CSE 344 – ISE 402

SOFTWARE ENGINEERING – SYSTEM DESIGN

COWPLEX
SMART FARM MANAGEMENT SYSTEM

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Istanbul, 2024

1 Introduction

1.1 Purpose Of The Document

The main purpose of this document is to give information regarding the Cowplex software's structure in an understandable way. Everything is explained, including the communication between the frontend and database. The document also includes explanations and relevant diagrams like class diagrams to provide everyone a clear understanding of the software's design and architecture. With clear understanding that provided by this document parties involved in its construction, maintenance, and use are able to establish effective communication and collaboration amongst each other.

1.2 Purpose Of The System

The goal of the Cowplex system is improving farm management by providing an user friendly software solution. The system's main objectives are to increase productivity, tracking animal datas (both individual and as a group), and health conditions of farm animals. The system is intended for use by farm managers, farm workers and farm veterinarians.

1.2.1 The New System

The system offers users following capabilities:

Animal Management:

Recording and Tracking Animal Information: Document every animal, including its breed, species, date of birth and identification number which is unique to the animal.

Health Tracking: Keep track and monitor all health records, such as diseases, vaccinations, prescription drugs, and physical examinations.

User Management:

Role-Based Access Control: Assign different user roles with different levels of access authority, such as farm manager, veterinarian, and general farm personnel.

Login and authentication: A secure login process guarantees that users are only able to access the features of the system with authorization.

Feeding Management:

Feed Logs: Maintain a record of the type and quantity of feed that is given to each animal.

Tracking Milking Sessions: It's important for dairy farms to keep a record of every milking session, including the date, duration of the session, and amount of milk produced.

Farm Management and Tracking:

Monthly Graphs: Monthly graphs of milking sessions and feed logs for each farm to analyze effectiveness of farm.

Adding or Removing Animals: In case of births, purchasing new animals, animal deaths or being sent to the abattoir farm managers can add or remove animals from the farm.

The overall objective of the system is to enhance the efficiency and effectiveness of farm management by tracking and organizing every data of animals and farms. By providing real-time data and management tools, the system aims to improve decision-making processes and ensure the optimal operation of the farm.

1.3 Structure Of The Document

This software design report is structured to provide a comprehensive and detailed understanding of the software architecture of the Cowplex application. The document begins with an introduction, which outlines the purpose of the document and the system, as well as the structure of the document itself.

Following the introduction, the document is divided into several key sections:

1. **Systems Architecture Models**:

○ **UML Component Diagram**: This diagram provides a high-level view of the software components and their interactions.

○ **UML Package Diagram**: This diagram maps the software components to the physical devices, illustrating the deployment of the system.

2. **Detailed Design Class Diagram**:

○ This section includes detailed class diagrams for each software component, showcasing the code structure of the system. Each diagram provides comprehensive information about the classes, including their attributes, methods, and relationships such as associations, compositions, and aggregations.

3. **Dynamic Models**:

○ **Sequence Diagrams**: These diagrams illustrate the interactions between objects in a sequential order, highlighting the flow of messages.

○ **State Diagrams**: These diagrams show the states of different objects and the transitions between these states.

○ **Activity Diagrams**: These diagrams depict the workflows and activities within the system, providing a clear understanding of the processes involved.

4. **Entity Relationship Diagram**:

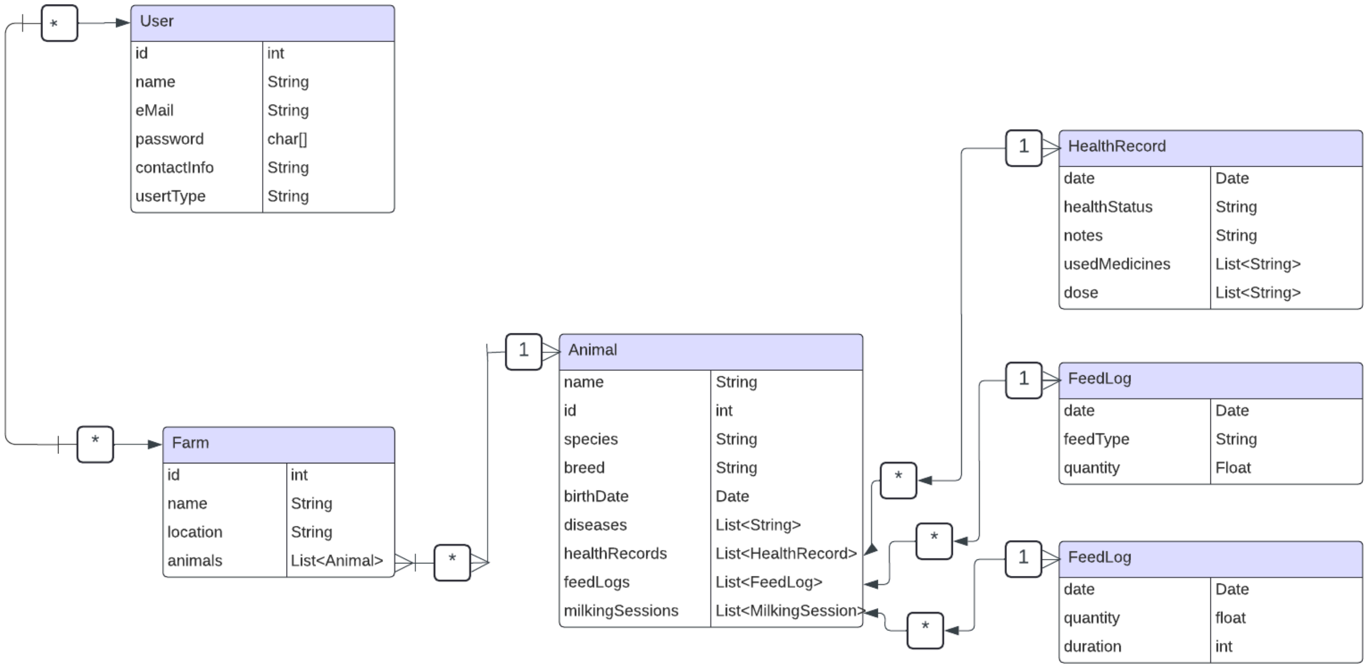
○ This section includes the ER diagram, which shows the relationships between different entities in the database. It provides a clear representation of the data model and how the entities interact with each other.

