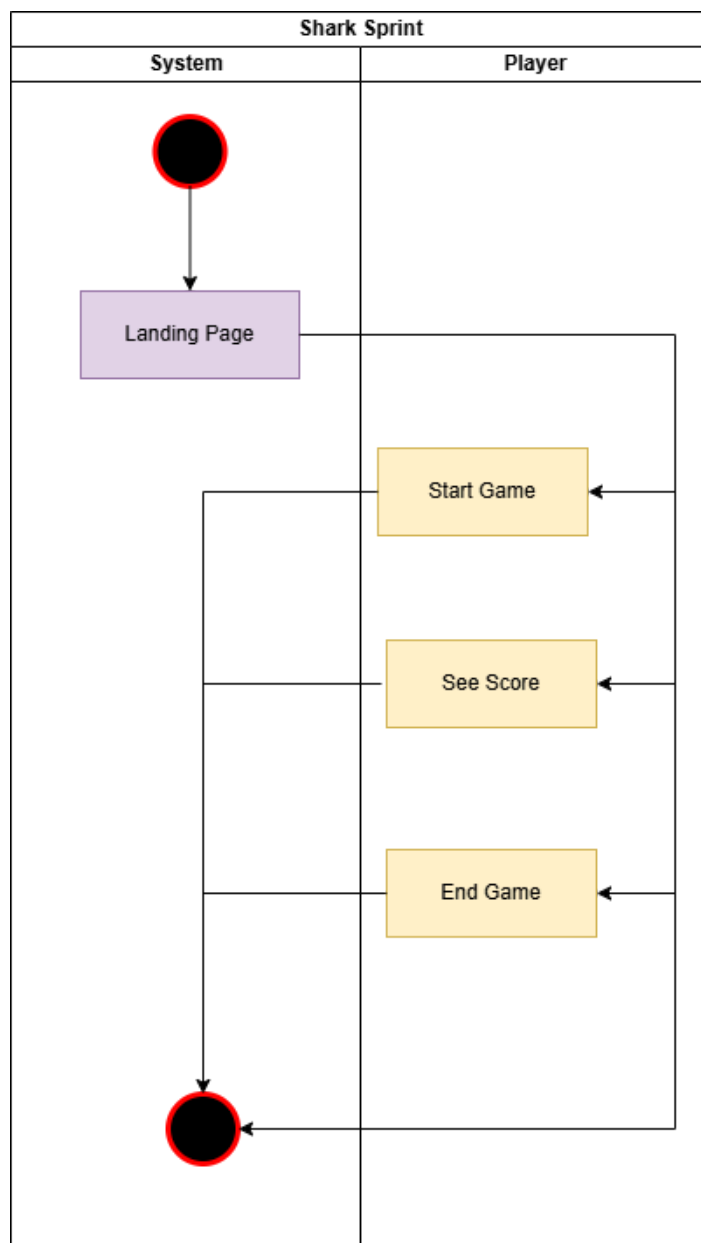


Fig 15: Swimlane 1.3

SID(Swimlane ID) : 1.4

Name:Community

Reference: Use Case and Activity Diagram level - 1.4

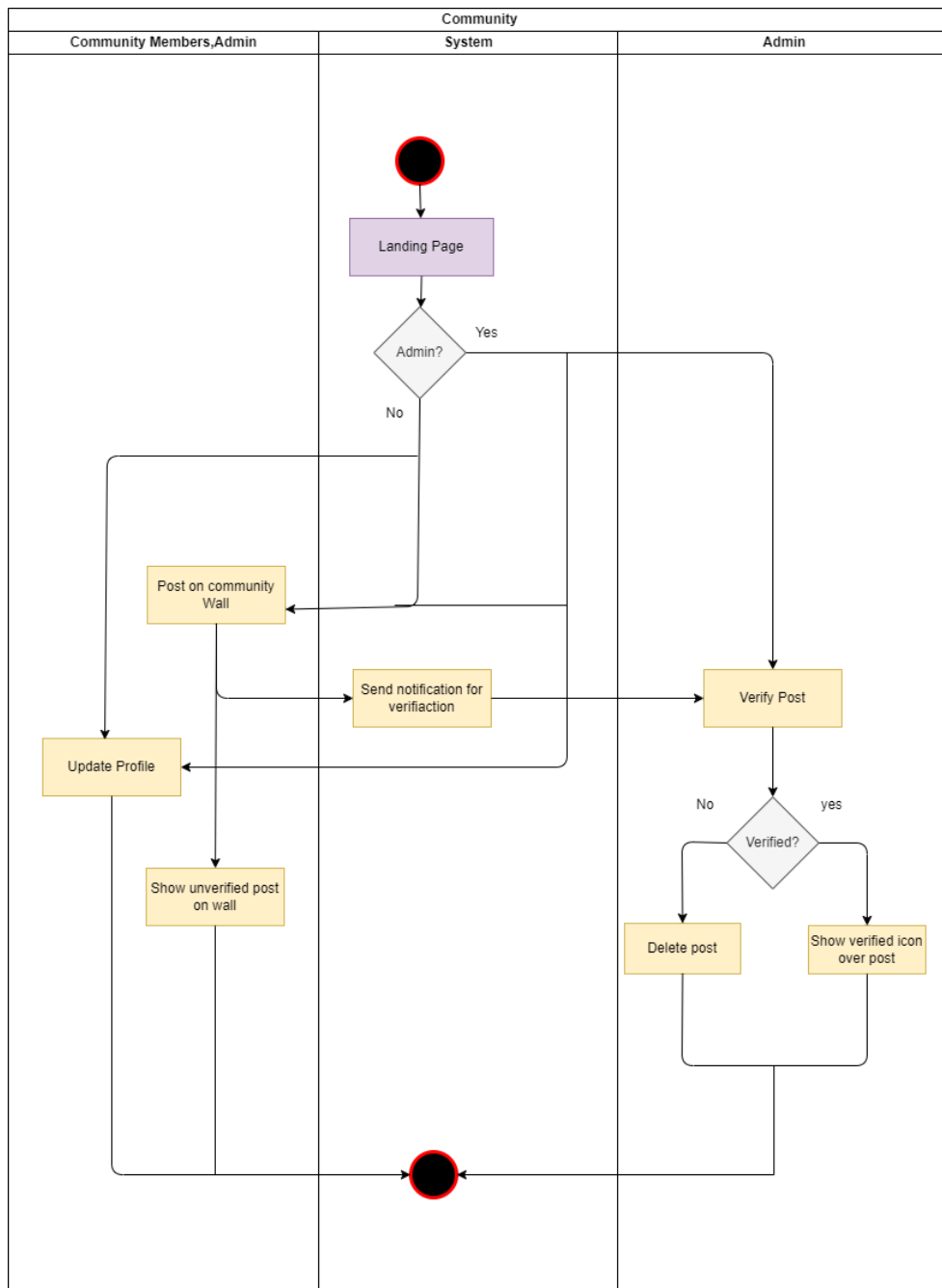


Fig 16: Swimlane 1.4

DataBased Modeling:

DATA MODELING 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 dataobjects are entered, stored, transformed and produced within the system.

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.

