COMP3030J: System Document
Starbucks Sustainable Coffee Development Platform

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Company: OriginBoost

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Abstract

This project develops a digital platform that aims to increase transparency in coffee farm management, facilitate collaboration between Starbucks and supply chain partners, and provide consumers with convenient access to sustainable coffee products. The platform supports farm information management, promotional releases, technical training, and financial support applications. Starbucks administrators can upload support programs and manage farmer applications, and consumers can purchase sustainable coffee products through the platform.

The platform utilized agile development methodologies to successfully overcome technical integration, communication, and schedule management challenges to ensure the project was delivered on time. The platform promotes sustainable development and fair trade in the coffee industry.

Website link: `https://csi420-02-vm2.ucd.ie/`

Code Hosting: `https://github.com/YunhanGa0/Coffee_SDG_Platform`

Project Introduction

1

1.1 Problem Statement

Nowadays, the UN SDGs is seen as an indicator of sustainable development. Starbucks, as a leading company in the coffee industry, is also strong on sustainability in its development, such as emphasizing fair trade in the coffee bean supply chain. Despite implementing the C.A.F.E. Practices certification, it is difficult to trace coffee beans across millions of globally dispersed smallholder farmers. The vast scale makes it nearly impossible to monitor environmental and social riskssuch as illegal deforestation at plantations or child labor in processing facilitiesthroughout the farming, processing, and transportation stages. This opacity fuels skepticism toward sustainability labels like "fair-trade" or "organic." Consumers increasingly accuse companies of greenwashing, doubting whether ethical claims equate to actual practices in supply chains. Moreover, The coffee trades profit system is deeply unfair. Coffee farmers earn only 1-2% retail price, trapped in poverty. Starbucks, as a socially responsible company, should take action to improve the situation, not just by choosing fair trade coffee beans, but by diversifying the coffee chain towards sustainability!

1.2 Our Solution

Establishing a digital platform to enhance transparency and fairness in the coffee supply chain, we aim to drive sustainable growth

For **coffee bean farmers** who need to get higher income and more decent work, we developed a website that can provide a platform to display coffee bean products, show the culture of coffee farms, and provide technology, funding, and online learning. As a result, we can not only improve the work and income level of coffee farmers (SDG1, SDG8), but also promote the development of the tourism industry in the coffee producing areas, bring more jobs (SDG1), and ultimately enhance the position of coffee farmers in the entire coffee supply chain.

For **Starbucks**, which needs to improve the sustainability of its business, our website provides a platform that enables Starbucks to provide advocacy, technical and financial support, and teaching for coffee bean growers in the coffee chain. Our platform allows Starbucks to increase the reach of its coffee farmers' initiatives (SDG17), and allows the company to learn more about great coffee farms and bring more social goodwill to the community.

For **customers** who want truly sustainable coffee products, we offer a platform where they can freely browse sustainable coffee produce and learn more about the culture of the coffee's origin as they do so. This allows customers to support a sustainable coffee supply chain and gain a deeper understanding of sustainability.(SDG12)