5. **References**:

○ **References**: This section lists all the sources of information consulted during the preparation of the document, offering a path for further research and clarification

2 Detailed Design Class Diagram

2.1 Database Diagram



User	
id	int
name	String
eMail	String
password	char[]
contactInfo	String
usertType	String

Farm	
id	int
name	String
location	String
animals	List<Animal>

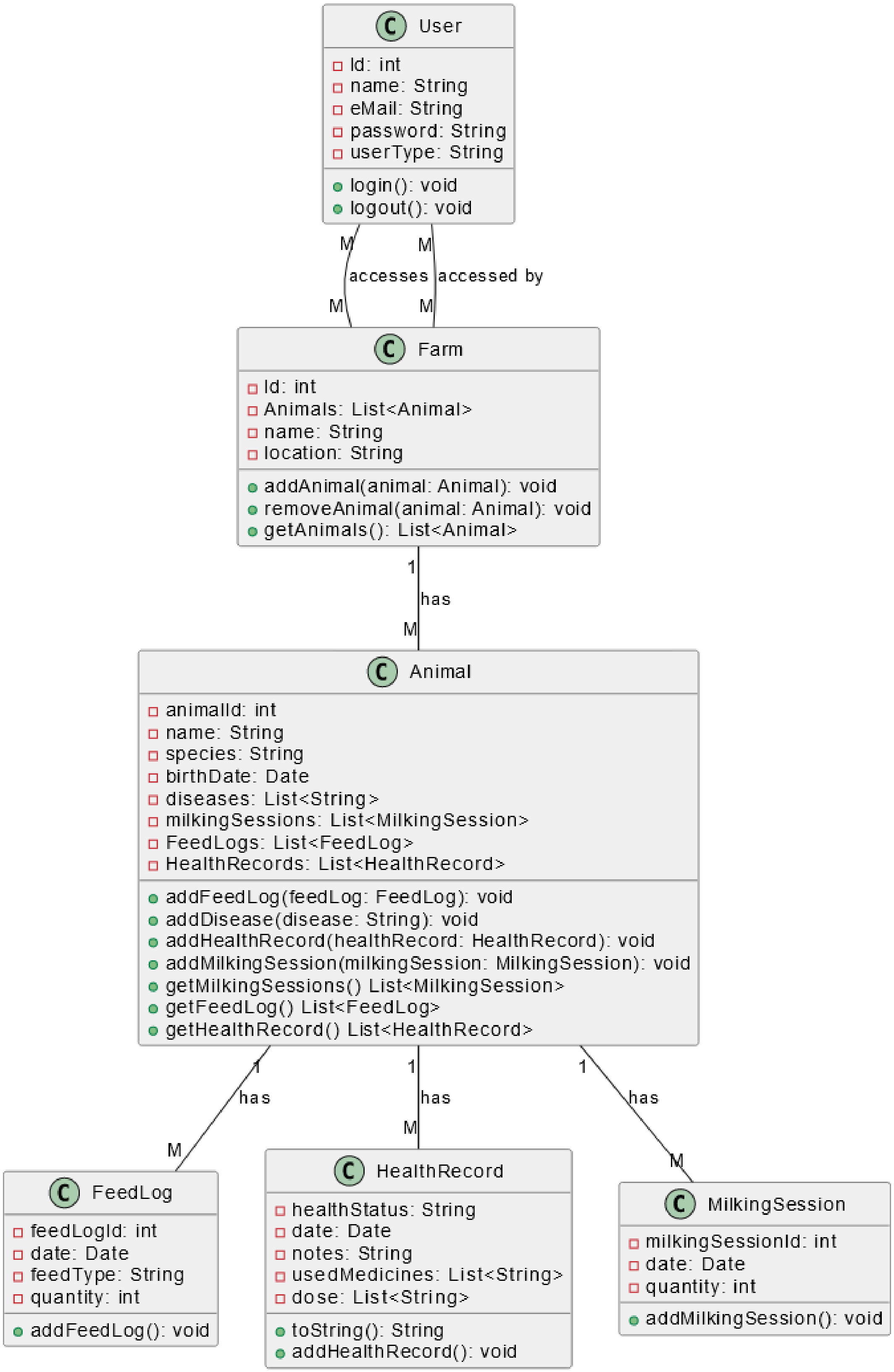
Animal	
name	String
id	int
species	String
breed	String
birthDate	Date
diseases	List<String>
healthRecords	List<HealthRecord>
feedLogs	List<FeedLog>
milkingSessions	List<MilkingSession>

HealthRecord	
date	Date
healthStatus	String
notes	String
usedMedicines	List<String>
dose	List<String>

