American International University-Bangladesh (AIUB)
Department of Computer Science
Faculty of Science & Technology (FST)

USS Discovery – *Intergalactic Traveling*

A Software Engineering Project Submitted
By

Semester: Fall 2024-25		**Section: H**	**Group Number: 02**	
SN	Student Name	Student ID	Contribution (CO3)	Individual Marks
01	Md. Siam Mehedi	22-48342-3	17%	
02	Rokiya Ibne Tanha	22-48833-3	17%	
03	Md. Lutful Kabir	22-49135-3	17%	
04	Maharin Afroj Richi	22-49145-3	17%	
05	Bijoy Ahamed	22-49373-3	17%	
06	Fahim Mubarrat Ishmam	22-49111-3	15%	

The project will be Evaluated for the following Course Outcomes

CO3: *Select* appropriate software engineering models, project management roles and their associated skills for the complex software engineering project and evaluate the sustainability of developed software, taking into consideration the societal and environmental aspects	Total Marks	
Appropriate Process Model Selection and Argumentation with Evidence	[5Marks]	
Evidence of Argumentation regarding process model selection	[5Marks]	
Analysis the impact of societal, health, safety, legal and cultural issues	[5Marks]	
Submission, Defense, Completeness, Spelling, grammar and Organization of the Project report	[5Marks]	

Description of Student's Contribution in the Project work

Student Name: Md. Siam Mehedi
Student ID: 22-48342-3
Contribution in Percentage: 17%
Contribution in the Project:

1. Introduction
2. Non-Functional Requirements
3. Use Case diagram
4. Process model (i. Appropriate Process Model Selection and Argumentation with Evidence
   ii. Analysis of Societal, Health, Safety, Legal, and Cultural Issues)

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Signature of the Student

Student Name: Rokiya Ibne Tanha
Student ID: 22-48833-3
Contribution in Percentage: 17%
Contribution in the Project:

1. Objective
2. Non-Functional Requirements
3. Sequence Diagram
4. Process model (i. Roles, Responsibilities and Associated Skills
   ii. Evaluation of Sustainability)

_____
Signature of the Student

Student Name: Md. Lutful Kabir
Student ID: 22-49135-3
Contribution in Percentage: 17%
Contribution in the Project:

1. Literature
2. Functional requirements
3. Class Diagram
4. Process model (i. Roles, Responsibilities and Associated Skills
   ii. Analysis of Societal, Health, Safety, Legal, and Cultural Issues)

_____
Signature of the Student

Student Name: Maharin Afroj Richi
Student ID: 22-49145-3
Contribution in Percentage: 17%
Contribution in the Project:

1. Target users and benefits
2. Functional Requirements
3. ER Diagram
4. Process model (i. Scrum process and practices
   ii. Appropriate Process Model Selection and Argumentation with Evidence)

_____
Signature of the Student

Student Name: Bijoy Ahamed
Student ID: 22-49373-3
Contribution in Percentage: 17%
Contribution in the Project:

1. Basic Functionalities
2. Functional Requirements
3. Activity Diagram
4. Process model (i. Appropriate Process Model Selection and Argumentation with Evidence
   ii. Evaluation of Sustainability)

_____
Signature of the Student

Student Name: Fahim Mubarrat Ishmam
Student ID: 22-49111-3
Contribution in Percentage (%): 15%
Contribution in the Project:

1. Sequence Diagram
2. Process model (i. Scrum process and practices)

_____
Signature of the Student

USS Discovery – *Intergalactic Traveling*

1. INTRODUCTION

The *USS (United Space Ship) Discovery - Intergalactic Traveling* aims to pioneer a user-friendly platform that enables civilians to plan and book intergalactic travel experiences, addressing an emerging demand for accessible space tourism. As space travel edges closer to reality for individuals beyond trained astronauts, there remains a significant gap in user-friendly solutions for booking, customizing, and managing space journeys. Currently, prospective travelers face barriers in obtaining clear information on the logistics, costs, and procedures associated with space trips. This project proposes an innovative platform to democratize space exploration by providing an accessible interface for adventurous individuals, space enthusiasts, researchers, and more.

By combining real-time updates, secure transactions, and customizable travel options, the *USS Discovery* platform will simplify intergalactic travel and make it a tangible option for the public. This platform aligns with NASA's commitment to expanding civilian engagement in space exploration, ensuring that users can experience a high level of reliability and accuracy in their travel planning. With its seamless, user-centric design, this project will not only revolutionize the space tourism industry but also contribute to advancing public understanding and involvement in space exploration. Through personalized features and streamlined booking options, *USS Discovery* will foster new opportunities for scientific research, cultural exchange, and personal growth, making space exploration an achievable dream for all.

2. OBJECTIVE

- Develop an accessible, user-friendly platform for civilians to plan, book, and manage intergalactic travel experiences.
- Integrate essential features, including secure booking, real-time updates, and customizable travel options.
- Democratize access to space travel, bridging the gap between civilians and space exploration.
- Cater to diverse users, such as adventurous individuals, space enthusiasts, and researchers.
- Ensure high standards of accuracy, security, and reliability, in alignment with space agency protocols.
- Revolutionize the space tourism industry by making space exploration more accessible and engaging.
- Promote broader societal benefits, including scientific research, cultural exchange, and personal growth.

3. TARGET USERS AND BENEFITS

***Target Users*:**

- *Adventurous Individuals:* Those looking for unique, life-changing experiences that go beyond conventional travel.
- *Space Enthusiasts:* Individuals passionate about space exploration who wish to witness the frontier of human discovery.
- *Researchers and Scientists:* Professionals seeking opportunities for scientific research in space environments, including planetary observation and interstellar phenomena.
  Space Tourism Seekers: Individuals interested in space tourism as a novel travel experience and looking to explore outer space destinations.