Nouns Identification Table :

SL	Noun	Problem/Solution Space (P/S)	Attributes
1.	Marine life	P	
2.	Bay of Bengal	P	
3.	User	S	16,17,34,46,47,48, 49
4.	Biodiversity	P	
5.	Pollution	P	
6.	Climate	P	

7.	Registration	P	
8.	Login	P	
9.	Platform Adventurer	S	16,34,46,47,48, 49
10.	Oceanography Student	S	16,17,34,46,47,48, 49
11.	Marine Biologist	S	16,17,34,46,47,48, 49
12.	Non Platform Adventurer	S	16,17,34,46,47,48, 49
13.	Community Member	S	16,17,34,46,47,48, 49
14.	Admin	S	15,16,46,47,48,49
15.	Admin ID	S	
16.	Role	S	
17.	Institution	S	
18.	Integrity	P	
19.	Security	P	
20.	Ocean Zone	S	21,39,55,56,57,58,5 9,60,62
21.	Species	S	42,23,24,25,26,27,2 8,29,30
22.	Species description	S	

23.	Geography	S	
24.	Habitat	S	
25.	Food	S	
26.	Photos	S	
27.	Population trend	S	
28.	Population status	S	
29.	Conservation status	S	
30.	Environmental threats	S	
31.	Shark Sprint	S	3,32,33,32,34,35
32.	Pollutants	P	
33.	Underwater threats	P	
34.	Score	S	
35.	Leaderboard	S	3,34
36.	Community	S	3,37,38,50
37.	Resources	S	
38.	Contribution	S	
39.	Chatbot	S	43
40.	Information	S	
41.	Tips	S	
42.	Content	S	

43.	Response	S	
44.	Support	S	
45.	Account	P	
46.	Email	S	
47.	Name	S	
48.	Username	S	
49.	Password	S	
50.	Post	S	25
51.	Comments	S	
52.	Approval Status	P	
53.	Progress	S	
54.	Milestones	P	
55.	Species Name	S	
56.	Temperature	S	
57.	pH	S	
58.	Salinity	S	
59.	O2 Level	S	
60.	Environment Data	S	56,57,58,59
61.	Chat	P	
62.	Depth	S	

Final Data Objects:

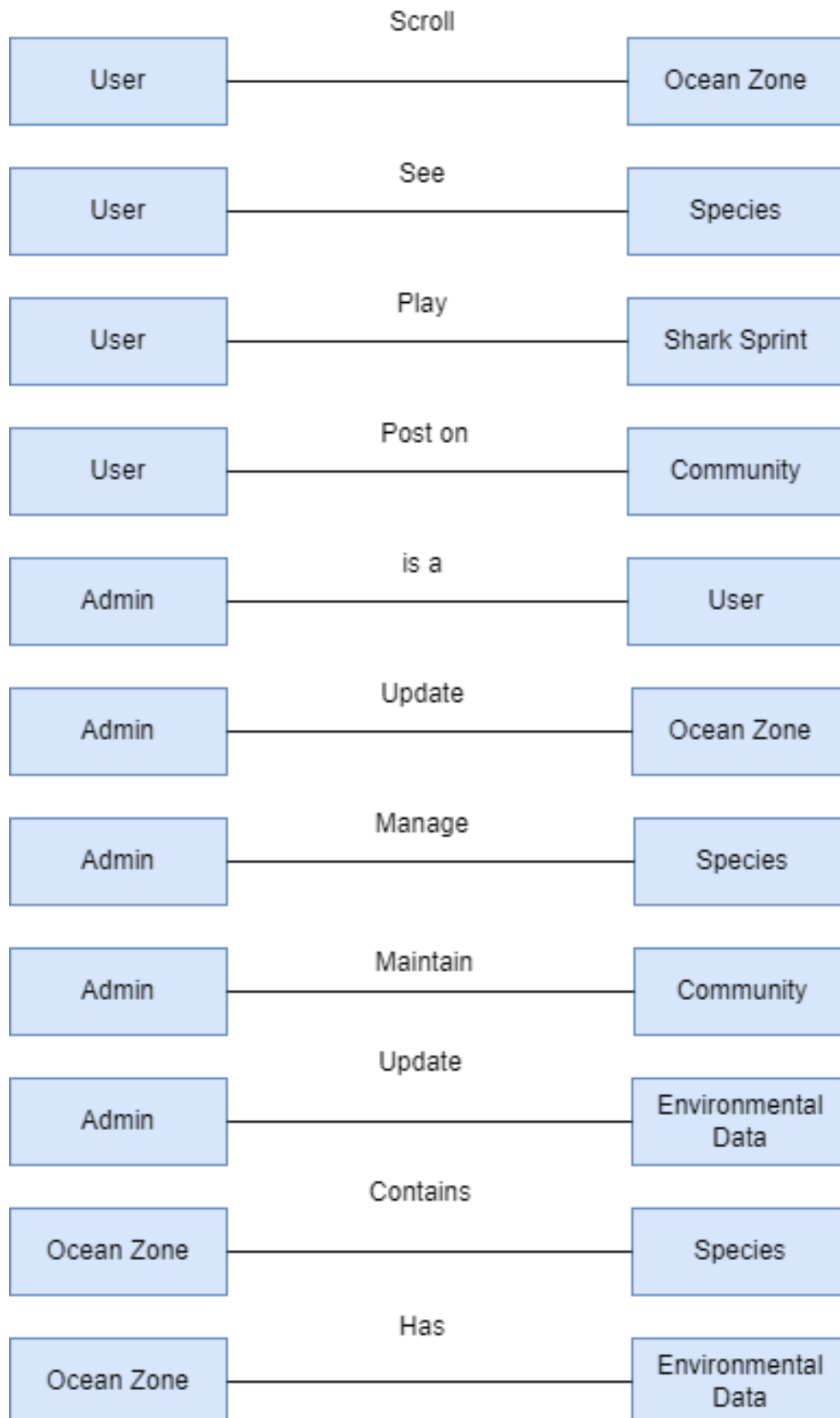
1. User
2. Admin
3. Ocean Zone
4. Species
5. Shark Sprint
6. Community
7. Environment Data

Schema Diagram:

Data Object	Attributes	Type	Size
User	Name	varchar2	40
	Email	Varchar2	40
	Password	Varchar2	15
	<u>Username</u>	Varchar2	20
	Role	Varchar2	40
	Institution	Varchar2	40
	score	Number	10
Admin	<u>Admin_id</u>	Number	15
	Name	Varchar2	40
	Email	Varchar2	40
	Password	Varchar2	15
	Username	Varchar2	20
	Code	Number	15
	Role	Varchar2	40
Ocean Zone	<u>Depth</u>	Number	15
	Species_name	Varchar2	200
	Description_sp	Varchar2	10000

Shark Sprint	<u>Username</u>	Varchar2	20
	Pollutant	Varchar2	20
	Underwater_threats	Varchar2	30
	Score	Number	10
Community	Username	Varchar2	20
	<u>Post_id</u>	Number	10
	Aproval_status	Bit	1
Species	<u>Species_name</u>	Varchar2	20
	Species_description	Varchar2	1000
	Geography	Varchar2	500
	Habitat	Varchar2	500
	Food	Varchar2	500
	Photos	Bit	1
	Population_trend	Varchar2	20
	Population_status	Varchar2	20
	Environmental_threats	Varchar2	50
Environmental Data	<u>Zone_name</u>	Varchar2	15
	Temperature	Varchar2	15
	pH	Varchar2	15
	Salinity	Varchar2	15
	O2_level	Varchar2	15

Relationship Between Data Objects:



ER Diagram:

Definition of ER Diagram : An Entity Relationship (ER) Diagram is a type of flowchart that illustrates how “entities” such as people, objects or concepts relate to each other within a system.