1.3 Use Case Diagram

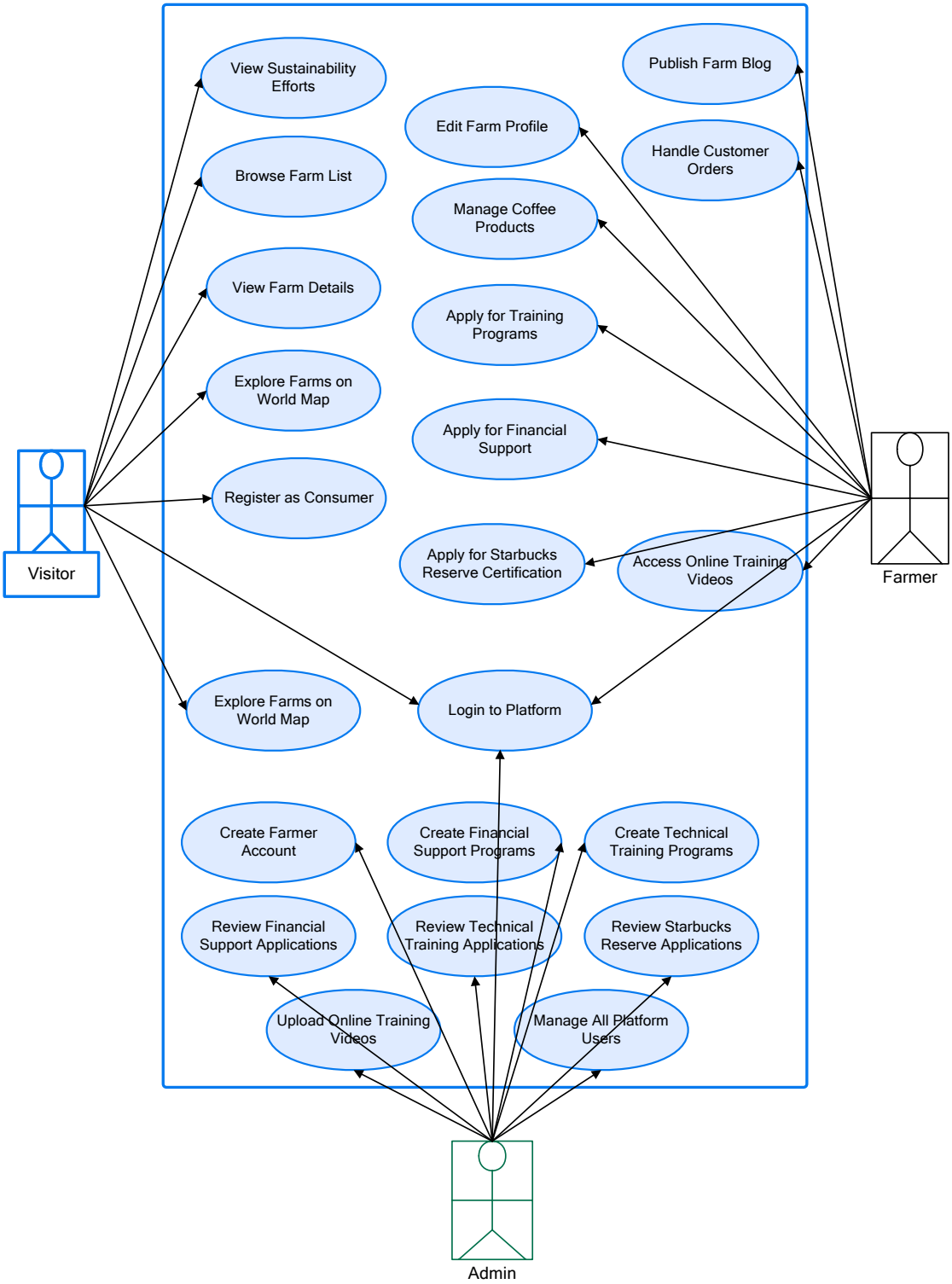
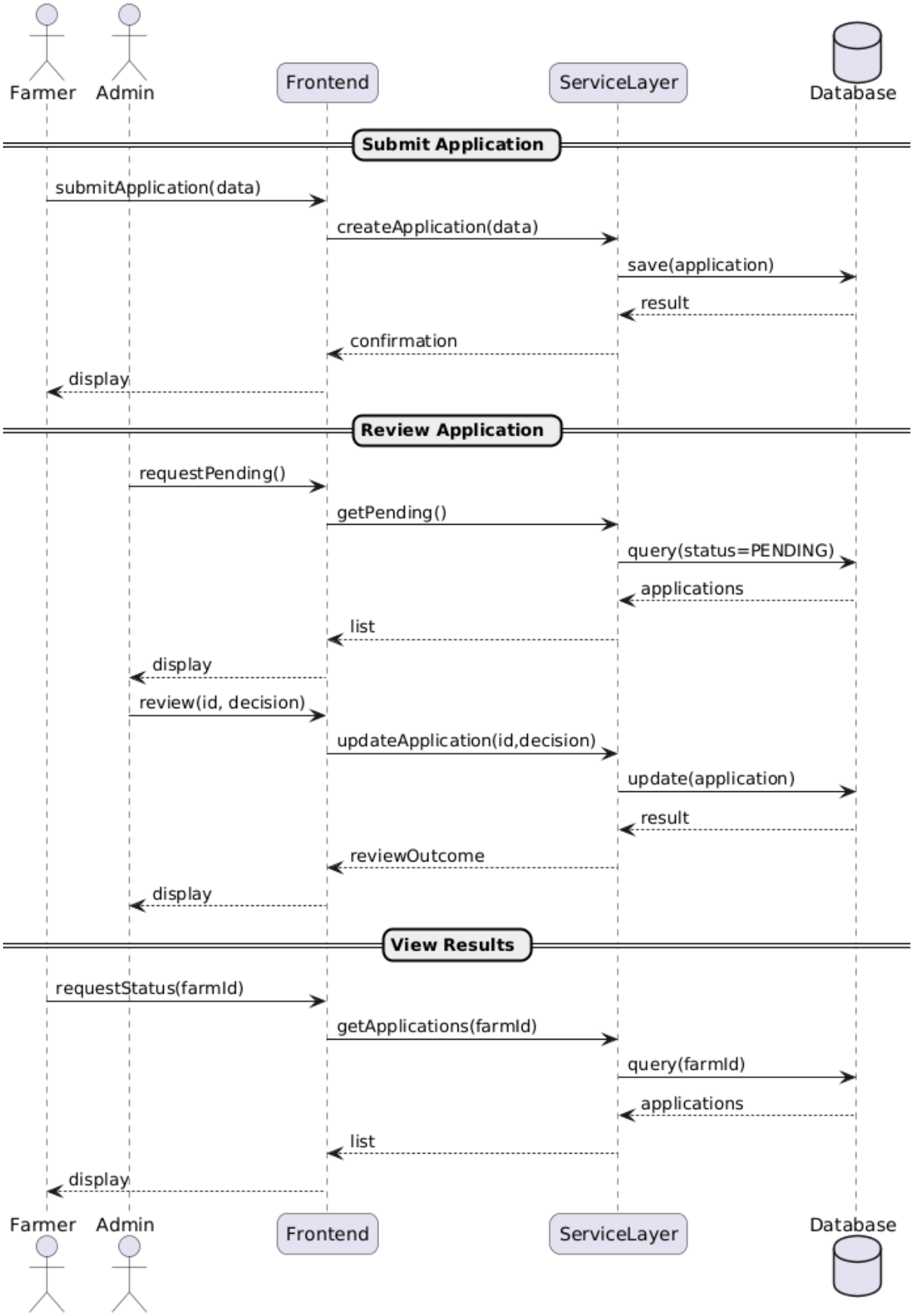