Benefits:

- *Accessibility:* Provides an inclusive platform that simplifies space travel planning, making it accessible to a broader audience beyond trained astronauts.
- *Informed Decision-Making:* Offers real-time information on trip costs, destinations, weather, and safety, helping users make well-informed travel decisions.
- *Customized Experiences:* Enables users to personalize their space travel, choosing options for round trips, scheduling, and destination preferences.
- *Space Education and Awareness:* Educates users on space destinations, planetary atmospheres, and the science of space travel, enhancing public understanding of space exploration.
- *Secure and Reliable Transactions:* Ensures safe and reliable payment processing and booking with integrated verification protocols.

4. LITERATURE REVIEW

As the space tourism industry has scope to grow, research supports the need for accessible civilian-oriented space travel platforms. A 2023 study highlighted that while companies like SpaceX and Blue Origin have developed viable suborbital and orbital travel options, these remain limited due to high costs and limited availability [1]. Current apps, such as the NASA App and SpaceX App, serve mainly as informational tools, lacking functionality for direct travel bookings [2].

Studies also emphasize that space tourism could be instrumental in advancing space science and research, making civilian access crucial to fostering a broader global interest in space exploration [3][4]. Thus, a platform like *USS Discovery - Intergalactic Traveling* could play a transformative role by integrating booking options and real-time information, which aligns with industry trends that call for transparency, accessibility, and user engagement.

5. BASIC FUNCTIONALITIES

User Authentication:

- Login/Signup: Users can create an account or log in securely using their credentials. The system will authenticate their username and password against stored records.
- Password Recovery: Users can initiate a password reset process via email if they forget their password, ensuring easy access to their accounts while maintaining security.

Destination Selection:

- Browse Destinations: Users can explore a wide range of interstellar destinations with intuitive browsing options.
  Detailed Information: Each destination will provide comprehensive details, including travel distance, duration, unique attractions, and environmental conditions, helping users make informed decisions.

Trip Customization:

- Booking Options: Users can select between one-way or round-trip journeys tailored to their travel plans.
- Personal Preferences: The app allows users to specify their preferences, such as departure dates and specific travel packages, enabling a personalized travel experience.

Real-Time Updates:

- Weather Information: Users can access current and forecasted weather conditions for their selected destinations, helping them plan their trips effectively.
- Safety Alerts: The app will provide alerts regarding any safety issues or significant events affecting travel plans, ensuring users are well-informed.

Booking and Payment:

- Seamless Booking Process: Users can easily book their space travel experiences directly through the app, with a user-friendly interface guiding them through the process.
- Secure Payment Options: The system will integrate secure payment gateways, allowing users to make transactions with confidence. They will receive immediate confirmation of their bookings.

Trip Management:

- Manage Bookings: Users can view and manage their upcoming trips, including the ability to modify details or cancel bookings if necessary.
- Notifications: Users will receive push notifications regarding trip reminders, updates, and important announcements, keeping them informed throughout their journey.

Virtual Passport:

- Digital Passport Creation: Users can create a virtual passport within the app that includes personal details, travel history, and visited destinations.
- Trip Tracking: The passport feature helps users keep track of their intergalactic adventures, enhancing their overall experience.

Cost Estimation:

- Transparent Pricing: The app will provide a detailed breakdown of trip costs based on the purpose of travel (e.g., tourism, research).

6. REFERENCES

[1] *A. A. Mahmood, "Emerging trends in space tourism applications," Journal of Space Exploration, 2024. [Online]. Available: https://www.linkedin.com/pulse/emerging-trends-space-tourism-nssabahrain-j25yc/*

[2] *Polkowska, Małgorzata. (2021). Space Tourism Challenges. Review of European and Comparative Law. 45. 153-182. 10.31743/recl.12223.*

[3] *NASA. (2022). Space travel for civilians: New frontiers. NASA Publications. Retrieved from https://www.nasa.gov/apps/*

[4] *SpaceX. (2023). Space tourism updates and mission planning. SpaceX Corporate Site.*

Software Requirements Analysis

FUNCTIONAL REQUIREMENTS

User Authentication

- The system should allow users to sign up, log in, and recover passwords.
- It should include security measures, such as verification codes, for failed login attempts.

Priority level- High

Destination Selection

- Users should be able to browse and select from a variety of space destinations with details like distance, travel time, and attractions.
- Destination filtering options by criteria like distance, type, or popularity.

Priority level - High

Trip Customization

- The system should allow users to choose between one-way and round-trip options.
- Users can select departure and return dates and modify these preferences.

Priority level - Medium

Calendar and Scheduling

- A calendar feature should display booked trips and available dates for travel.
- Users should be able to view upcoming events or holidays that may affect trip availability.

Priority level - High

Real-Time Updates

- Provide real-time weather and environmental data (temperature, atmospheric conditions) for selected destinations.
- Updates on potential hazards should be displayed to aid in trip planning.

Priority level - Low

Booking and Payment

- Users should be able to book their trips and make payments through secure online options.
- The system must display a clear cost breakdown, including any additional fees.

Priority level - High

Notifications

- The app should send push notifications for trip reminders, updates, and other important announcements.
- Users can customize notification settings in their preferences.

Priority level - Medium

Virtual Passport and Trip History

- Users can create a virtual passport with personal information and travel history.
- The system should maintain and display previous trip records, including destination and travel dates.

Priority level - low

Trip Management

- *Users should be able to view, modify, and cancel their bookings if needed.*
- Rescheduling options based on availability and change notifications should be provided.

Priority level - Medium

Feedback and Rating System

- User can provide feedback on their travel experience and rate the service.
- Allows user to leave comments and review about travel route and trip quality with service.

Priority level – Medium

Station and Planet Information

- Display detailed information about departure stations, such as location and facilities.
- Users can access information about planet atmospheres, surface conditions, and environments.

Priority level - Low

NON-FUNCTIONAL REQUIREMENTS

Performance

- The system should have minimal response times for loading information, especially for real-time updates.
- Booking and payment processing should be completed withing minimum time (3000MS).