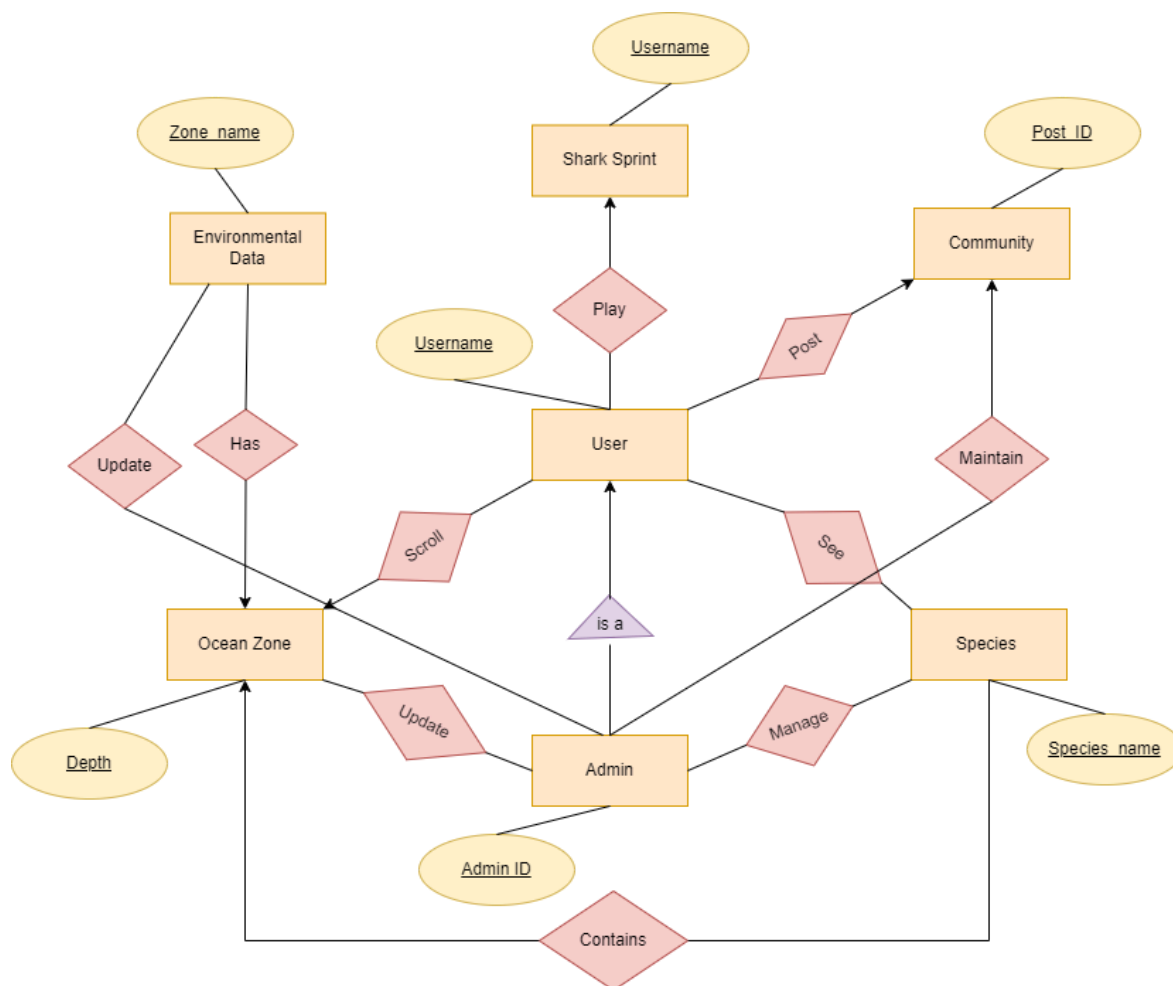


Fig 17: ER Diagram

Class Based Modeling:

CLASS BASED MODELING 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.

Nouns and Verbs Identification:

Nouns Table:

SL	Noun
1.	Marine life
2.	Bay of Bengal
3.	User
4.	Biodiversity
5.	Pollution
6.	Climate
7.	Registration
8.	Login
9.	Platform Adventurer
10.	Oceanography Student
11.	Marine Biologist

12.	Non Platform Adventurer
13.	Community Member
14.	Admin
15.	Admin ID
16.	Role
17.	Institution
18.	Integrity
19.	Security
20.	Ocean Zone
21.	Species
22.	Species description
23.	Geography
24.	Habitat
25.	Food
26.	Photos
27.	Population trend
28.	Population status
29.	Conservation status
30.	Environmental threats
31.	Shark Sprint

32.	Pollutants
33.	Underwater threats
34.	Score
35.	Leaderboard
36.	Community
37.	Resources
38.	Contribution
39.	Chatbot
40.	Information
41.	Tips
42.	Content
43.	Response
44.	Support
45.	Account
46.	Email
47.	Name
48.	Username
49.	Password
50.	Post
51.	Comments

52.	Approval Status
53.	Progress
54.	Milestones
55.	Species Name
56.	Temperature
57.	pH
58.	Salinity
59.	O2 Level
60.	Environment Data
61.	Chat
62.	Depth

Verbs Table:

SL	Verb
1	Raise
2	Educate
3	Explore

4	Engage
5	Reflect
6	Contribute
7	Manage
8	Verify
9	Observe
10	Maintain
11	Avoid
12	Share
13	Build
14	Monitor
15	Approve
16	Notify
17	Answer
18	Provide
19	Oversee
20	Register
21	Save
22	Track

General Classification

Candidate classes are categorized based on the seven general classifications. The analysis classes manifest themselves in one of the following ways:

1. External entities
2. Things
3. 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.

General Classification Table:

Sl	Noun	Characteristics Met
1	Marine Life	2, 7
2	Bay of Bengal	6
3	User	4, 5, 7
4	Biodiversity	2
5	Pollution	2, 3
6	Registration	3, 5
7	Login	3, 5
8	Platform Adventurer	4, 5, 7

9	Oceanography Student	4, 5,7
10	Marine Biologist	4, 5, 7
11	Non-Platform Adventurer	4, 5, 7
12	Admin	4, 5, 7
13	Ocean Zone	2, 6, 7
14	Species	1,2, 7
15	Environmental Data	1,2, 7
16	Shark Sprint	2, 3, 5
17	Community Space	5, 6, 7
18	Chatbot	1,2,3

Candidate Classes from the Nouns :

Based on the above criteria, the following nouns qualify as candidate classes:

- **Platform Adventurer**
- **Non Platform Adventurer**
- **Admin**
- **Species**
- **Shark Sprint**
- **Community**
- **Environment Data**

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:

Selection Criteria (SC) Table

Sl	Noun	SC Criteria Met
1	User	1, 2, 3, 4, 5
2	Platform Adventurer	1, 2, 3, 4, 5
3	Oceanography Student	1, 2, 3, 4,5
4	Marine Biologist	1, 2, 3, 4,5
5	Non-Platform Adventurer	1, 2, 3, 4,5
6	Admin	1, 2, 3, 4, 5
7	Ocean Zone	1, 2, 3, 6
8	Species	1, 2, 3, 4, 5

9	Environmental Data	1, 2, 3, 6
10	Shark Sprint	1, 2, 3, 6
11	Community Space	1, 2, 3, 5, 6
12	Chatbot	6

Selected Classes:

- Platform Adventurer
- Non Platform Adventurer
- Admin
- Species
- Shark Sprint
- Community
- Environment Data
- Chatbot

Attribute and method identification:

Class Name	Attributes	Methods
User	-user_id -username -password -email -Platform_Adventurer[] -Non_platform_adventurer[] -Admin[]	+registrar() +login() +view_profile() +update_profile()
Platform Adventurer	-adventurer_id +progress +achievements -Shark_sprint -ocean_zone	+explore_ocean(), +play_game(), -save_progress()
Non-Platform Adventurer	-Non_id, -progress +institution +specialization -Suggestion[] -username -Admin	+view_profile(), -suggest_species(),+review_profile()

Admin	-admin_id, -username, -password, -email, -User[], -Environment_data -Community_space, -Species	-approve_registration(), -manage_users(), -update_data(),-approve_post()
Ocean Zone	-zone_id, +zone_name, +depth, -Species[], -Environmental_data[], -Admin	+view_zone(), +explore_zone()
Species	-species_id, +name, +description, +habitat, +food, +photos, +population_trend, +threats -Admin	+view_profile(), +update_profile()
Environmental Data	-data_id, +temperature, +salinity, +pH, +oxygen_level -Admin	+validate_data(), +display_data()
Shark Sprint	-game_id, +score, +level, +pollution_cleaned, +leaderboard, -Platform_Adventurer[]	+start_game(), -update_score(), +End_game()
Community Space	+posts, +comments, +likes, -User[] -Admin	+create_post(), +view_posts(), -approve_post()

Chatbot	+chat_id -User[]	+provide_answer()
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● **Class Card:**