Fig. 1.1: Use Case Diagram of the Sustainable Coffee Platform

1.4 Four Main Sequence Diagram



Farmer Application

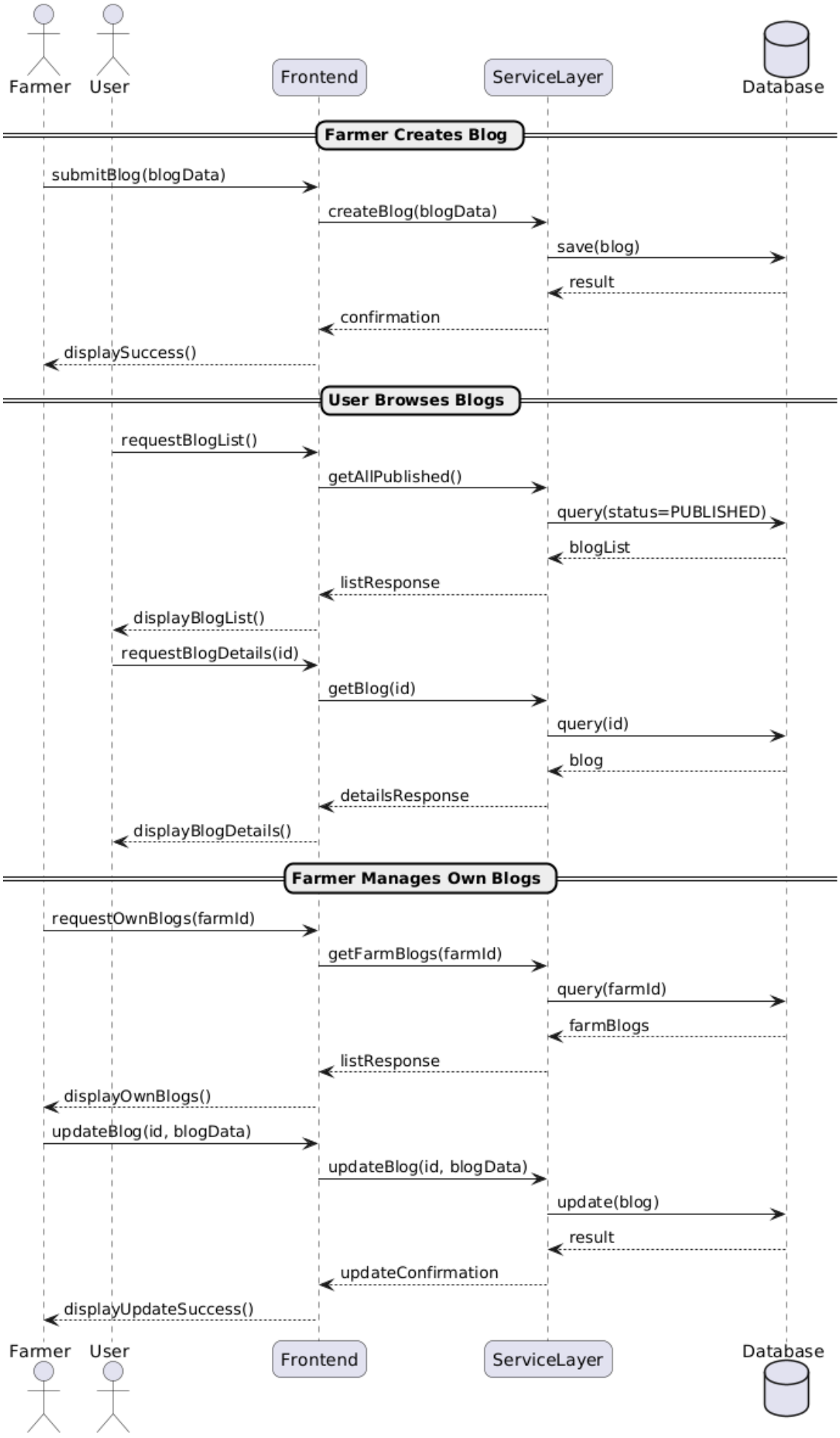


Fig. 1.2: Trade of Coffee

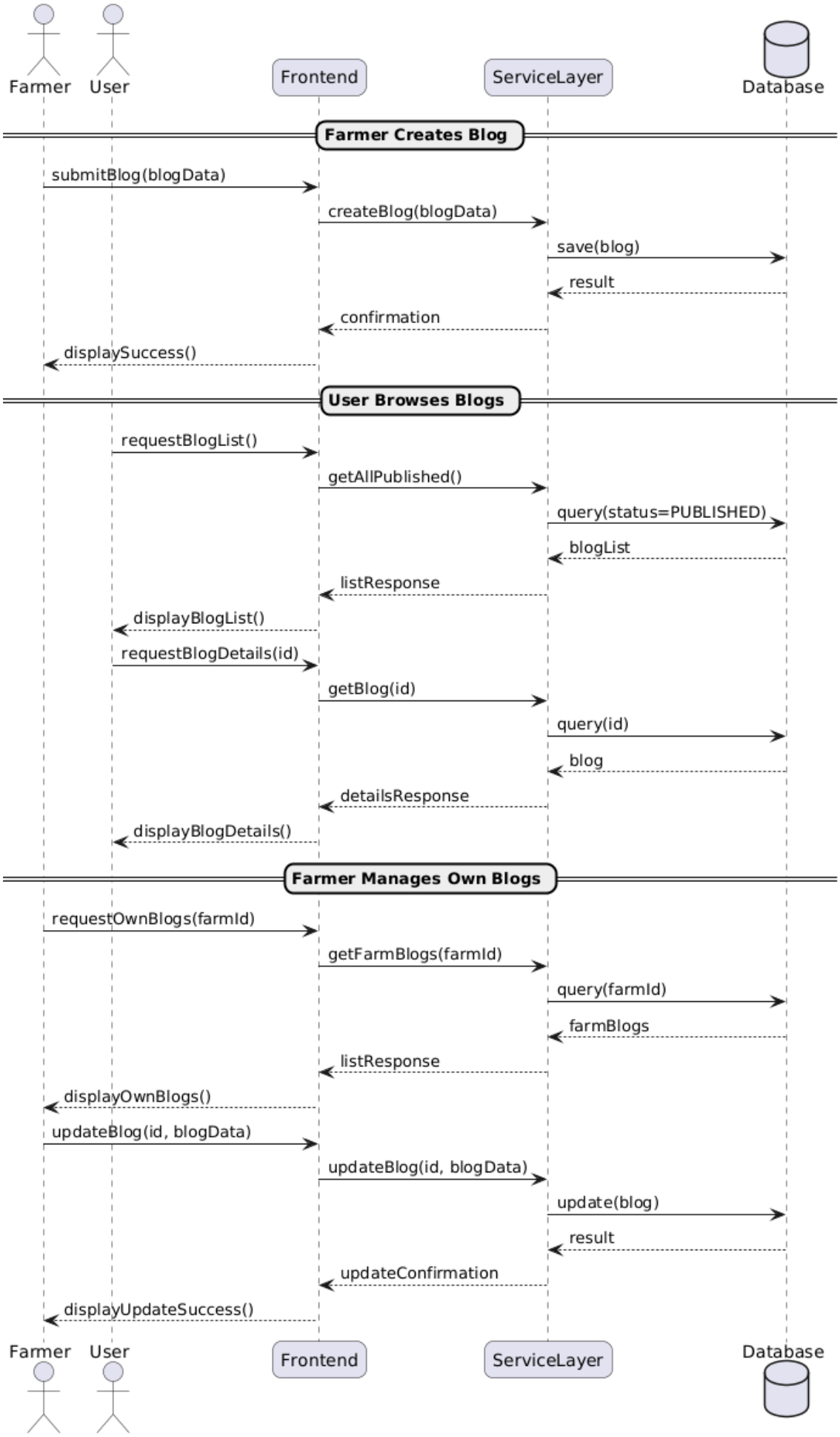


Fig. 1.3: Publish Blog

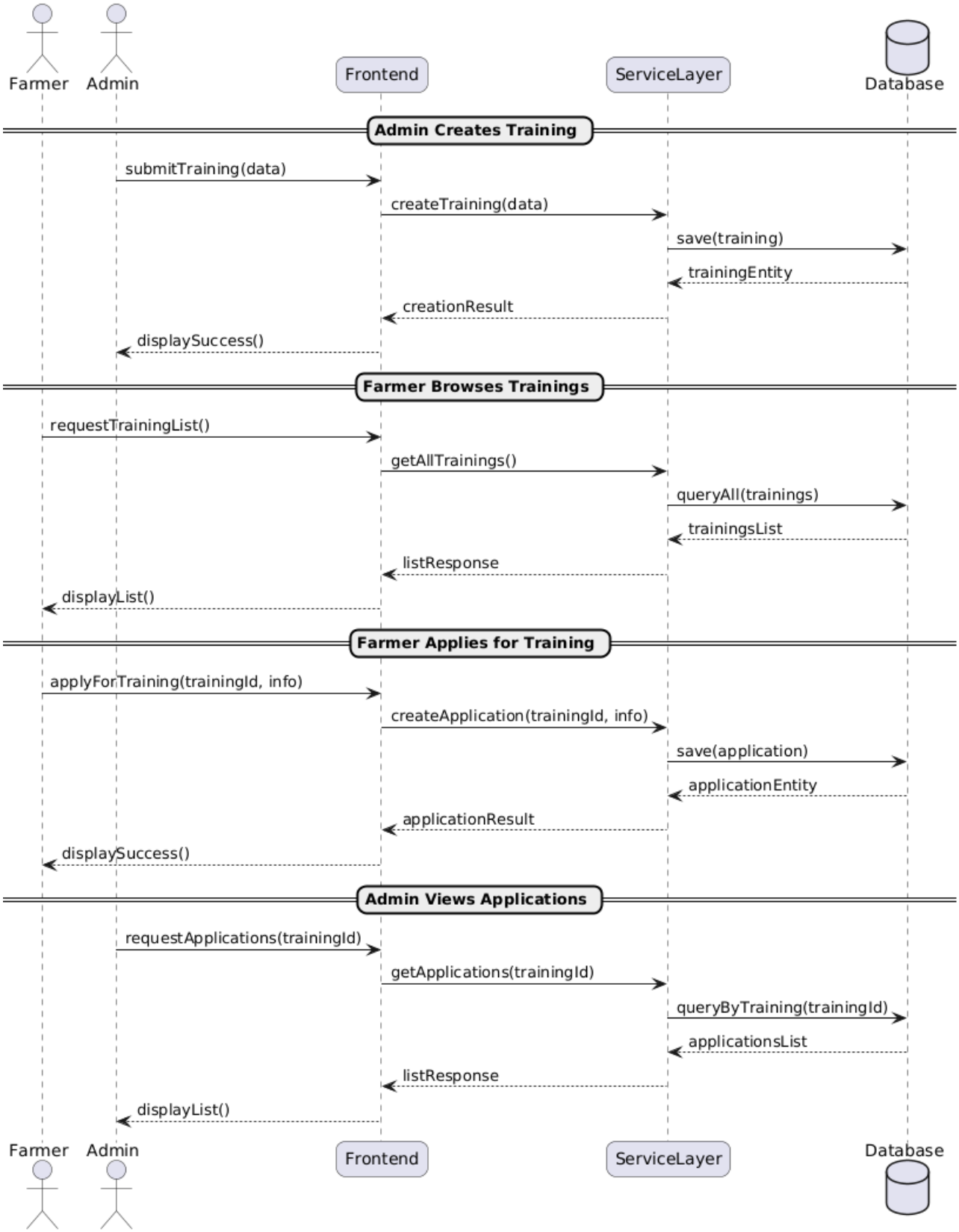


Fig. 1.4: Application Tech

Project Plan

2

2.1 Time Management

We have divided the entire project into several milestones, each corresponding to specific tasks with clear timelines. These milestones represent key points in the development process, ensuring steady progress and timely delivery.

2.1.1 Milestone 1 (Week 1): Requirement Research and System Use Case Modeling

- Task 1.1: Requirement Research and Analysis.
- Task 1.2: System Use Case Modeling.

2.1.2 Milestone 2 (Weeks 2-3): System Design and Technology Selection

- Task 2.1: Select the technology stack for frontend and backend development.
- Task 2.2: Design interaction and UI/UX based on system requirements.
- Task 2.3: Data structure design and system interaction design.
- Task 2.4: API design and documentation.
- Task 2.5: Complete the System Design Document (SDD).

2.1.3 Milestone 3 (Weeks 4-5): Front-End Development and UI Prototyping

- Task 3.1: Design and develop web page mockups based on UI requirements.
- Task 3.2: Front-end development implementation.
- Task 3.3: Perform testing and optimization for front-end and back-end integration.
- Task 3.4: Deploy the front-end application to the server.

2.1.4 Milestone 4 (Weeks 6-7): Back-End Development and Integration

- Task 4.1: Design core backend logic and business functionalities.
- Task 4.2: Develop backend logic and services.
- Task 4.3: Conduct joint debugging and optimization for front-end and back-end integration.
- Task 4.4: Deploy the back-end system and conduct testing.

2.1.5 Milestone 5 (Weeks 8-9): System Testing and Deployment

- Task 5.1: Set up testing infrastructure for system validation.
- Task 5.2: Conduct system testing and performance optimization.
- Task 5.3: Deploy the complete system and ensure functionality.
- Task 5.4: Present the system and provide a project summary.