Security

- Implement encryption for user data, especially during authentication and payment.
- Payment systems must comply with security standards to ensure safe transactions.

Usability

- The interface should be intuitive, with a user-friendly layout for easy navigation.
- The system should include accessibility options to cater to users with disabilities.

Reliability and Availability

- The system should have maximum uptime to ensure consistent availability.
- Backups should be performed regularly to prevent data loss.

Scalability

- The system should support an increasing number of users and transactions without compromising performance.
- Should be designed to integrate with additional services (e.g., NASA, SpaceX, Blue Origin) in the future.

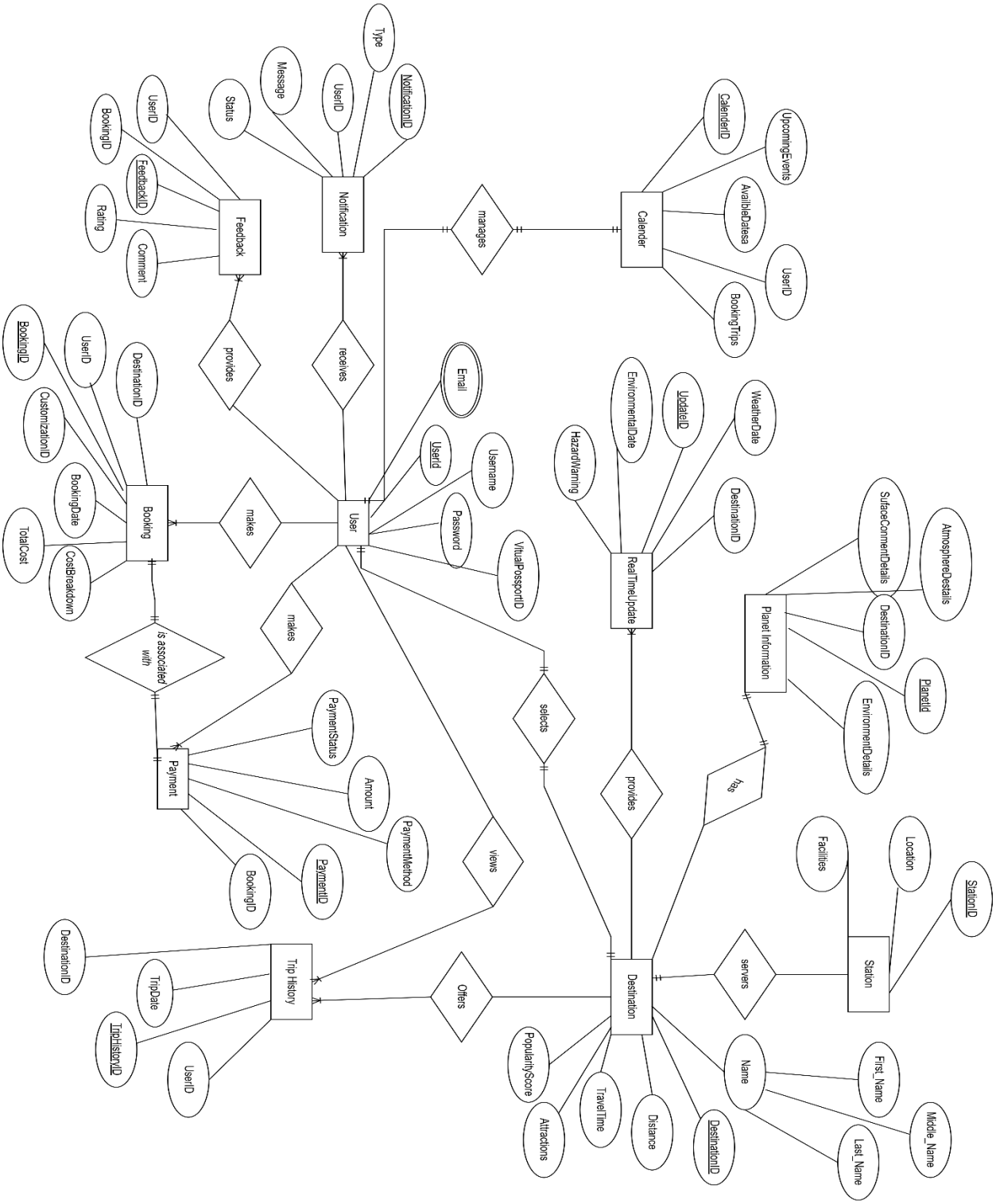
Compliance

- Ensure compliance with space industry standards and regulations.
- Data handling must comply with privacy laws to protect user information.

Maintainability

- The codebase should be modular to support easy updates and debugging.
- Documentation should be maintained for all features and modules to aid future developers.