User	
Attribute	Method
-user_id -username -password -email	+registrar() +login() +view_profile() +update_profile()
Responsibilities	Collaborator
<ul style="list-style-type: none"> ● Register for the system ● Login to access the platform ● View and update their profile 	<ul style="list-style-type: none"> ● Platform Adventurer ● Non-Platform Adventurer ● Admin

Platform Adventurer	
Attribute	Method
-adventurer_id, +progress, +achievements, -username, -Shark_sprint -ocean_zone -Species	+explore_ocean(), +play_game(), -save_progress() +interact_chatbot()
Responsibilities	Collaborator
<ul style="list-style-type: none"> • Explore ocean layers using the scroll-based feature. • Participate in the Shark Sprint game. • View species profiles and learn about conservation challenges. • Save progress and track milestones. 	<ul style="list-style-type: none"> • Ocean Zone • Shark Sprint

Non Platform Adventurer	
Attribute	Method
-user_id, -progress, +institution, +specialization, -username -Admin	+view_profile(), +track_progress(), +suggest_species(), +review_profile()
Responsibilities	Collaborator
<ul style="list-style-type: none"> • Suggest Admin • View environment data and species 	<ul style="list-style-type: none"> • Admin

Admin	
Attribute	Method
-admin_id, -username, -password, -email, -User[], -Environment_data[], -Community_space,	-approve_registration() -manage_users() -verify_data() -approve_post()

-Species	
Responsibilities	Collaborator
<ul style="list-style-type: none"> • Verify post • Update Environment Data • Oversee Species Profile 	<ul style="list-style-type: none"> • Community, • Environment Data • Species

Ocean Zone	
Attribute	Method
-zone_id, +zone_name, +depth, -Species[], -Environmental_data[], -Admin -Chatbot	+view_zone() +explore_zone() +Chatbot()
Responsibilities	Collaborator
<ul style="list-style-type: none"> • Show Ocean Layers 	<ul style="list-style-type: none"> • Environment Data • Species • Chatbot

Species	
Attribute	Method
-species_id, +name, +description, +habitat, +food, +photos, +population_trend, +threats -Admin	+view_profile() +update_profile()
Responsibilities	Collaborator
<ul style="list-style-type: none"> • Store and display information about marine species • Reflect real-time conditions using environmental data. • Allow Admins to update and maintain profile content. 	<ul style="list-style-type: none"> • Admin

Environment Data	
Attribute	Method
-data_id, +temperature, +salinity, +pH, +oxygen_level -Admin	+validate_data(), +display_data()
Responsibilities	Collaborator

<ul style="list-style-type: none"> • Collect and store real-time ocean data (temperature, salinity, pH). • Ensure data accuracy through Admin verification. 	<ul style="list-style-type: none"> • Admin
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Shark Sprint	
Attribute	Method
-game_id, +score, +level, +pollution_cleaned, +leaderboard, -Platform_Adventurer[]	+start_game(), -update_score(), +End_game()
Responsibilities	Collaborator
<ul style="list-style-type: none"> • Offer an educational and engaging game experience. • Save user scores and progress to the leaderboard. 	Platform Adventurer

Community Space	
Attribute	Method
+posts, +comments, +likes, -User[] -Admin	+create_post(), +view_posts() -approve_post()
Responsibilities	Collaborator
<ul style="list-style-type: none"> • Enable users to share resources and insights. • Allow users to create posts and comments. • Allow Admin to approve posts 	<ul style="list-style-type: none"> • User • Admin

Chatbot	
Attribute	Method
+chat_id -User[]	+provide_answer()
Responsibilities	Collaborator
<ul style="list-style-type: none"> • Provide required answer 	User

CRC Diagram:

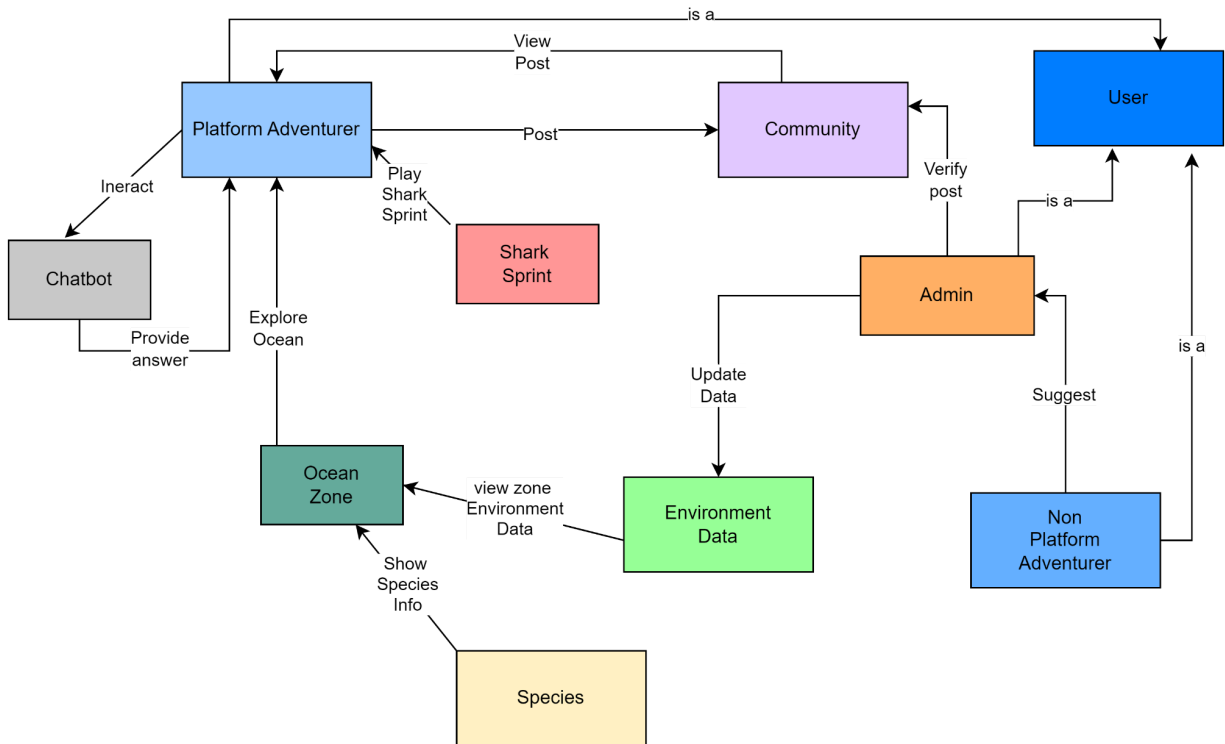


Fig 18: CRC diagram

Behavioral Modeling:

Behavioral modeling in software engineering captures the dynamic aspects of a system, illustrating its responses to inputs, interactions, and events over time. For the Conserve The Deep platform, this specifically involves using state transition diagrams and sequence diagrams. State transition diagrams depict the states the app can be in and the transitions between those states triggered by various events, providing insights into the web app's dynamic behavior and possible state changes. Sequence diagrams detail the step-by-step interactions between objects, showing how the app components interact over time to accomplish tasks. These visual representations improve understanding of requirements, facilitate stakeholder communication, and aid in designing test cases, ensuring the platform behaves as expected across different states, timelines, and actors.

State Transition Diagram:

A state transition diagram, or state machine diagram, visually represents the states of the web application and the transitions between those states triggered by various events. Key components include states (conditions or situations of the app), transitions (arrows indicating movement between states), events (triggers for transitions), and actions (activities performed during transitions). It starts with an initial state and may include a final state, marking the beginning and end of the app's processes. For the web platform by mapping out the platform's dynamic behavior and possible state changes, these diagrams provide valuable insights for system design, enhance stakeholder communication, and help identify potential errors or missing transitions in the system. This helps ensure the app operates smoothly and efficiently, providing a clear picture of its operational flow.