2.1.6 Milestone 6 (Weeks 10-11): System Optimization and Final Adjustments

- Task 6.1: Final adjustments for system optimization.
- Task 6.2: Conduct final quality checks and ensure system performance.
- Task 6.3: Complete the deployment and verify server stability.

2.1.7 Milestone 7 (Weeks 12-13): Final Presentation and Reporting

- Task 7.1: Prepare and present the final system demonstration.
- Task 7.2: Write the final project report and document the results.
- Task 7.3: Final evaluation and client feedback.

The following Gantt chart shows our detailed plan.

Group 1 USPA	Team Members	March W1	W2	W3	W4	April W1	W2	W3	W4	May W1	W2	W3	W4	June W1	W2	W3	W4	Notes
WP 1: Requirement Analysis Manager: Le Liu																		
Task 1.1: Requirement Research and Analysis	ALL																	Identify user needs based on SDG goals
Task 1.2: System Use Case Modeling	ALL																	Write Use Case Descriptions
WP 2: System Design Manager: Ziheng Wang																		
Task 2.1: Technology Selection	Le Liu																	Select the technology stack for frontend and backend
Task 2.2: Interaction Design	Yunhan Gao																	Design key business processes and create sequence diagrams
Task 2.3: Data Structure Design	Bohan Zhang+Yunhan Gao+Le Liu																	Class Diagrams; ER Diagrams
Task 2.4: API Design	ALL																	Define API endpoints, request parameters, and response formats
Task 2.5 System Design Documentation	ALL																	System Design Document (SDD)
WP 3: Front-End Development Manager: Bohan Zhang																		
Task 3.1: Web page mock-up	Le Liu+Yunhan Gao+Sicheng Yi																	Design and refine UI prototypes based on system requirements.
Task 3.2: Front-end implementation	Yunhan Gao																	Design and refine UI prototypes based on system requirements.
Task 3.3: Testing Between Front-end and Back-end. Optimization.	Le Liu+Yunhan Gao																	Ensure smooth data exchange and improve performance.
Task 3.4: Testing and deploy into server	Sicheng Yi																	Finalize, test, and deploy the front-end application.
WP 4: Back-End Development Manager: Yunhan Gao																		
Task 4.1: Core business logic design	Le Liu																	Define and structure core backend functionalities.
Task 4.2: Core business functionalities implementation																		Develop backend logic and services.
Task 4.3: Front-end and back-end joint debugging and optimization	Bohan Zhang+Ziheng Wang																	Ensure seamless integration and fix issues.
Task 4.4: Back-end deployment and testing	Sicheng Yi																	Deploy and conduct final backend testing.
WP5: Testing + Deployment Manager: Sicheng Yi																		
Task 5.1: Test environment construction	ALL																	Set up testing infrastructure for system validation.
Task 5.2: System testing and performance optimization	ALL																	Conduct thorough testing and optimize system performance.
Task 5.3: Deployment and final testing	ALL																	Deploy the complete system and verify functionality.
Task 5.4: Project demonstration and summary.	ALL																	Present the system and summarize key learnings.
														Deliverable				
														Milestone				

2.2 Technology Stack

Front-End	Vue, node.js
Back-End	spring boot, Java
Database	MySQL
AI Service	文心一言
Design Tools	Figma, 墨刀

Collaboration

3

3.1 Group Work Division

Our team utilizes a clear division of labor, where each member is responsible for a specific core area and works closely with the others. There are five members in the group and the team structure and division of labour is shown in the diagram below:

Member	Role	Responsibilities
Bohan Zhang	Prototype designer and deployment manager	Primarily responsible for the website prototype design and deployment. Composing user and system documentation.
Le Liu	API designer and coordinator	Mainly responsible for designing interface and coordinate between front and back end.
Yunhan Gao	Front-End developer	Mainly responsible for front-end development and development.
Ziheng Wang	Back-End developer	Primarily responsible for back-end development.
Sicheng Yi	Testing developer and Back-End developer	Mainly responsible for testing and back-end development.

3.2 Team conflicts and dispositions

Conflicts are inevitable in teamwork. To ensure team cohesion and sustained productivity, we adopt the following strategies to address and resolve disputes effectively:

- **Timely Communication**: Once disagreement arises, team members should communicate as early as possible to avoid backlog of problems. This can be done through team meetings or one-on-one communication to clearly express their respective views and listen to others.
- **Maintain Respect**: When discussing and resolving conflicts, each member must respect the other's opinion and avoid personal attacks or emotional remarks. Respecting different ideas helps to brainstorm the best solution.
- **Seek compromise solutions**: When different opinions cannot be agreed upon, the team should try to seek compromise solutions to balance the interests of all parties and ensure that the team's goals are not compromised.
- **Introduce Neutral Mediation**: If a conflict cannot be resolved through internal discussion, team leaders or external neutrals can be invited to act as mediators to help clarify issues and propose solutions.

- **Summarize and Reflect**: After the conflict has been resolved, the team should summarize the situation, analyze the root cause of the problem, and formulate improvement measures to prevent similar problems from recurring.
- **Team Building**: Regularly organize team activities to strengthen the trust and cooperation between members and create a good team atmosphere to reduce the occurrence of conflicts.

Through the above measures, we ensure that our team can effectively respond to challenges and maintain efficient cooperation and a positive working atmosphere.

3.3 RACI Chart

The RACI chart below summarizes the responsibilities of each team member for key project tasks. The categories are defined as follows:

- **R (Responsible)**: The person who performs the task.
- **A (Accountable)**: The person ultimately accountable for the task's completion.
- **C (Consulted)**: People who provide input and expertise.
- **I (Informed)**: People who need to be kept informed of progress.