1. ER Diagram:


Type
NotificationID
UserID
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Status
Notification
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Calender
CalenderID
UpcomingEvents
AvailbleDatesa
UserID
BookingTrips
BookingID
FeedbackID
Rating
Comment
Feedback
provides
receives
Email
UserId
Username
Password
VirtualPassportID
User
BookingID
UserID
CustomizationID
BookingDate
TotalCost
CostBreakdown
DestinationID
Booking
makes
makes
is associated with
Payment
PaymentStatus
Amount
PaymentMethod
PaymentID
BookingID
views
DestinationID
TripDate
TripHistoryID
UserID
Trip History
Offers
selects
EnvironmentalDate
UpdateID
HazardWarning
WeatherDate
DestinationID
RealTimeUpdate
provides
has
AtmosphereDestails
SufaceCommentDetails
DestinationID
PlanetId
EnvironmentDetails
Planet Information
servers
Facilities
Location
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Attractions
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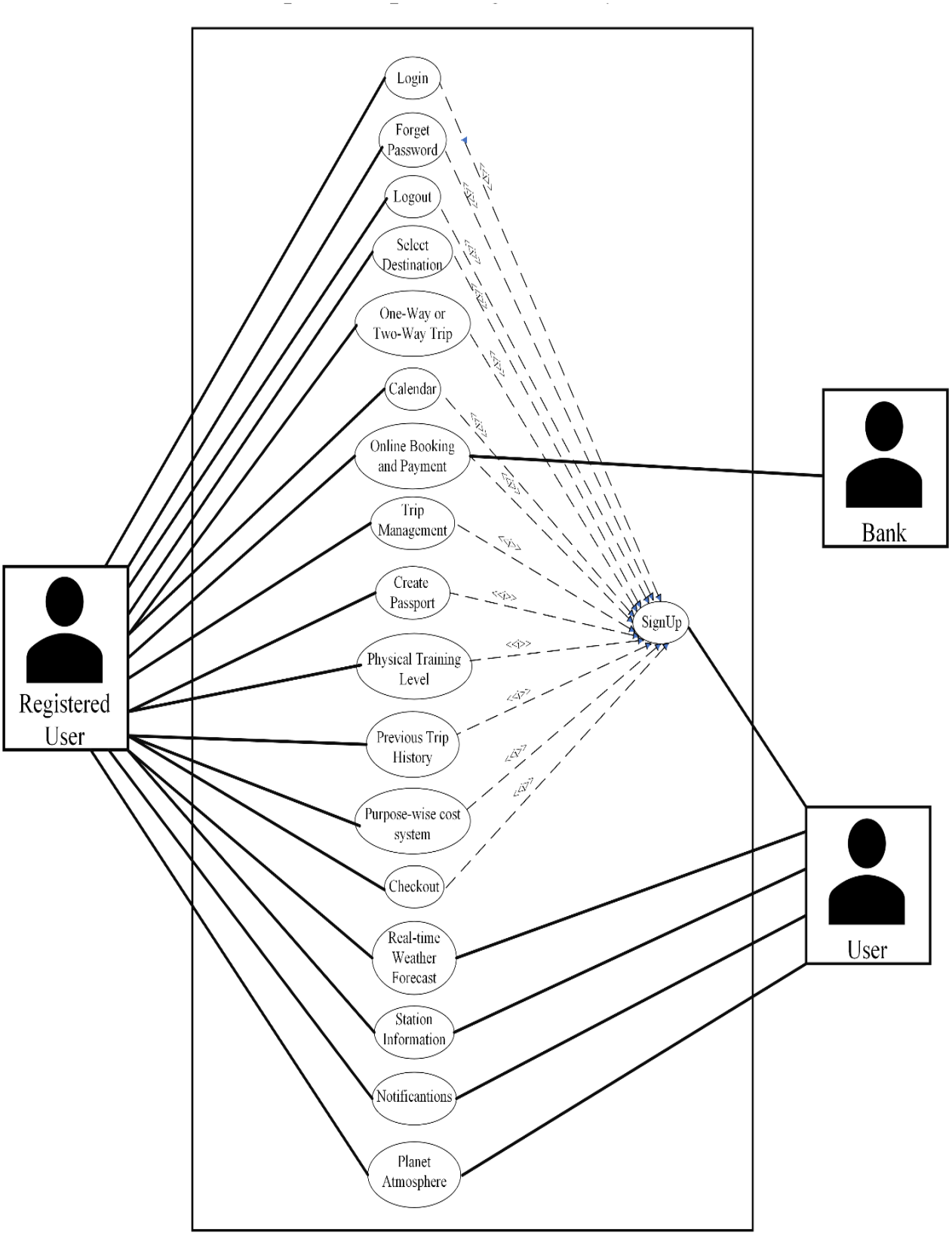
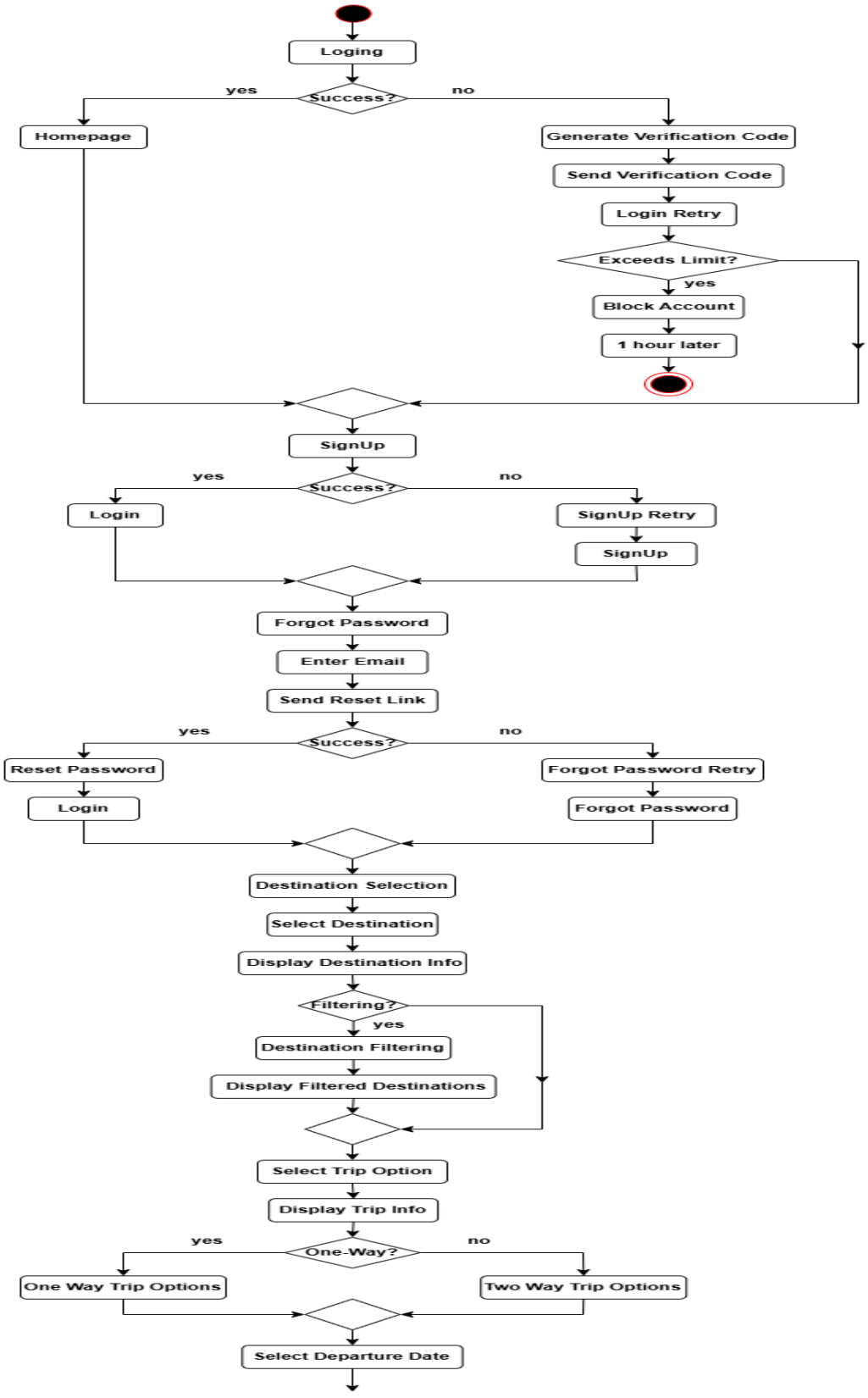
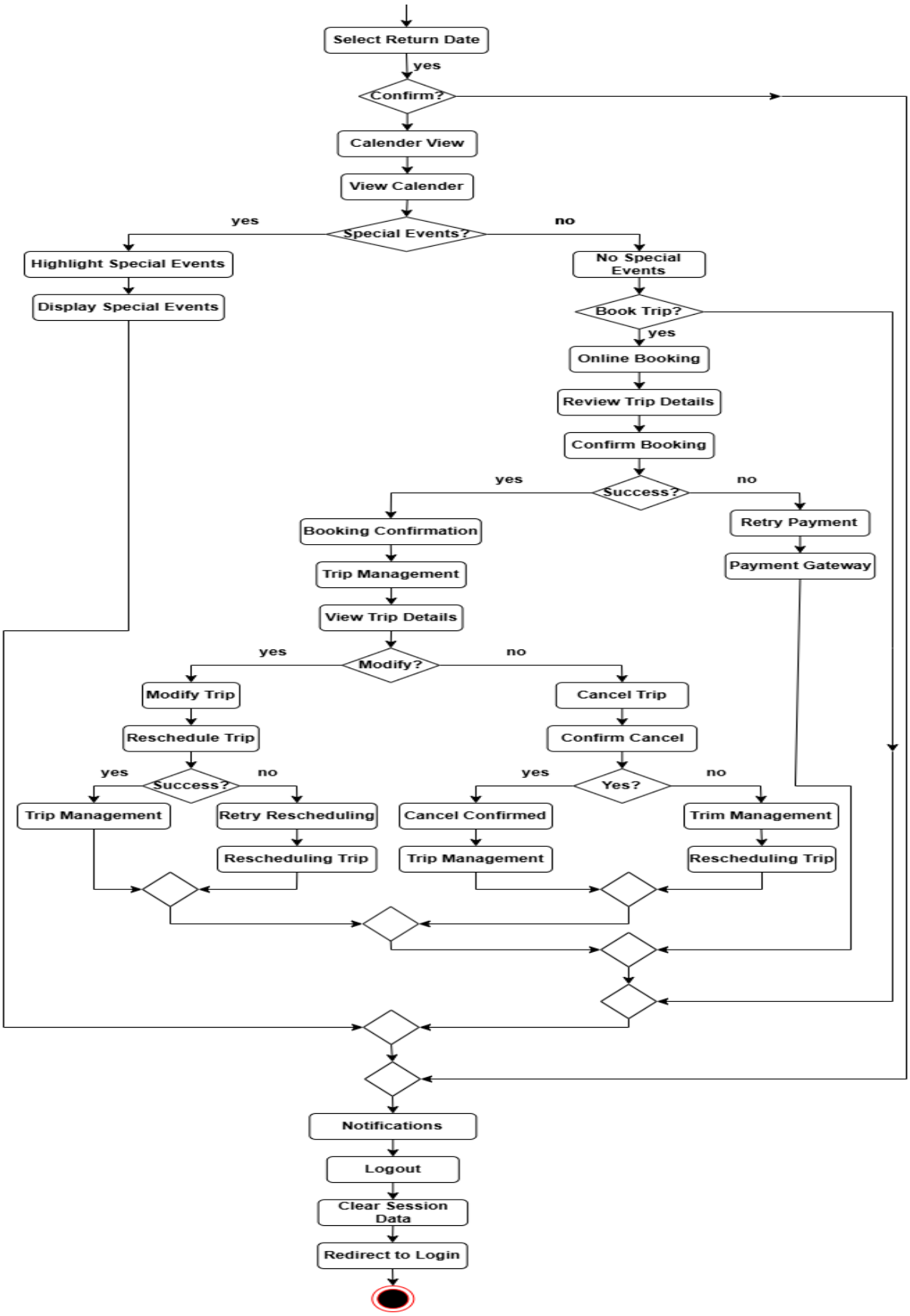
Distance
DestinationID
Destination
Name
First_Name
Middle_Name
Last_Name