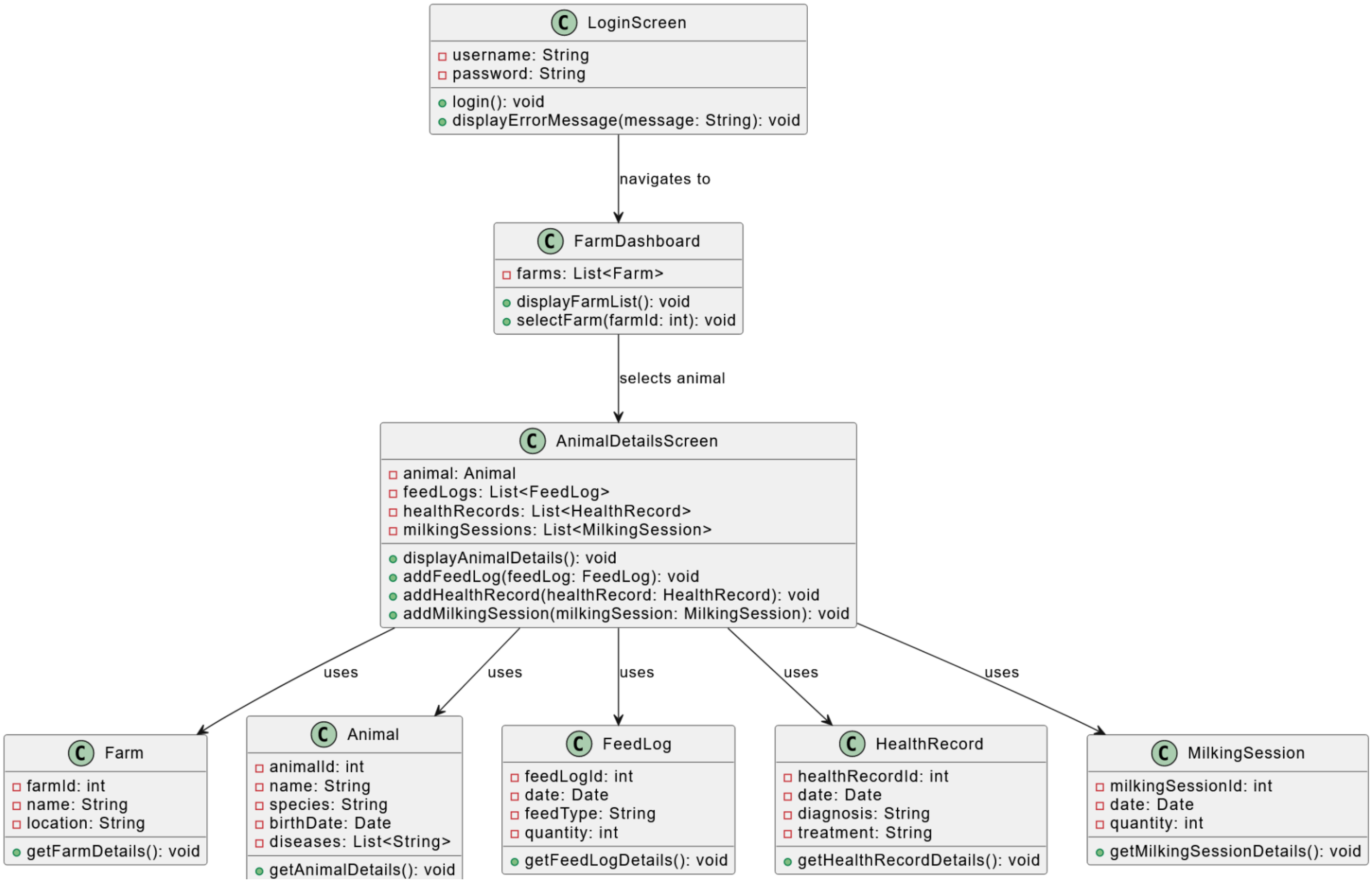
FeedLog	
date	Date
feedType	String
quantity	Float