Task	Team Member				
	Bohan Zhang	**Le Liu**	**Yunhan Gao**	**Ziheng Wang**	**Sicheng Yi**
Requirement Analysis	A	A	C	C	C
System Design	A	R	C	C	I
Front-End Development	C	A	R	I	C
Back-End Development	C	C	I	R	A
System Testing	I	C	R	A	R
Deployment	R	I	C	C	I
Project Reporting	R	C	C	C	A

Tab. 3.1: RACI Chart for Team USPA

Design and Implementation

4

4.1 Functional Requirements of visitors

4.1.1 Browse Coffee farms and origins

User Story: As a visitor, I would like to visit the detailed introductory page about coffee farms and origins in order to learn about the origins of coffee, the growing process, and its sustainable practices.

Design:

- Provide visitors with a clear navigational interface that allows them to easily navigate through background information on different coffee farms and coffee growing regions.
- The design of the page should be simple and intuitive, ensuring that the uniqueness of each coffee farm and source region is reflected.
- Utilize interactive elements, such as maps and image displays, to provide more visually appealing information and help users better understand the full picture of coffee production.

Challenges and Solutions in Development:

- **challenges**: How to make sure the informative page displays well on different devices, especially with the mobile adaptation issues.
- **solution**: use responsive design to ensure that page content automatically adapts to device screens. We can utilize CSS media queries to load the appropriate content presentation for different screen sizes.
- **challenge**: How to effectively display content from multiple farms and source locations to avoid repetitive and cluttered information.
- **solution**: Design separate introductory modules for each farm and source, each including a short overview and graphic content. Users can view detailed information by clicking the view more button, which keeps the page simple and provides enough information for users.

4.1.2 View Sustainability Efforts

User Story: As a visitor, I would like to access information about Starbucks' promotion of sustainable agriculture and fair trade in order to understand how Starbucks is involved in improving the global coffee industry and supporting sustainable development.

Design:

- A dedicated sustainability page on the platform showcasing the sustainable agriculture and fair trade programs Starbucks promotes in the coffee supply chain.
- Design clear charts, infoboxes and short videos to more vividly communicate Starbucks' sustainability philosophy and achievements.

Challenges and Solutions in Development:

- **challenge**: Making data-rich content engaging and comprehensible.
- **solution**: Introducing data visualization tools, such as dynamic charts and interactive maps

4.1.3 Using Coffee World Map

User Story: As a visitor, I would like to know coffee farms in different regions. I am curious about coffee origins

Design:

- Provide an interactive world map interface with geographic markers for coffee-growing regions.
- When a user clicks on a region, display origin-specific information such as soil type, altitude, climate characteristics, and coffee bean flavor profiles.
- List local farms in the selected region, with brief farm descriptions and links to detailed farm pages.

Challenges and Solutions in Development:

- **Challenge**: A key challenge in token-based authentication is the conflict between security and usability. Short-lived JWTs (e.g., 2-hour expiry) mitigate security risks but force frequent session interruptions. When tokens expire during active use - like while analyzing interactive maps - users face abrupt logouts and data loss. This creates frustration while compromising productivity in data-intensive applications.
- **Solution**: dual-token authentication architecture.
  - **Short-lived Access Token (2h)**: Used for regular API requests, ensuring security through frequent expiration.
  - **Long-lived Refresh Token (7d)**: Securely stored (HTTP-only, encrypted) and used to silently obtain new access tokens without user interaction.

4.1.4 Registration and Login

User Story: As a visitor, I would like to be able to quickly register and log in to the platform in order to browse more personalized content and enjoy the full range of services on the platform.

Design:

- Provide a simple and intuitive registration and login interface.
- Provide password encryption and validation during registration.

4.2 Functional Requirements of Farmers

4.2.1 Edit Farm Information

User Story: As a farmer, I would like to be able to edit my farm information to showcase my farm's features, sustainable practices, and products in order to attract more consumers and partners.

Design:

- provides a simple and intuitive farm information management interface that allows farmers to upload and update basic farm information, such as farm description, geographic location, cultivation status, etc.
- Supports farmers to easily add farm related content through text box, image upload, etc.

Challenges and Solutions in Development:

- **challenges**: Designing a usable interface for non-technical users.

- **solution**: A guided design with 'quick start' tutorials to ensure that farmers can get started quickly.

4.2.2 Post Promotional Articles

User Story: As a farmer, I would like to publish promotional articles on the platform to showcase the advantages of my products, farm features and event information so as to attract more consumers

Design:

- Provide a rich-text editor that allows farmers to edit promotional articles, including title, content, images, etc.
- Support preview before publishing and manage drafts or previously published content.

Challenges and solutions in development:

- **challenges**: Helping farmers express their promotional ideas clearly and attractively.
- **solution**: Offer layout templates and a preview feature to simplify writing and improve content quality.

4.2.3 Apply for Financial Support and Technical Training

User Story: As a farmer, I would like to apply for financial support, participate in technical training, and have the opportunity to become a Starbucks Select Coffee Farm.

Design:

- Provides a simplified application page where farmers can simultaneously apply for financial support, enroll in technical training, and submit an application to become a Starbucks Select Coffee Farm.
- The progress of each application can be viewed in real time, so farmers can keep track of the status of their application.

4.2.4 Watch E-learning video

User Story: As a farmer, I want to watch e-learning videos to enhance my farming skills, especially in climate change and environmentally adapted farming.

Design:

- provides a learning video module where farmers can choose the courses they are interested in watching.
- Design a simple video player interface that supports playback control, subtitle display and progress bar function to enhance user experience.

Challenges and Solutions in Development:

- **challenges**: Integrating third-party video platforms (e.g., Bilibili, YouTube) to deliver training content while ensuring smooth playback and compatibility across devices.
- **solution**: Embed responsive iframe players using the platforms official APIs or embed codes, which offload video streaming, resolution adaptation, and playback control to the third-party service.

4.2.5 Processing Customer Orders

User Story: As a farmer, I want to easily process customer orders, ensure timely delivery of products and manage customer purchase records.

Design:

- Provide an order management interface where farmers can view and manage customer orders, including order details, payment status and logistics information.

4.3 Functional Requirements for Starbucks Administrator

4.3.1 Upload Financial and Technical Support Program

User Story: As a Starbucks Administrator, I want to upload the Financial and Technical Support Program so that farmers can access relevant resources to improve their productivity and sustainability.