2. Use Case Diagram:

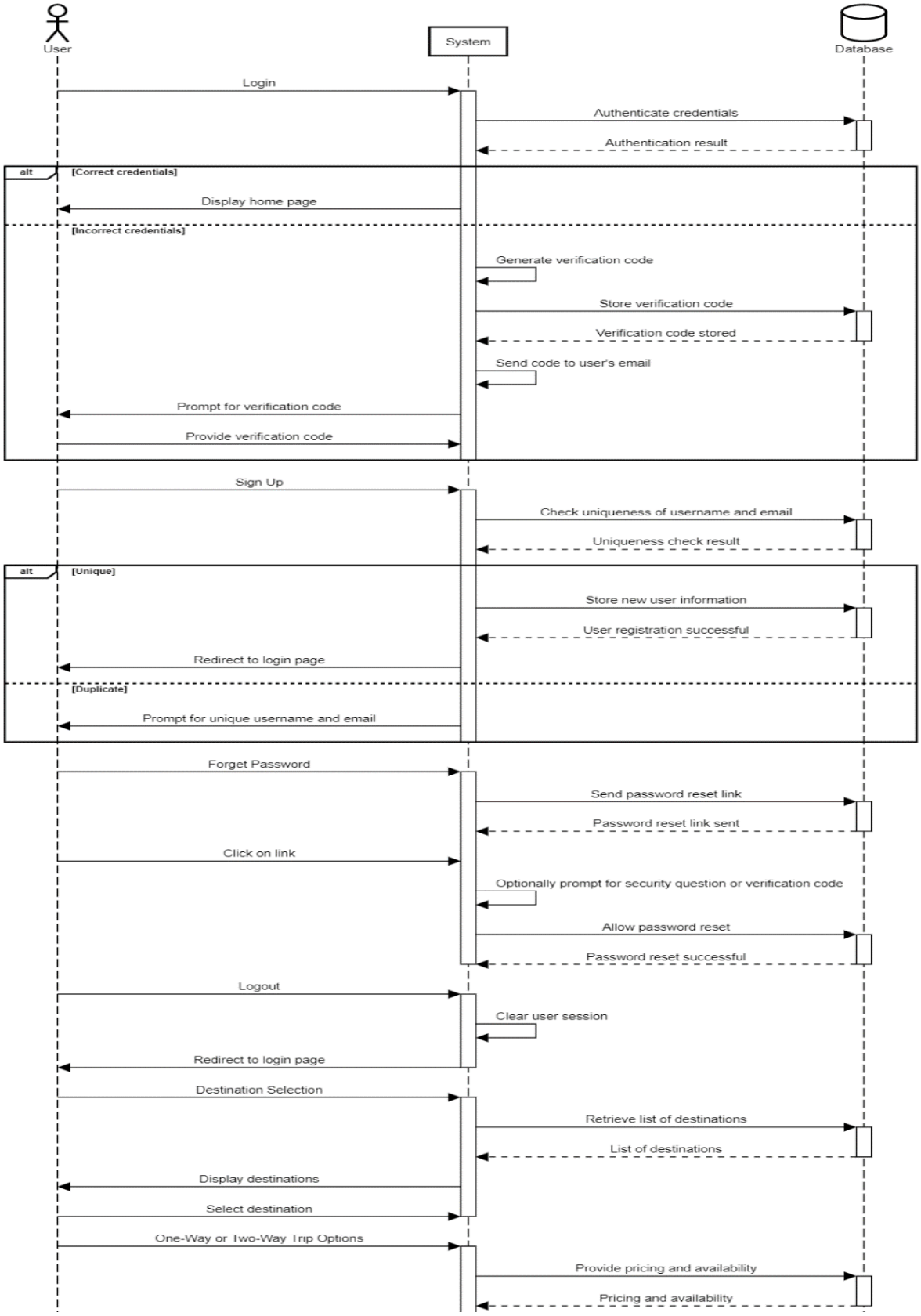


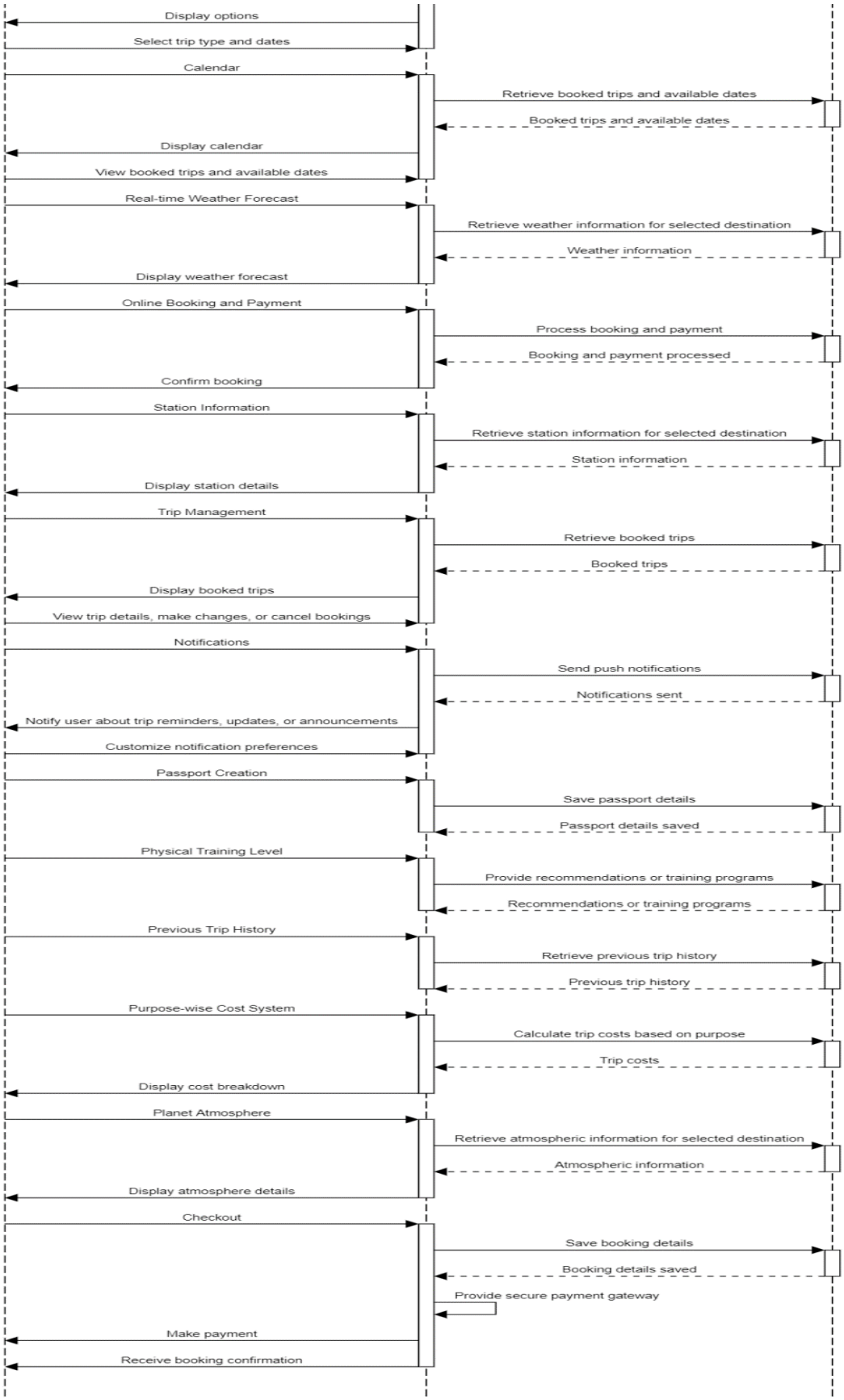
3. Activity Diagram:



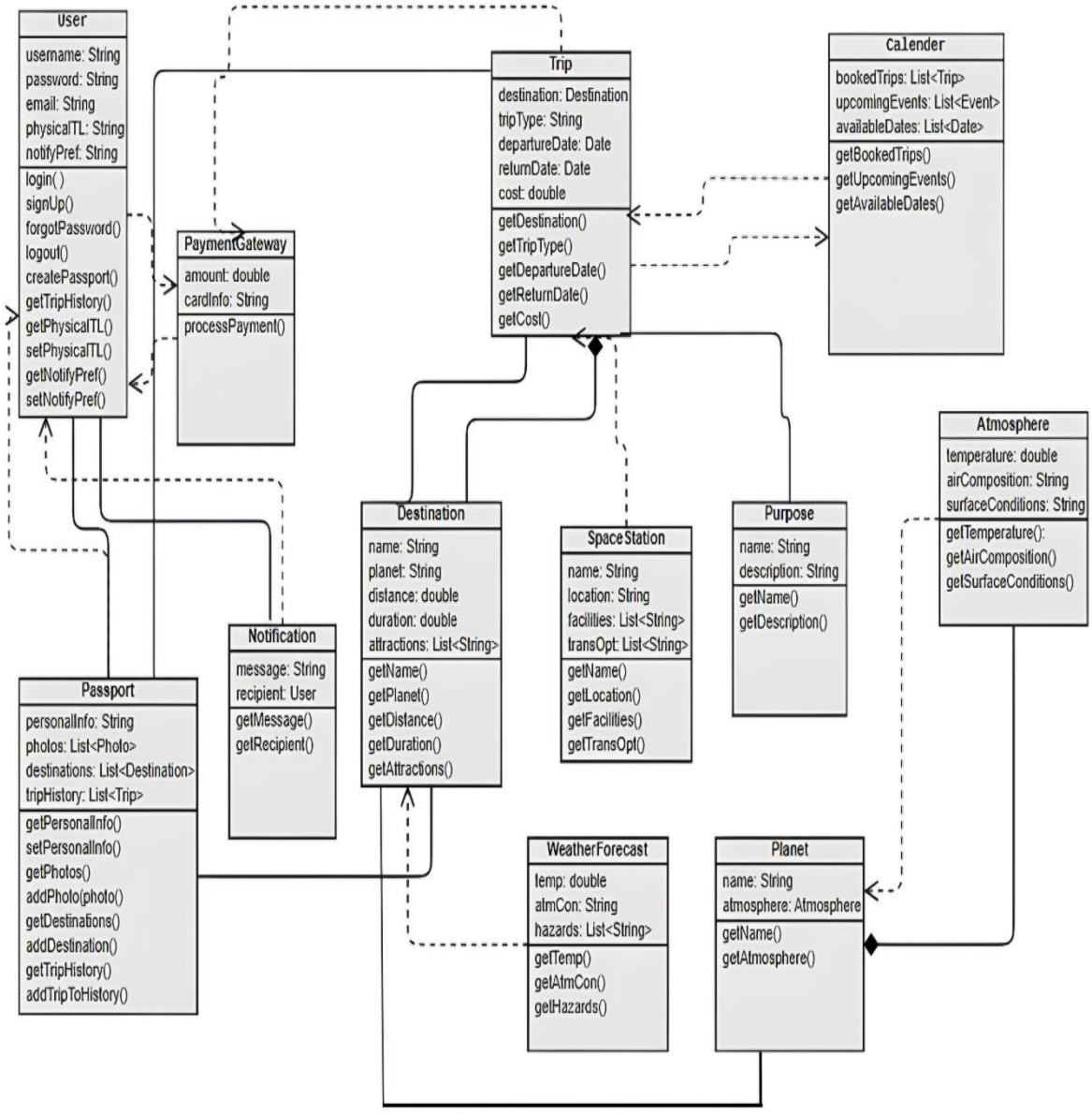

Select Return Date
yes
Confirm?
Calender View
View Calender
yes
Special Events?
no
Highlight Special Events
Display Special Events
No Special Events
Book Trip?
yes
Online Booking
Review Trip Details
Confirm Booking
yes
Success?
no
Booking Confirmation
Retry Payment
Payment Gateway
Trip Management
View Trip Details
yes
Modify?
no
Modify Trip
Reschedule Trip
Cancel Trip
Confirm Cancel
yes
Success?
no
yes
Yes?
no
Trip Management
Retry Rescheduling
Rescheduling Trip
Cancel Confirmed
Trip Management
Trim Management
Rescheduling Trip
Notifications
Logout
Clear Session Data
Redirect to Login