FeedLog	
date	Date
quantity	float
duration	int

2.2 Class Model Diagram



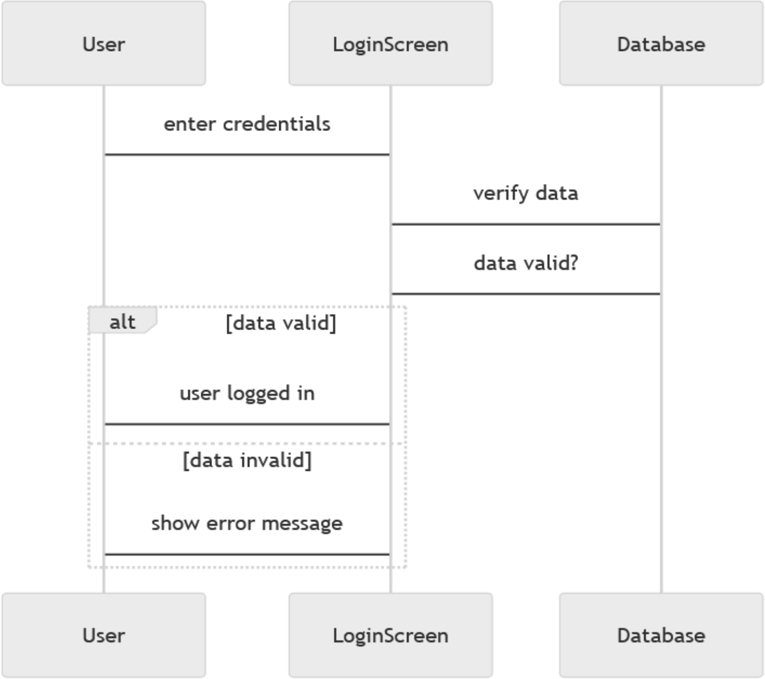
2.3 UI Class Model Diagram

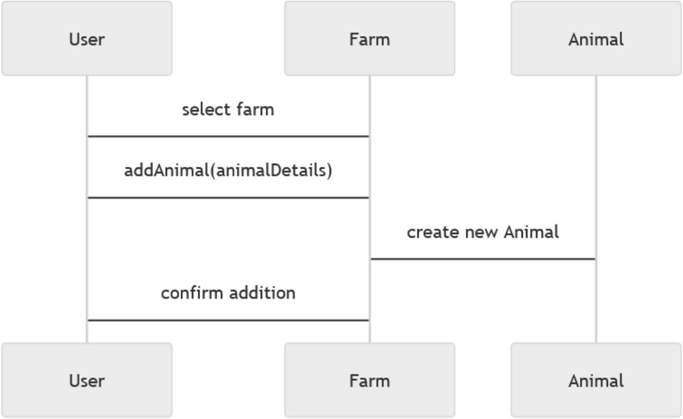


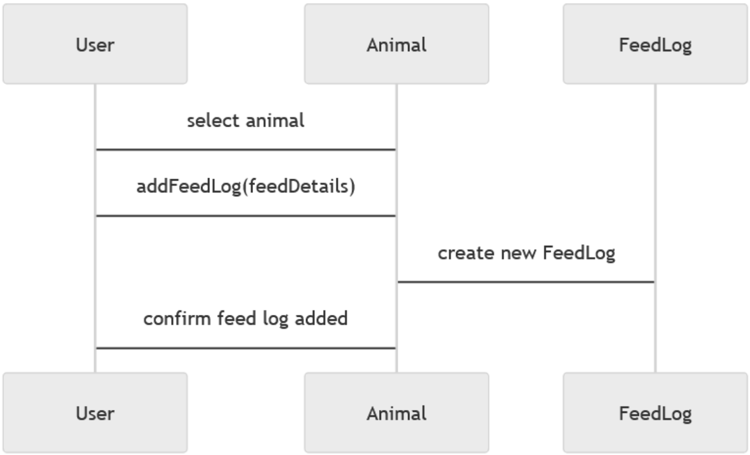
3 Dynamic Models

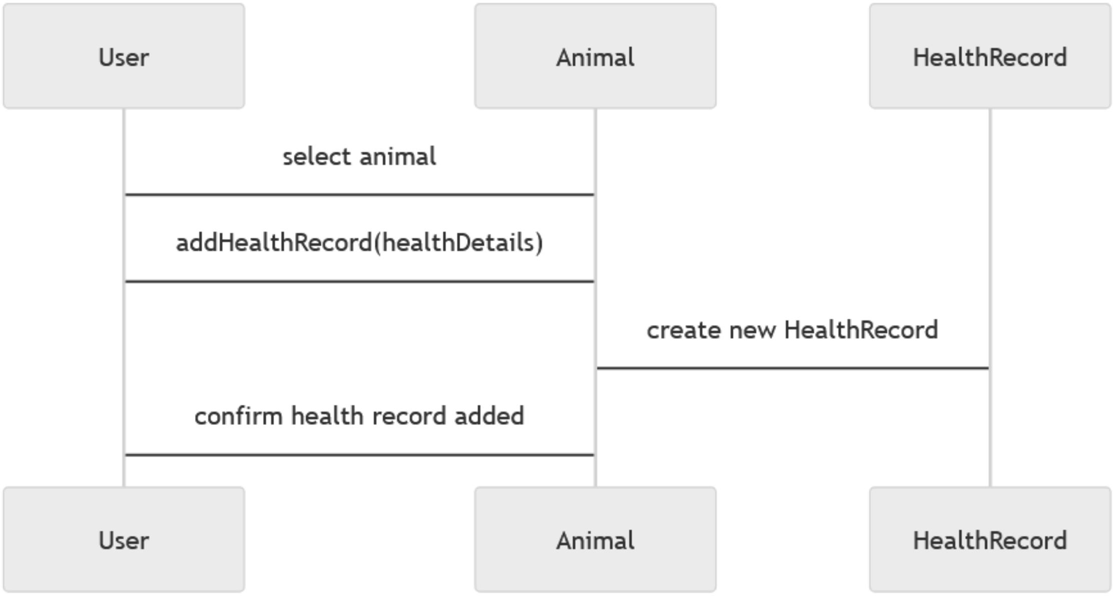
3.1 Sequence Diagrams

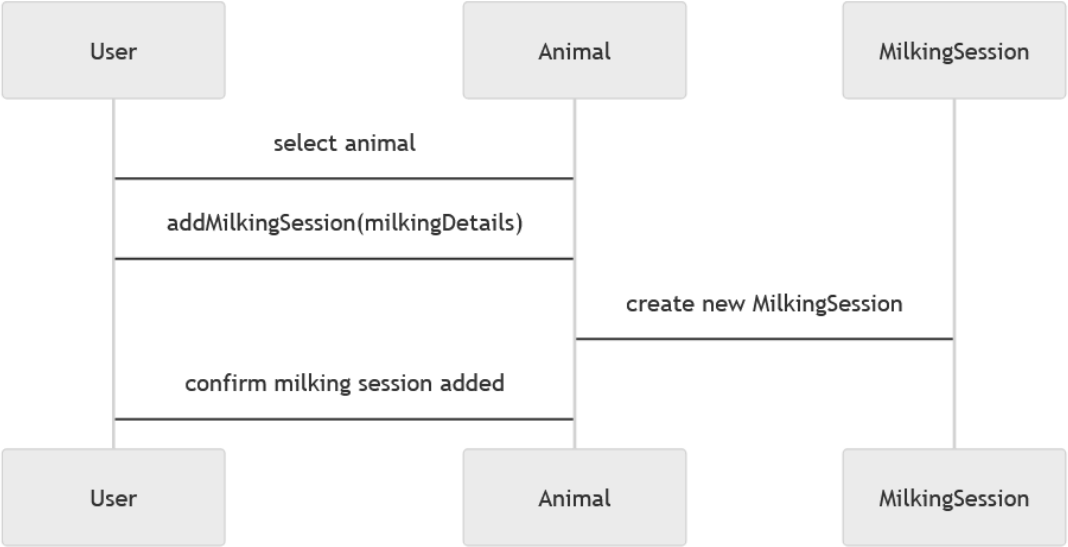
- **Login Sequence**

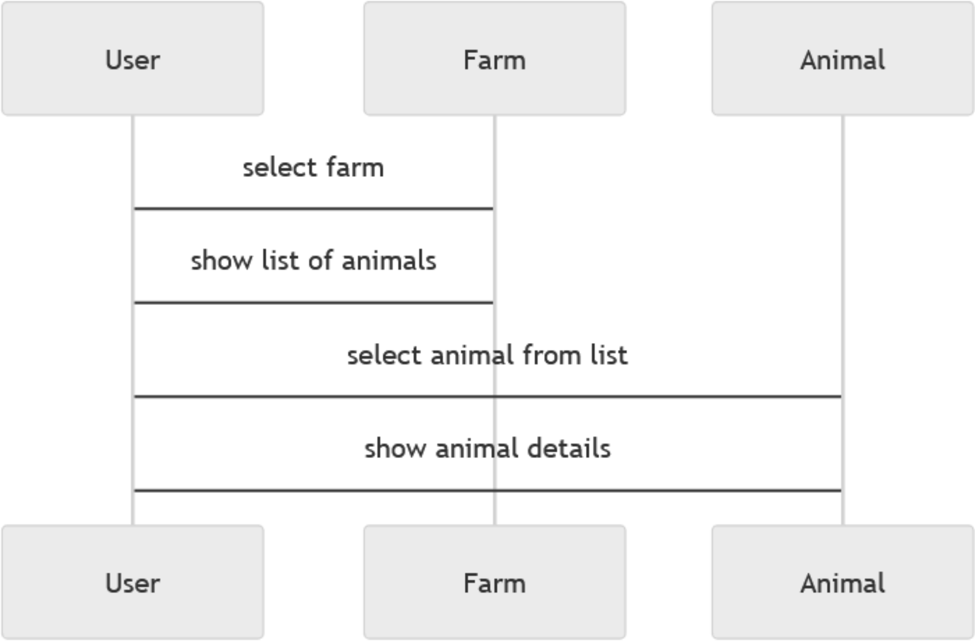


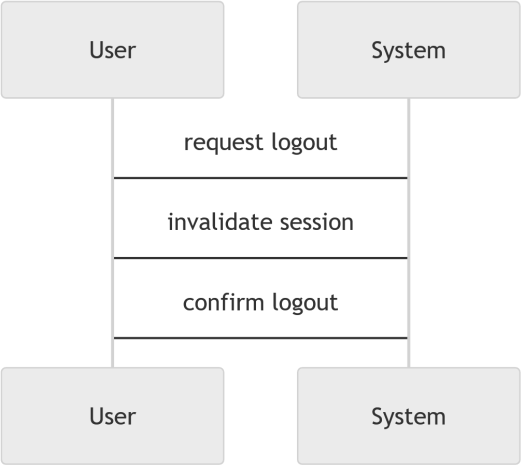



User
Animal
FeedLog
select animal
addFeedLog(feedDetails)
create new FeedLog
confirm feed log added
User
Animal
FeedLog