Design:

- provides a clean upload interface that allows administrators to upload various types of financial and technical support programs.
- supports file uploading and text input to ensure that administrators can provide detailed support plan information.

Challenges and Solutions in Development:

- **challenges**: How to secure the uploaded data and prevent leakage of sensitive information.
- **solution**: Set permission management for the uploaded files to ensure that only authorized personnel can access the relevant files.

4.3.2 Processing Requests for Financial and Technical Support

User Story: As a Starbucks administrator, I want to review and process financial support and technical support requests submitted by farmers.

Design:

- Provides an application review page where administrators can view applications for financial support and technical support submitted by farmers.
- Displays application details, allowing administrators to quickly review and approve or reject applications.
- Provides application progress tracking, allowing farmers to view application status in real time.

4.3.3 Managing Starbucks Select Coffee Farm

User Story: As a Starbucks Administrator, I would like to manage the list of Starbucks Select Coffee Farms, ensure that each farm meets Starbucks standards.

Design:

- provides a farm management module that allows administrators to view, edit and update the list of Starbucks Select Coffee farms.

As a Starbucks administrator, I would like to upload online learning videos so that farmers can learn through the platform to upgrade their skills and adapt to the needs of sustainable farming.

4.3.4 Management Platform Users

User Story: As a Starbucks administrator, I want to be able to manage all users on the platform, including farmers, consumers, and other administrators, to ensure proper platform operations and information security.

Design:

- Provide user management interface, administrator can view and manage information of all users of the platform, including registration information, permission settings, order history, etc.
- Provide role and permission management functions for users to ensure that different types of users can only access their authorized functions and data.
- Provide search, filtering and sorting functions to make it easy for administrators to quickly find and process user information.

Challenges and Solutions in Development:

- **challenges**: How to ensure the security of user data against unauthorized access or data leakage.
- **Solution**: Use encryption technology and permission control systems to ensure that only authorized administrators can access sensitive data. Processing to ensure efficient operation of the platform.

4.4 Functional Requirements for Customer

4.4.1 Browse and buy sustainable coffee products from coffee farms

User Story: As a customer, I want to be able to easily browse sustainable coffee products from coffee farms and be able to purchase them directly through the platform, ensuring that the coffee I buy meets sustainability standards.

Design:

- provides simple and intuitive product showcase pages where customers can easily find coffee products from different farms through search, filter and categorization functions.
- Each product page displays detailed product information, including product description, farm background, sustainability certifications and more.
- Support the display of product images, ratings and user reviews to help customers make purchasing decisions.
- Provide easy shopping cart function, customers can view, add or delete products in the shopping cart at any time to facilitate the order.

4.4.2 Manage Orders

User Story: As a customer, I want to be able to easily manage my orders, view order status, modify or cancel orders, and ensure my buying experience is smooth and convenient.

Design:

- Provides an order management page where customers can view detailed information of all historical orders, including order status, payment status, logistics information, etc.
- Each order item can be clicked to view the details, support to view the logistics progress, return or cancel the order and other operations.

- provides real-time update function for each order to ensure that customers can always know the latest status of the order.
- provides a simple interface that allows customers to filter and sort orders based on time, status and other criteria.

Development Challenges and Solutions:

- **challenges**: How to ensure that order information is updated in real-time to ensure that customers can quickly check the status of their orders.
- **solution**: Ensure that the status of each order is reflected in the user interface in a timely manner through real-time data synchronization with the backend order system.

4.5 Non-functional Requirements

4.5.1 System Security

User Story: As a platform user, I want my personal data and transaction records to be adequately protected against leakage or unauthorized access, and to ensure that all my operations on the platform are in a secure environment.

Design:

- uses encryption technology to ensure that users' personal information, payment data and transaction records are always encrypted during transmission and storage.
- implements strict permission control and authentication mechanisms to ensure that only authorized users can access sensitive data.
- Conduct regular security audits and vulnerability scans to repair possible security holes in a timely manner to ensure the security of the platform.

Challenges and Solutions in Development:

- **challenges**: How to ensure that the platform encrypts sensitive information of all users to prevent data leakage.
- **solution**: Use algorithms to encrypt and store user passwords and update the encryption policy regularly.
- **challenge**: How to prevent the platform from malicious attacks such as SQL injection, XSS and other security vulnerabilities.
- **Solution**: Use secure programming practices such as input validation, parameterized queries, etc. to prevent malicious code injection. Also, conduct regular code audits and penetration tests to ensure system security.

Challenges and Solutions in Development:

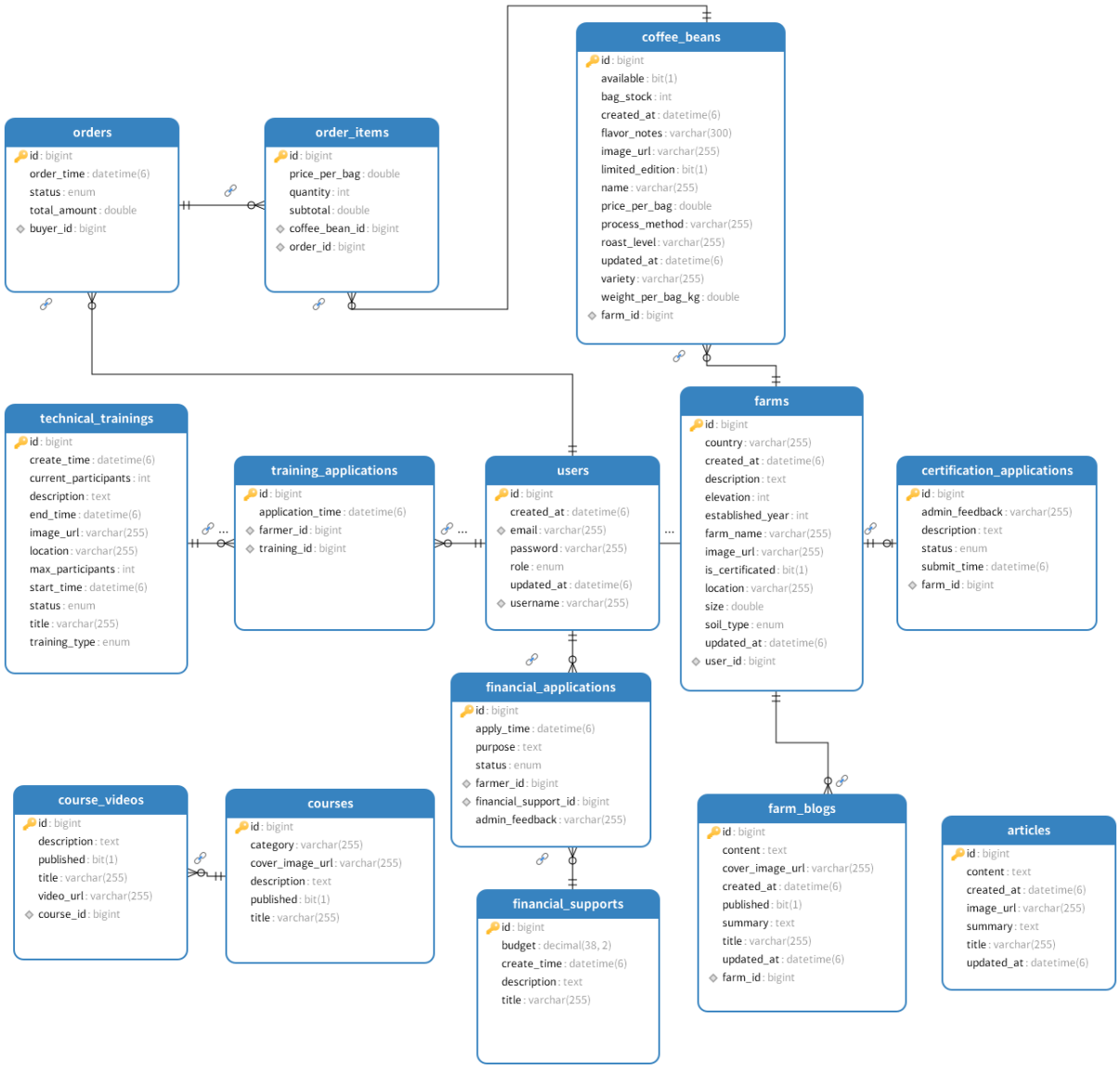
- **challenges**: How to ensure that the product display page is concise, intuitive, and does not look cluttered when there is a lot of information.
- **solution**: Ensure that each product information has a clear display location through modular design, and utilize paging or folding features to display detailed information to avoid overly long pages.

System Design

5

5.1 Database Design

According to this ER diagram, our database design contains 14 tables, which are mainly used to support the core business processes of the coffee farm management platform. The tables include functions such as order management, user management, farm information, coffee beans, technical training, and financial support. The tables are connected through foreign key relationships to ensure data consistency and integrity. The design is simple and efficient, and can meet the platform's daily operational needs.



5.2 Testing

Risk Analysis

6

During the development of the project, we identified several potential risks and proposed countermeasures for each of them. Below is our program for assessing and managing project risks:

6.1 Technical risk

Risk Description: Front-end and back-end integration may encounter problems, resulting in the overall functionality of the system not being successfully realized.

Countermeasures: To mitigate this risk, we schedule regular joint debugging sessions to ensure consistent data exchange and reliable API communication between components. Automated unit and integration tests are applied to validate system stability and compatibility following each development iteration.

6.2 Progress Risk

Risk Description: Frequent changes in requirements may lead to delays in the project schedule and affect the project delivery time.

Countermeasures: We adopt an Agile development approach, enabling iterative planning and task reprioritization to accommodate evolving requirements. Sprint Reviews are held regularly to gather feedback and make necessary adjustments. Additionally, a backup resource pool is maintained to address unexpected team member unavailability and ensure continuity.

6.3 Communication Risks

Risk Description: There may be miscommunication among team members, leading to misunderstanding or incorrect execution of tasks and affecting the quality of the project.

Countermeasures: To avoid miscommunication, we will hold short standup meetings (standup meetings) every day to ensure that every team member is quickly informed of project progress and problems encountered. In addition, we will use the Lark collaboration tool for daily communication to ensure that information is conveyed in a timely manner.

6.4 Other Potential Risks

Risk Description

- System scalability issues, as users grow, the platform may face performance bottlenecks.
- Data privacy and security issues, may be subject to external attacks or data leakage.

countermeasures

- For scalability issues, we will conduct performance tests and design the system to ensure high scalability.
- For data privacy and security issues, we will use encrypted storage and conduct regular security audits to ensure the security of user data.

Conclusion

7.1 Project Summary

Through the implementation of this project, we successfully designed and built a digital platform that supports coffee farm management, Starbucks collaboration and consumer engagement. The platform not only improves the transparency of the coffee supply chain, but also provides a convenient channel for farmers to showcase their farms and apply for financial support and technical training. At the same time, the platform provides Starbucks with efficient tools to better support partner farms and advance sustainability goals. With easy user registration, farm information management and order processing, the platform ensures that consumers can easily purchase coffee products from sustainable supply chains.

7.2 Future Outlook and Plans

Looking ahead, we will continue to optimize the performance and security of the platform to ensure that the system remains efficient and stable under large-scale user use. At the same time, we plan to expand the platform's functionality based on user feedback to enhance user experience and support more sustainable development initiatives. We will also further strengthen our cooperation with farmers and Starbucks to promote more farms to join the platform, thus realizing broader social benefits.

7.3 Team Contribution and Collaborative Spirit

In terms of teamwork, every member of the project plays a crucial role. Whether in technical development, user experience design or project management, each member demonstrated excellent professional ability and team spirit. Through close cooperation and division of labor, we overcame the challenges of the project together. In the future, we will continue to maintain this cooperative atmosphere, continue to innovate, and push the platform to a higher standard.

7.4 Summary

In conclusion, this project not only improves the efficiency of the interaction between Starbucks and its supply chain partners, but also makes a positive contribution to the sustainable development of the coffee industry. Through the joint efforts of the team, we believe the platform will play a greater role in promoting the goals of social responsibility and environmental protection.