4. Sequence Diagram:




Display options
Select trip type and dates
Calendar
Retrieve booked trips and available dates
Booked trips and available dates
Display calendar
View booked trips and available dates
Real-time Weather Forecast
Retrieve weather information for selected destination
Weather information
Display weather forecast
Online Booking and Payment
Process booking and payment
Booking and payment processed
Confirm booking
Station Information
Retrieve station information for selected destination
Station information
Display station details
Trip Management
Retrieve booked trips
Booked trips
Display booked trips
View trip details, make changes, or cancel bookings
Notifications
Send push notifications
Notifications sent
Notify user about trip reminders, updates, or announcements
Customize notification preferences
Passport Creation
Save passport details
Passport details saved
Physical Training Level
Provide recommendations or training programs
Recommendations or training programs
Previous Trip History
Retrieve previous trip history
Previous trip history
Purpose-wise Cost System
Calculate trip costs based on purpose
Trip costs
Display cost breakdown
Planet Atmosphere
Retrieve atmospheric information for selected destination
Atmospheric information
Display atmosphere details
Checkout
Save booking details
Booking details saved
Provide secure payment gateway
Make payment
Receive booking confirmation

5. Class Diagram:



Process Model Selection and Argumentation

The *USS Discovery: Intergalactic Traveling* project presents a complex software engineering challenge requiring iterative development, dynamic adaptability, and sustainability considerations. To meet these needs, the **Scrum methodology** has been selected.

1. Appropriate Process Model Selection and Argumentation with Evidence

Scrum, a lightweight Agile methodology, is ideal for the *USS Discovery* project because:

1) **Iterative and Incremental Development**
   - **Evidence**: Scrum divides the project into short, fixed-length iterations called **Sprints**, where each sprint delivers a functional increment of the software.
   - **Relevance**: This approach ensures the continuous delivery of features such as destination selection, real-time updates, and secure booking, enabling stakeholder feedback early and often.
2) **Frequent Inspection and Adaptation**
   - **Inspection**: Daily stand-ups, sprint reviews, and retrospectives identify and address issues, ensuring continuous improvement.
   - **Adaptation**: Changes in requirements, such as new payment gateways or compliance updates, can be accommodated seamlessly.
   - **Evidence**: Studies have shown that Scrum reduces risk by identifying issues earlier in the development cycle.
3) **Transparency and Collaboration**
   - **Scrum Roles**: Defined roles such as **Product Owner**, **Scrum Master**, and **Development Team** promote collaboration and ensure clarity in task ownership and progress.
   - **Evidence**: Transparent processes like sprint planning and product backlog management help align stakeholder expectations.
4) **Risk Mitigation**
   - Delivering working software at the end of every sprint minimizes risks and allows for continuous testing, stakeholder feedback, and quality assurance.

2. Scrum Process and Practices

1) **Sprint Planning**
   - Sets a **Sprint Goal** based on the most critical user stories, e.g., real-time space travel updates or destination booking.
   - Defines deliverables and task allocations from the **Product Backlog**.
2) **Daily Stand-Ups**
   - Brief daily meetings ensure alignment, track progress, and resolve roadblocks.
3) **Sprint Reviews**
   - Demonstrate completed functionality to stakeholders for feedback and validation.

4) **Sprint Retrospectives**
    - Identify opportunities for improvement in processes, tools, and teamwork.

3. Roles, Responsibilities and Associated Skills

1) **Product Owner**
    - Manages the **Product Backlog**, prioritizes tasks, and ensures the team focuses on delivering maximum value.

    Skills: Domain expertise in space travel, strong communication, and stakeholder engagement.
2) **Scrum Master**
    - Facilitates Scrum events, removes impediments, and ensures adherence to Scrum principles.

    Skills: Leadership, problem-solving, and expertise in Agile practices.
3) **Development Team**
    - Self-organizing group responsible for delivering working increments of the software.

    Skills: Full-stack development (backend APIs, front-end UI/UX), testing, and quality assurance.
4) **Space experts** (NASA, SpaceX, Blue Origin etc)
    - Provide domain expertise on space exploration, including mission requirements, regulations and safety standards.
    - Offer guidance and feedback to the development team on technical and operational aspects of space exploration.

    Skills: Knowledge in multi-planetary systems and space exploration.
5) **Users** (Space Travelers, Space Scientist)
    - Provide input on user needs, preferences, and pinpoints related to space travel.
    - Helps in prioritizing features and improvements based on their experience and requirements as space traveler and Scientist.
6) **System Administrators:**
    - Maintain server performance and platform availability.
    - Ensure security for sensitive user and payment data.
7) **Investors/sponsors:**
    - Monitor project milestones and ROI (Return On Investment).
    - Provide strategic direction based on market potential.

4. Evaluation of Sustainability

1) **Societal Aspects**
    - **Inclusivity**: Multilingual support and accessible interfaces make the platform available to diverse users.
    - **Education and Research**: Promotes space science education by simplifying access to intergalactic travel.

2) **Environmental Aspects**
    - Prioritizes integration with green propulsion technologies for actual space journeys, aligning with global sustainability goals.
    - Uses reusable rocket system for decreasing space garbage.
3) **Sustainable Practices in Scrum**
    - **Iterative Development** reduces waste by focusing only on high-priority tasks.
    - **Frequent Feedback** ensures resources are allocated effectively and unnecessary features are avoided.

5. Analysis of Societal, Health, Safety, Legal, and Cultural Issues

1) **Societal Impact**
    - Ensures inclusivity by accommodating cultural preferences, diverse languages, and accessibility standards.
2) **Health and Safety**
    - Provides clear safety guidelines for intergalactic travel, aligning with international space travel regulations.
3) **Legal Compliance**
    - Ensures compliance with data protection laws for handling user data securely.
4) **Cultural Sensitivity**
    - Features are designed with cultural appropriateness, such as region-specific travel destinations and user interfaces.