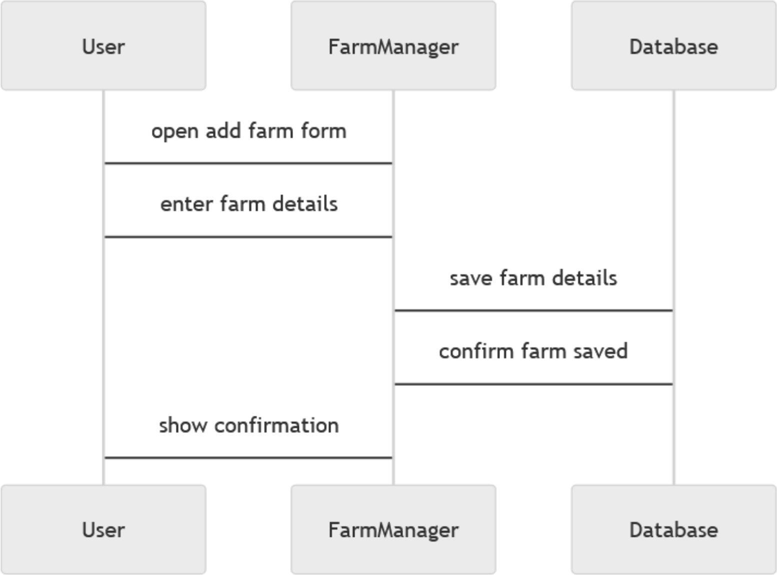

User
Animal
HealthRecord
select animal
addHealthRecord(healthDetails)
create new HealthRecord
confirm health record added
User
Animal
HealthRecord

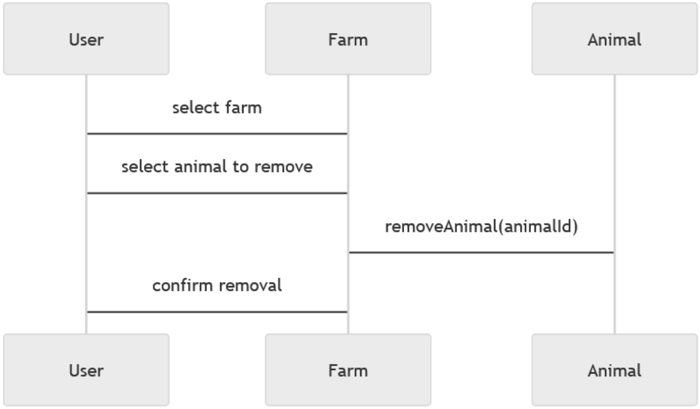

User
Animal
MilkingSession
select animal
addMilkingSession(milkingDetails)
create new MilkingSession
confirm milking session added
User
Animal
MilkingSession


User
Farm
Animal
select farm
show list of animals
select animal from list
show animal details
User
Farm
Animal