Event Table

Initiator	Events	Collaborator
User	Creates an account	Database, System
User	Explores ocean zones and views real-time environmental data	Ocean Zone
User	Views species profiles and learns about endangered marine life	Species
User	Plays Shark Sprint to clean pollutants and score points	Shark Sprint
User	Posts resources, or strategies in the community space	Community, Admin
Admin	Logs in to the system using predefined credentials	Database, System
Admin	Approves user registrations and ensures profile accuracy	System
Admin	Verifies and updates environmental data	Ocean Zone, Environmental data
Admin	Oversees updates to species profiles	Biologists, Researchers

Ocean Zone	Allows users to scroll through the ocean layers	System
Species	Allows users to explore comprehensive profiles of endangered, vulnerable, and extinct marine life and updates profile details under admin supervision	Admin
Shark Sprint	Allows users to play the game, save player score and updates leaderboard	System
Environment Data	Shows Environment data and allows admin to update data	Admin
Community	Allows users to post, update profile and allows admin to monitor posts for relevance and accuracy	User
Chatbot	Provides real-time conservation guidance and answers	User, System

Diagram ID: 1

Name: User

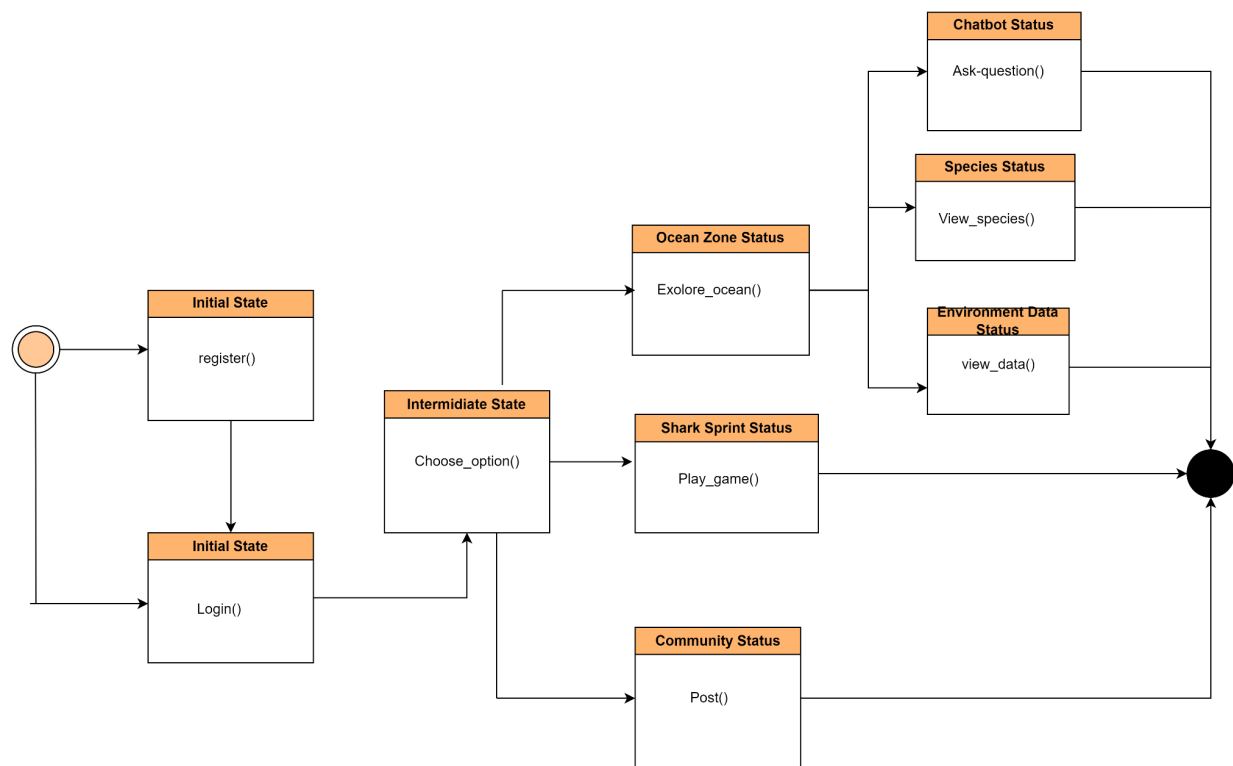


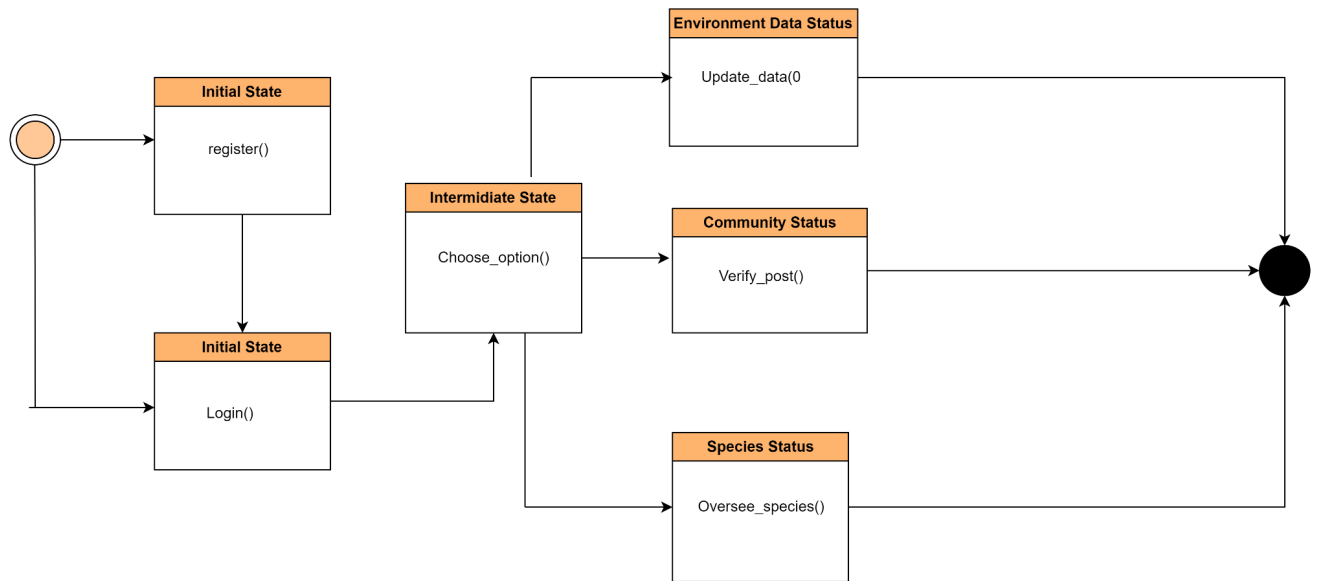
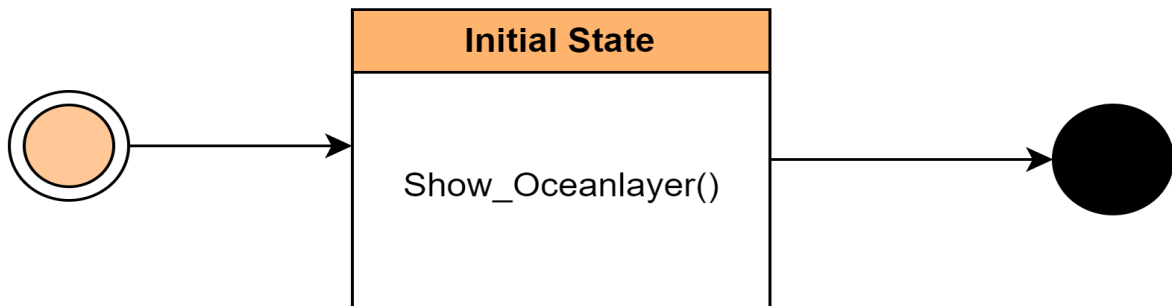
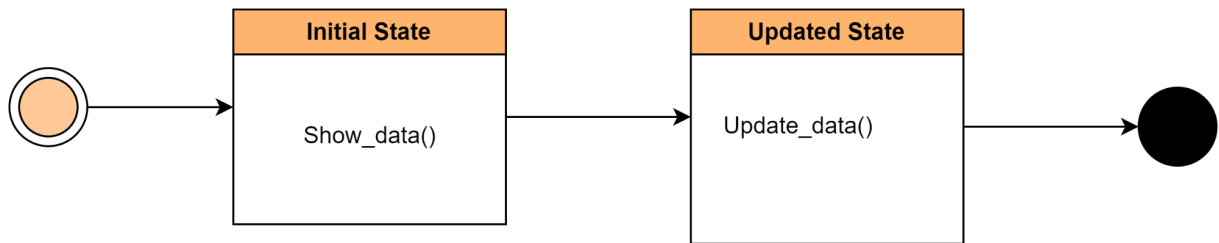
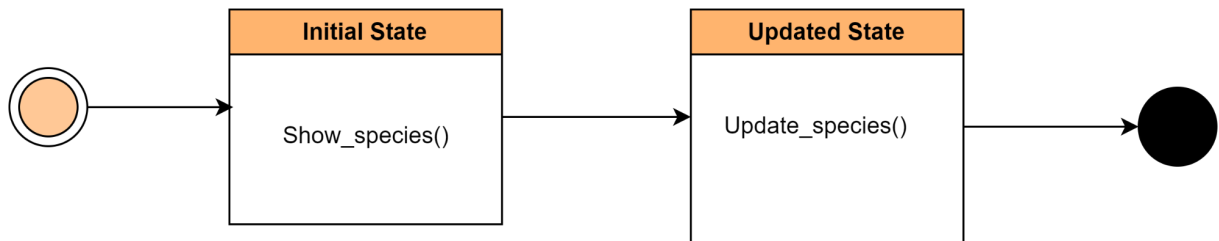
Diagram ID: 2**Name: Admin****Diagram ID: 3****Name: Ocean Zone**