- **Add Farm Sequence**

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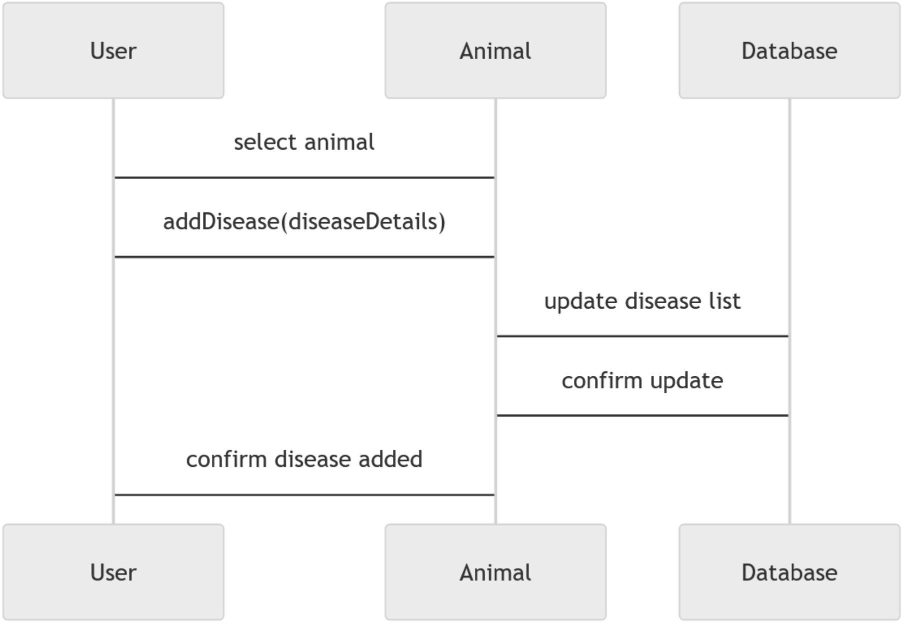
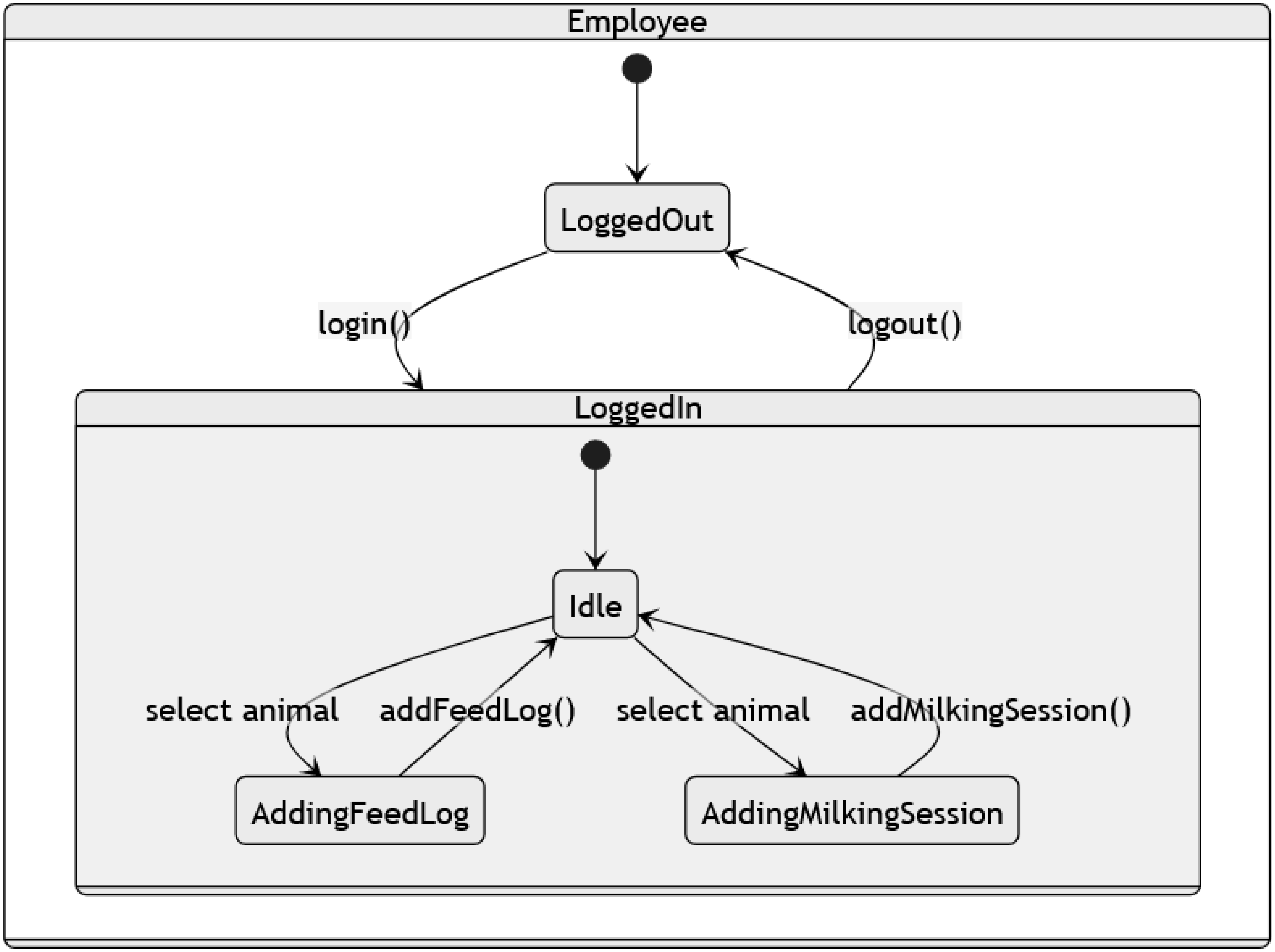
Farm
Animal
select farm
select animal to remove
removeAnimal(animalId)
confirm removal
User
Farm
Animal