Diagram ID: 4

Name: Environment Data

**Diagram ID: 5**

Name: Species

**Diagram ID:6**

Name: Shark Sprint

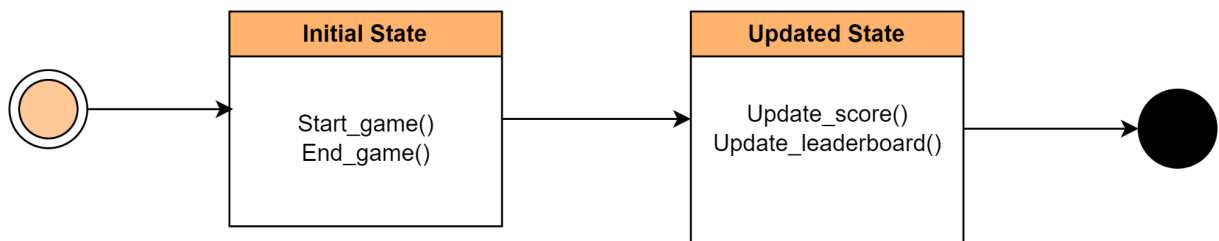
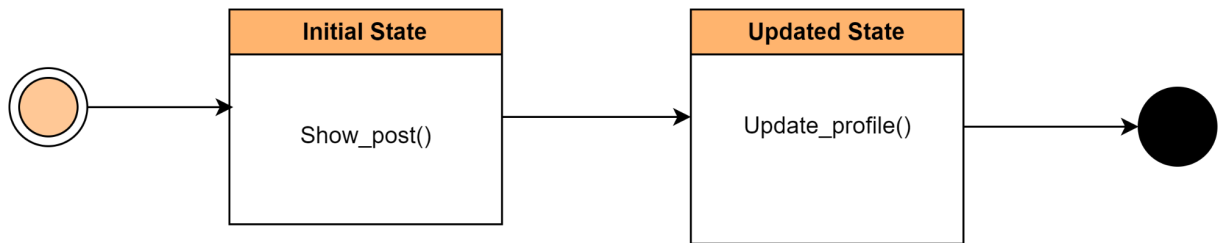
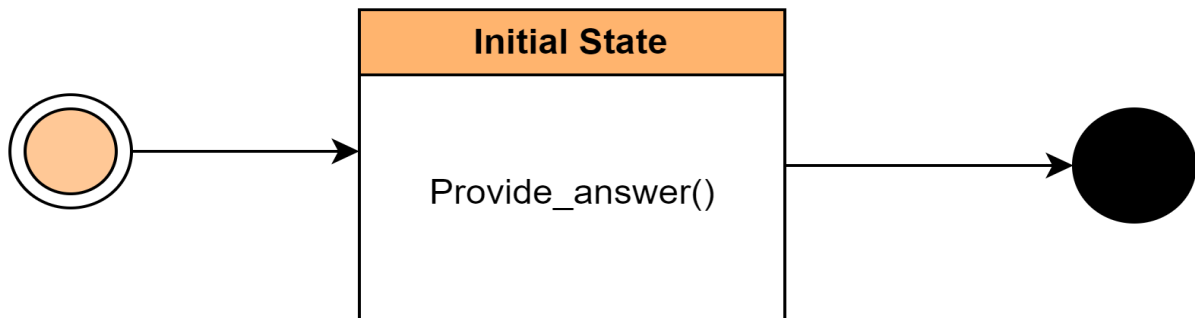


Diagram ID: 7**Name: Community****Diagram ID:8****Name: Chatbot**

Sequence Diagram:

A sequence diagram for the Conserve The Deep platform illustrates the interactions between users and system components over time. It shows how a user registers for this platform, how the web interface processes the request, how the AI chatbot responds with an appropriate message, and visualization of ocean environment and different species. By detailing the step-by-step exchange of messages, sequence diagrams help clarify the flow of operations, ensuring that each component interacts correctly to complete tasks. This enhances the design and communication among stakeholders, leading to a smoother app functionality.

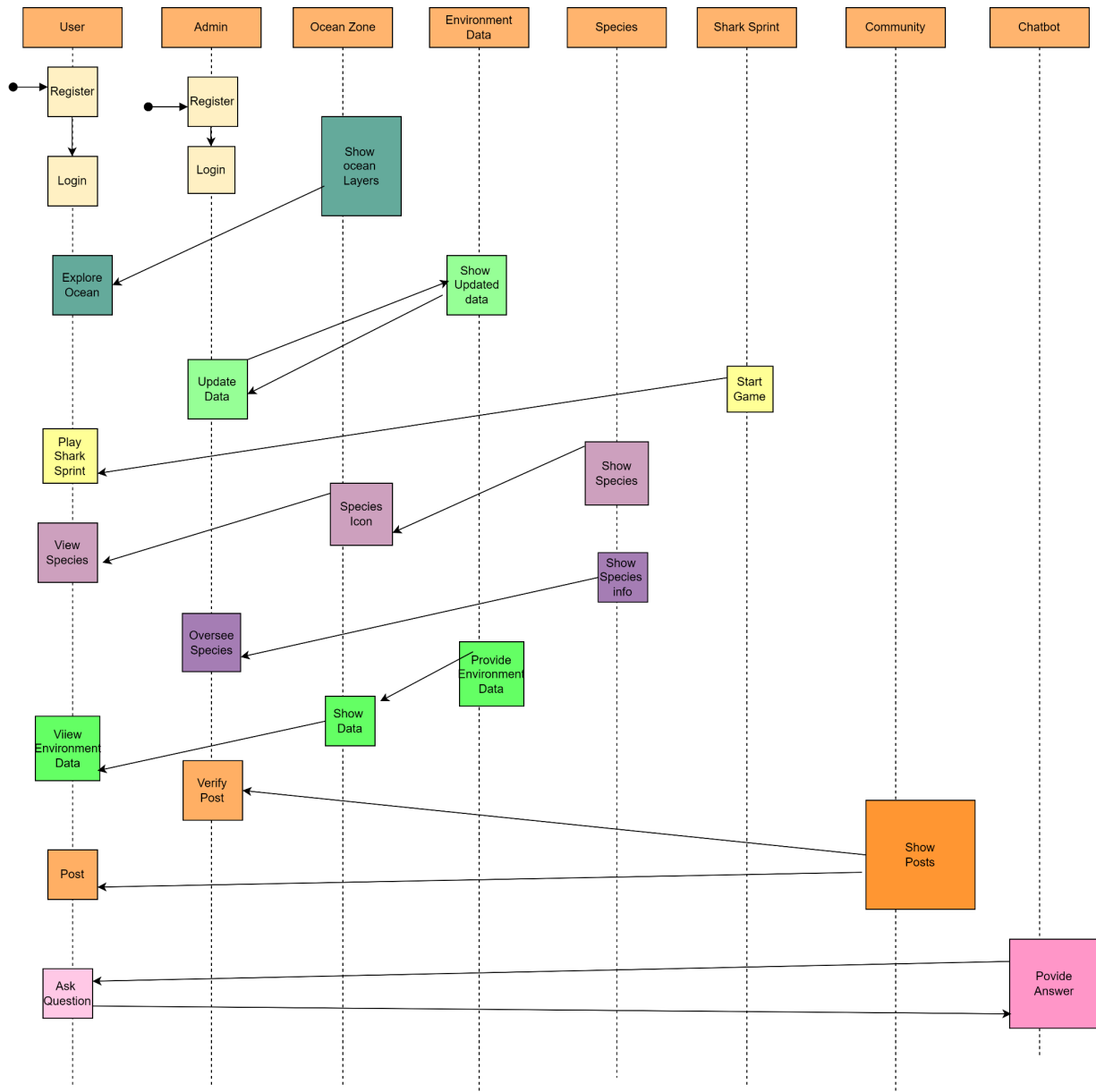


Fig 19 : Sequence diagram

Flow-Based Modeling

Data Flow Diagram (DFD)

A data-flow diagram is a visual representation of how data moves through a system or a process. A data flow diagram (DFD) shows how information moves through any system or process. It displays data inputs, outputs, storage locations, and routes between each destination using predefined symbols such as rectangles, circles, and arrows as well as brief text labels.

Level 0: Conserve The Deep

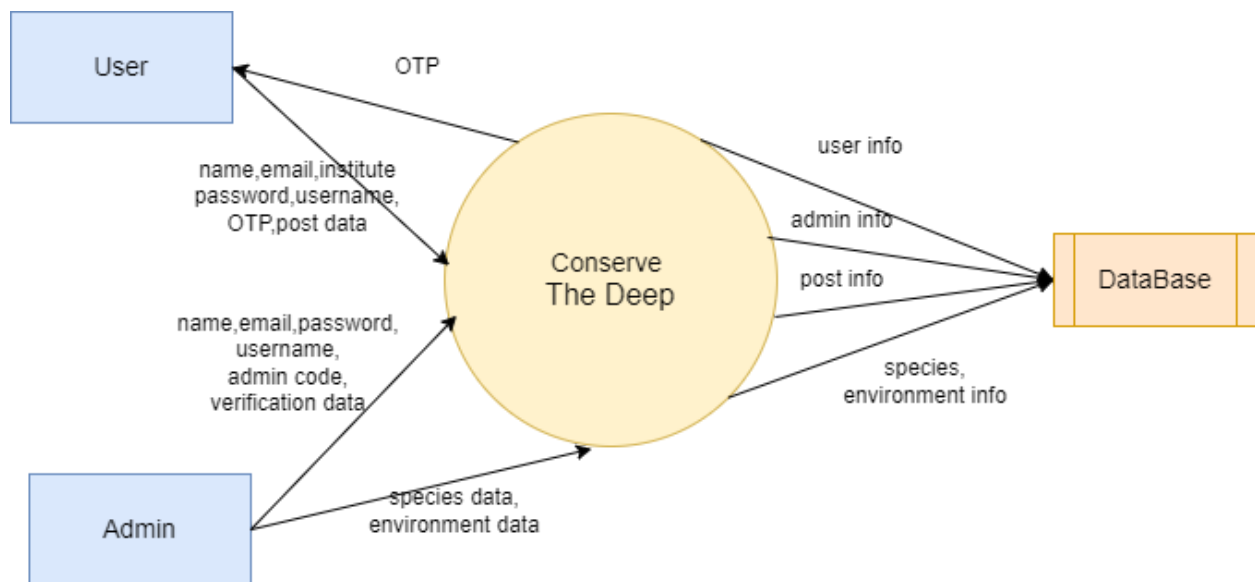


Fig 20: Data Flow Diagram level 0 (Conserve The Deep)

Level 1: Conserve The Deep

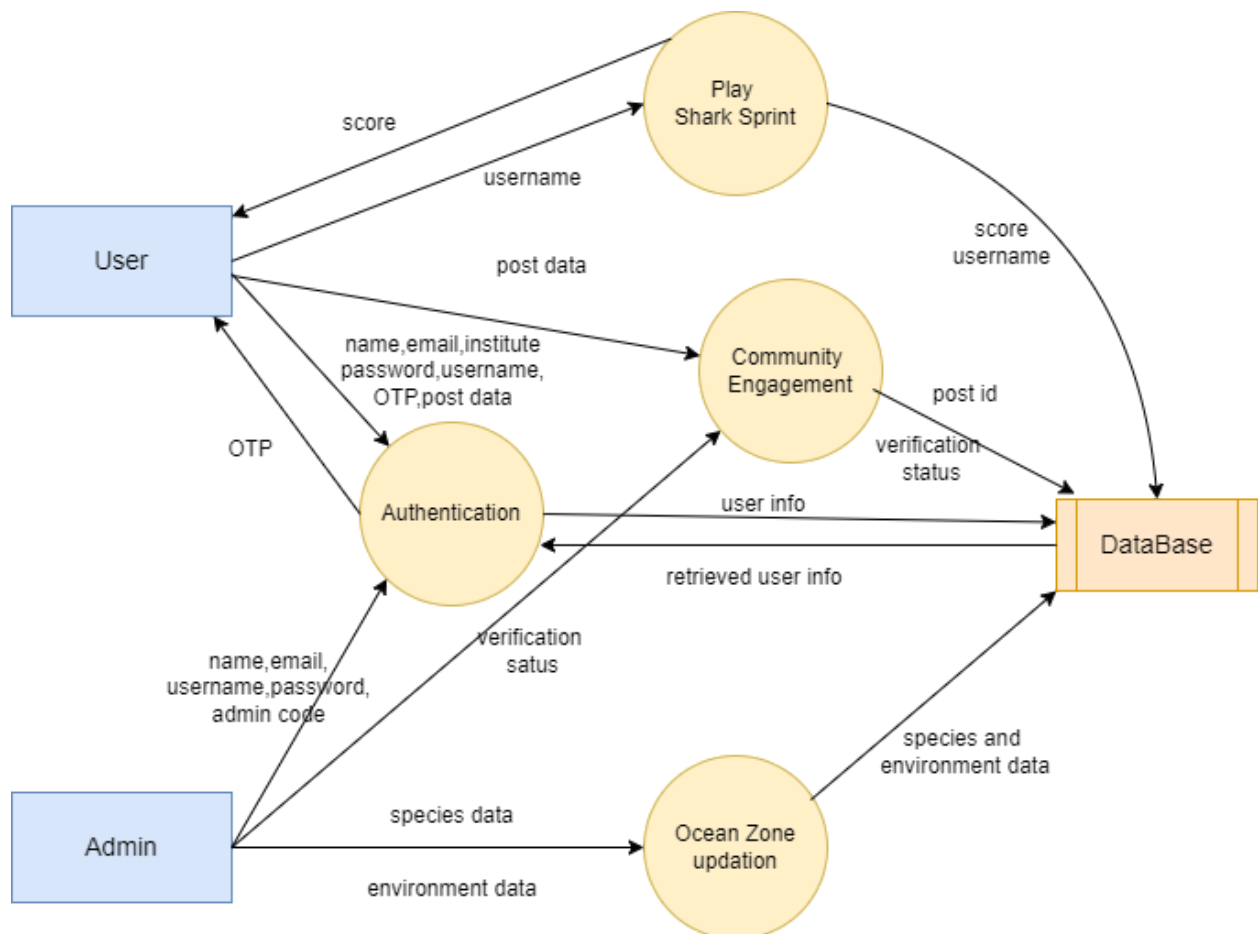


Fig 21: Data Flow Diagram level 1(Conserve The Deep)