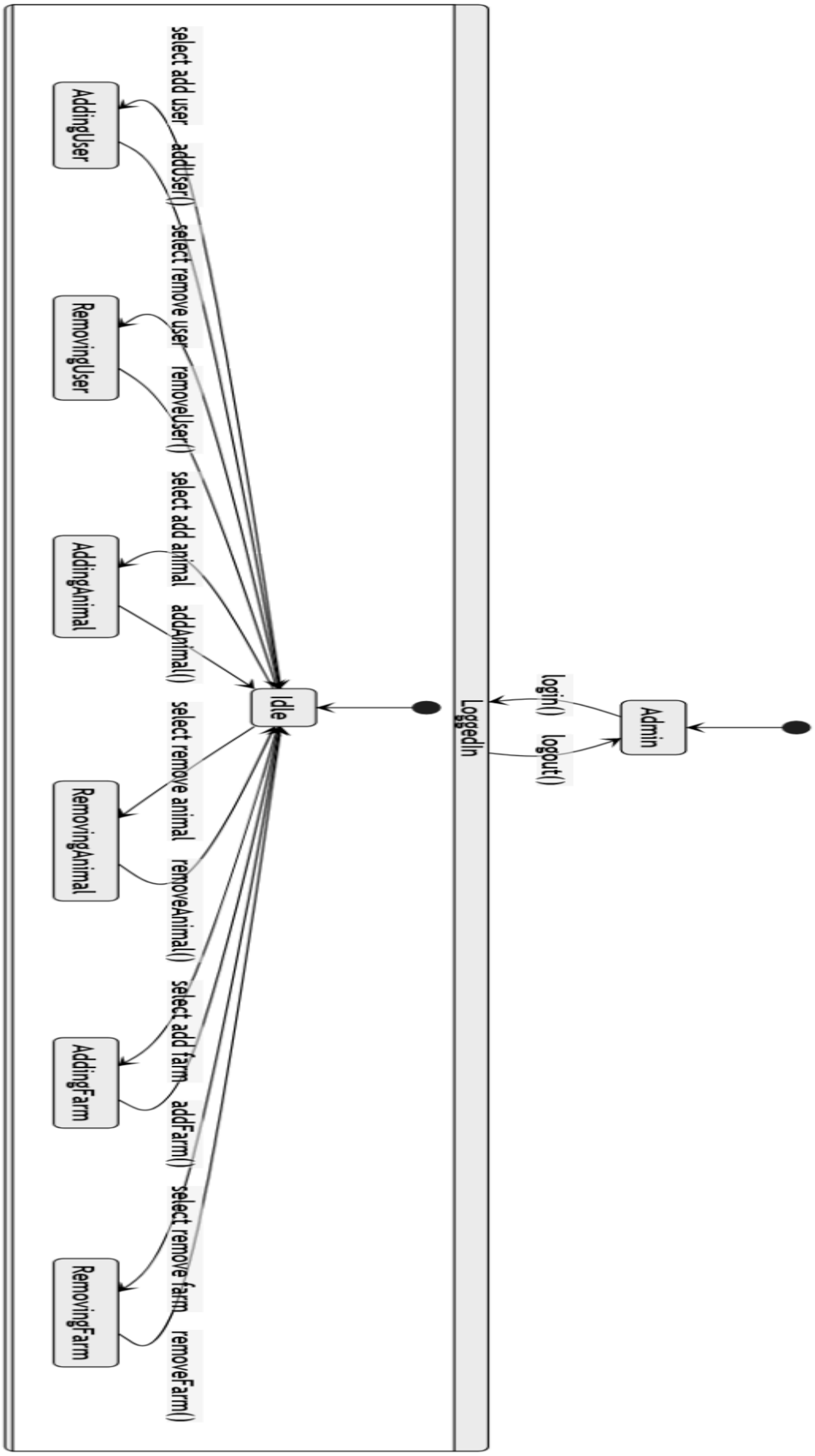

User
Animal
Database
select animal
addDisease(diseaseDetails)
update disease list
confirm update
confirm disease added
User
Animal
Database