Level 2: Authentication

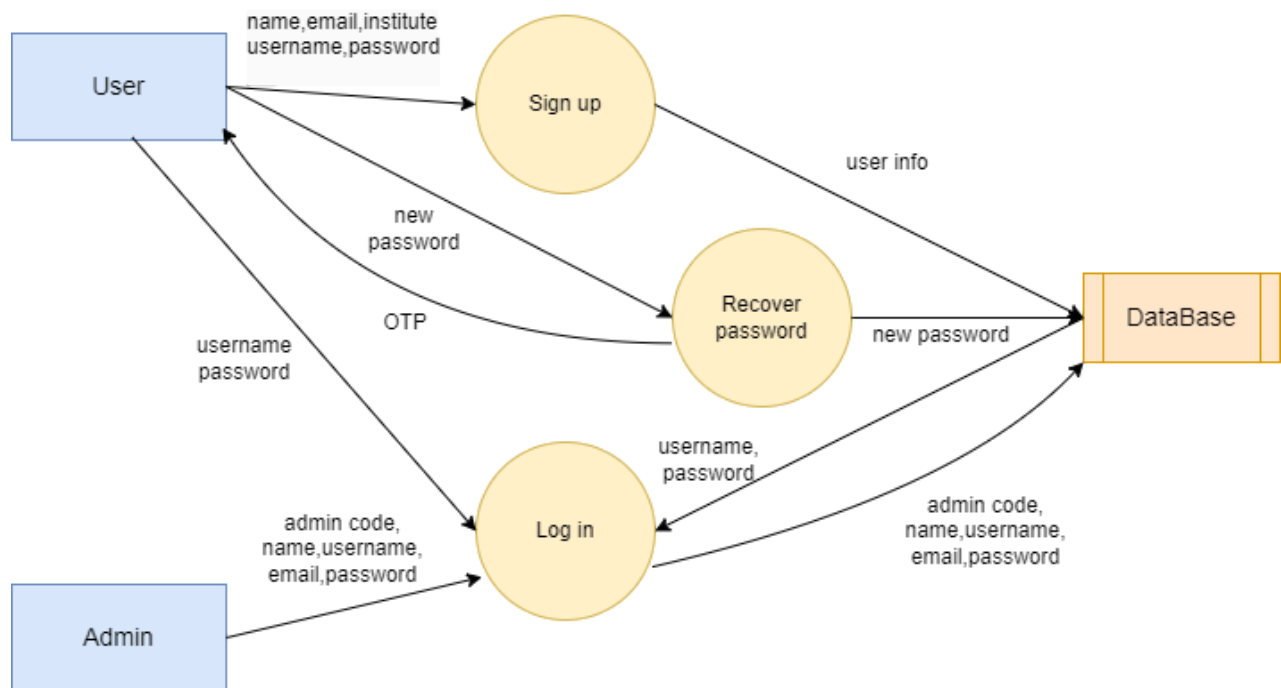


Fig 22: Data Flow Diagram level 2(Authentication)

Level 2: Ocean Zone Updation

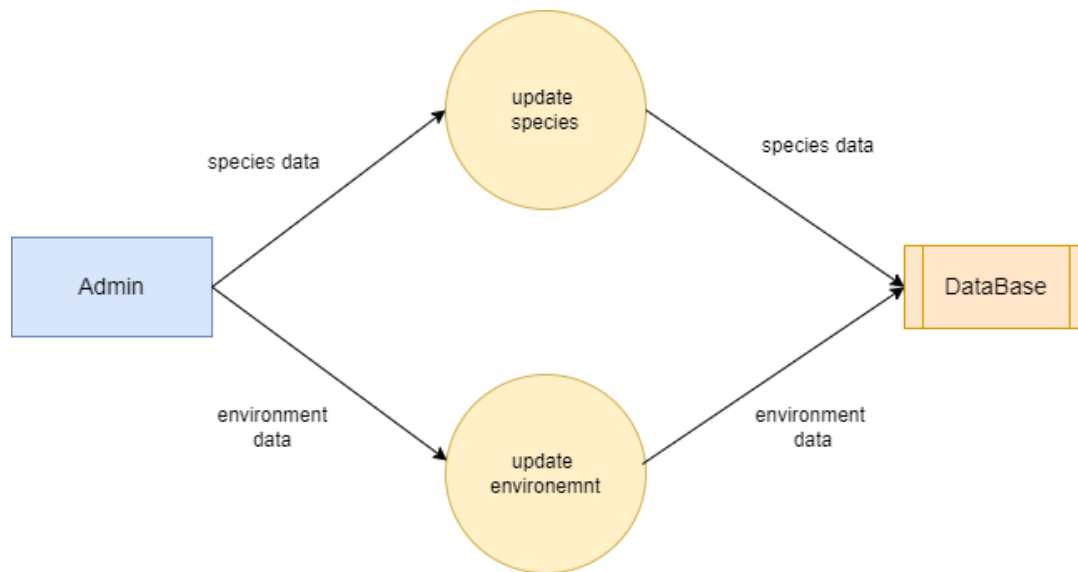


Fig 23: Data Flow Diagram level 2 (Ocean Zone Updation)

Level 2: Community Engagement

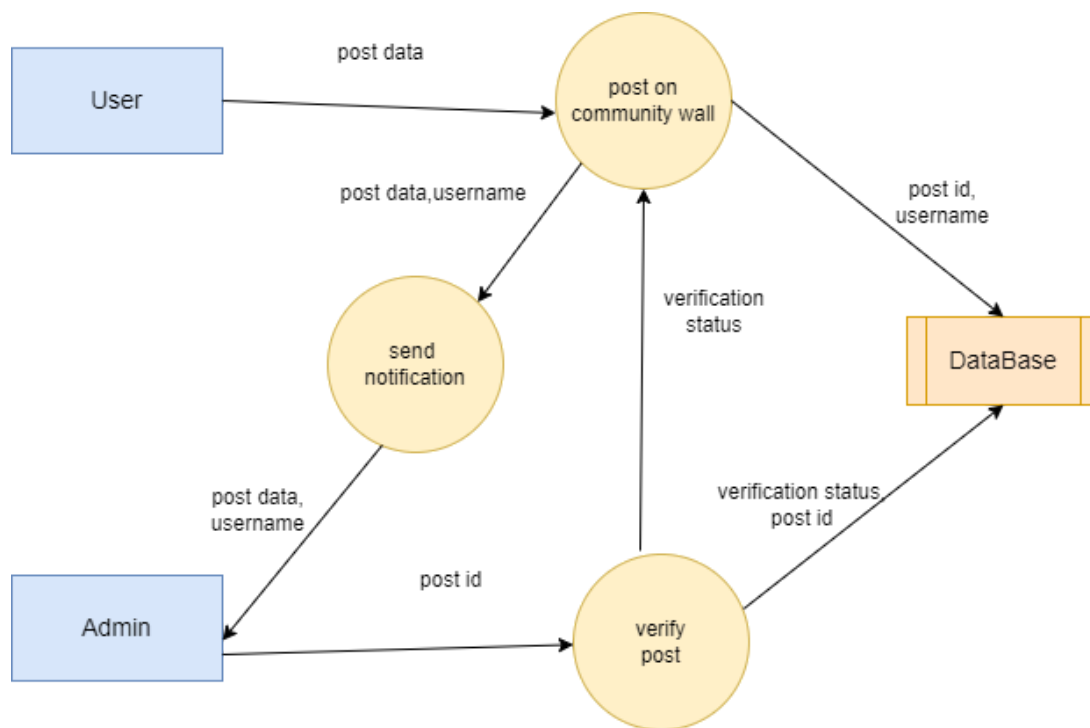


Fig 24: Data Flow Diagram level 2 (Community Engagement)