3.2 State Diagrams

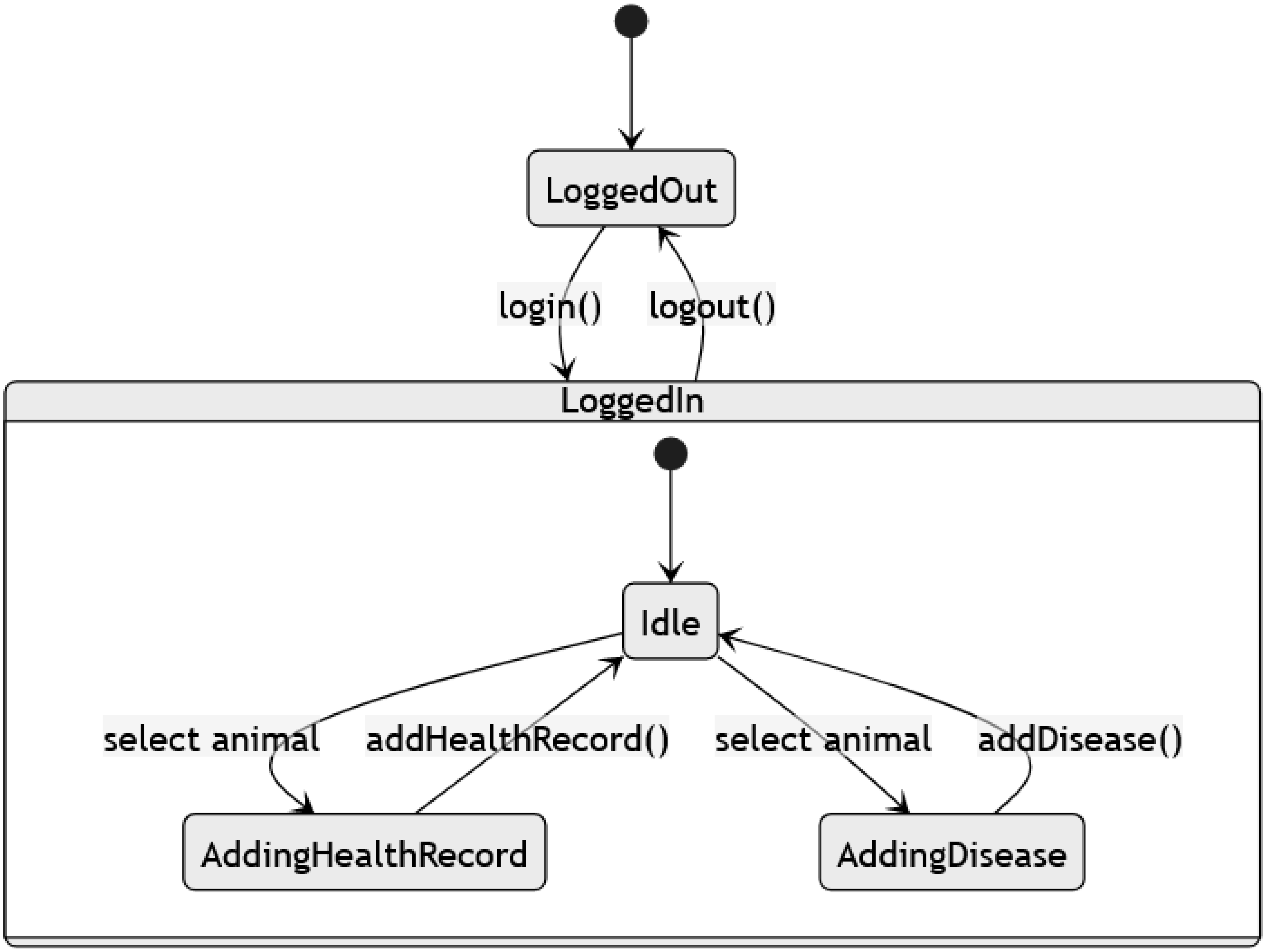
- **Employee State Diagram**



- **Admin State Diagram**

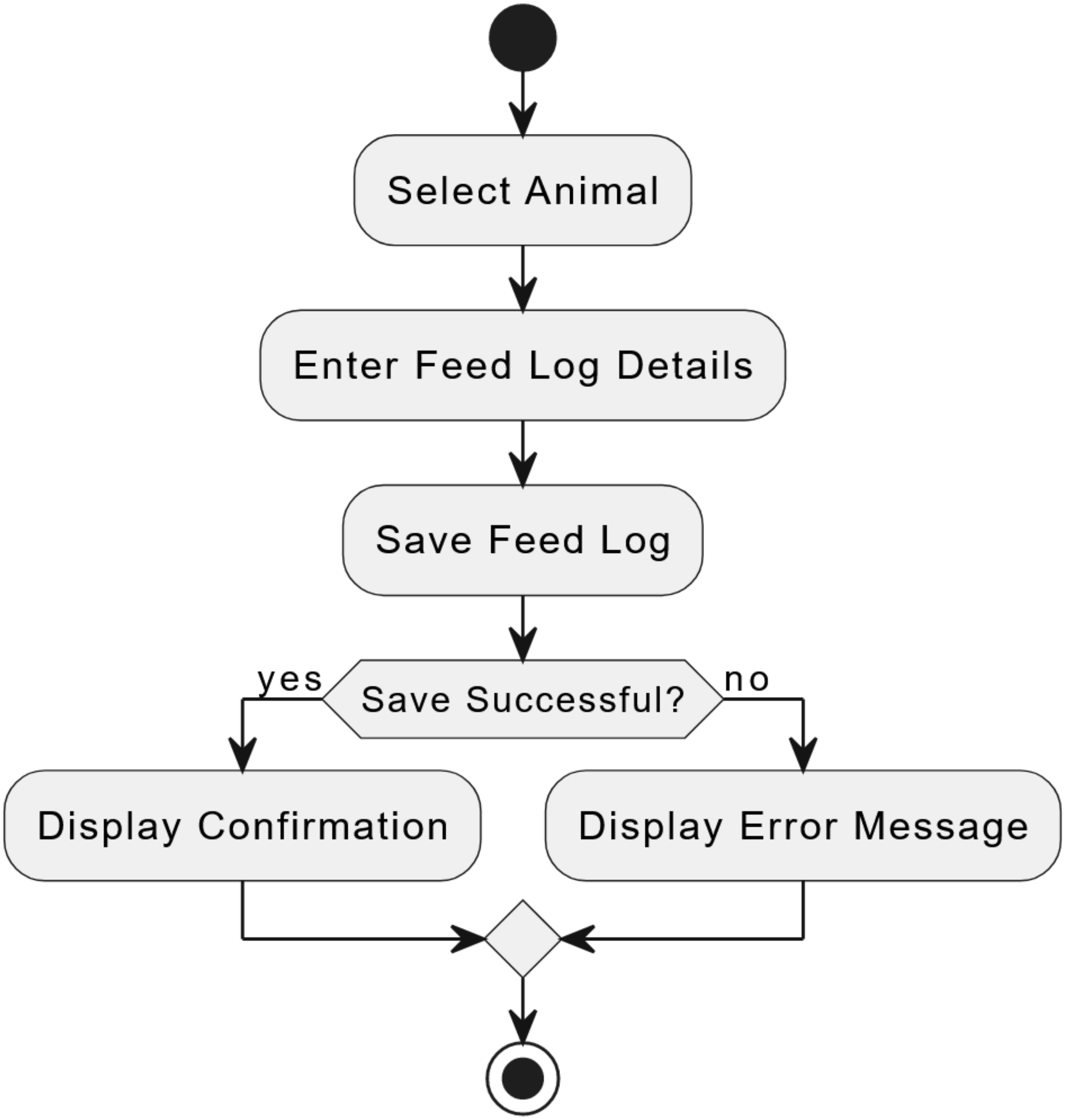


- **Veterinarian State Diagram**

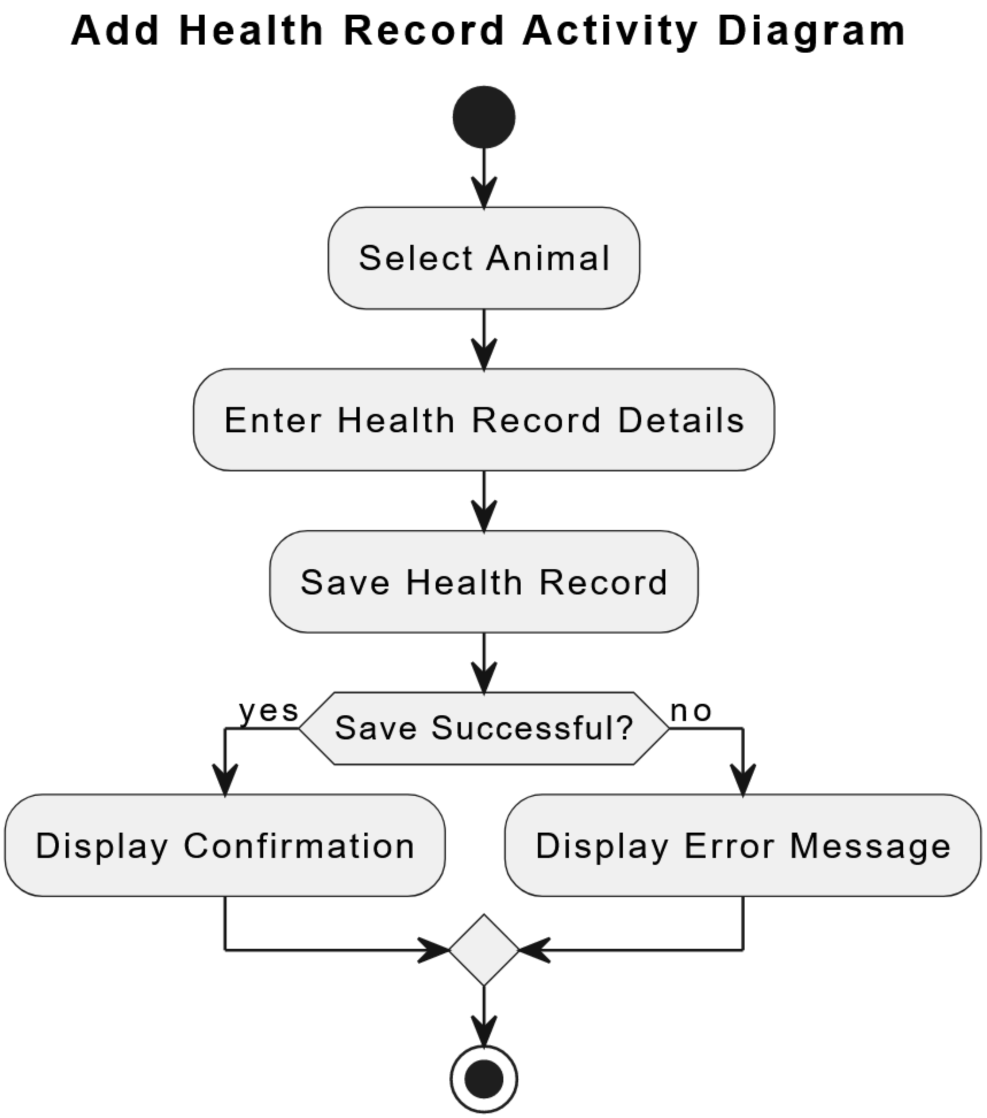


3.3 Activity Diagrams

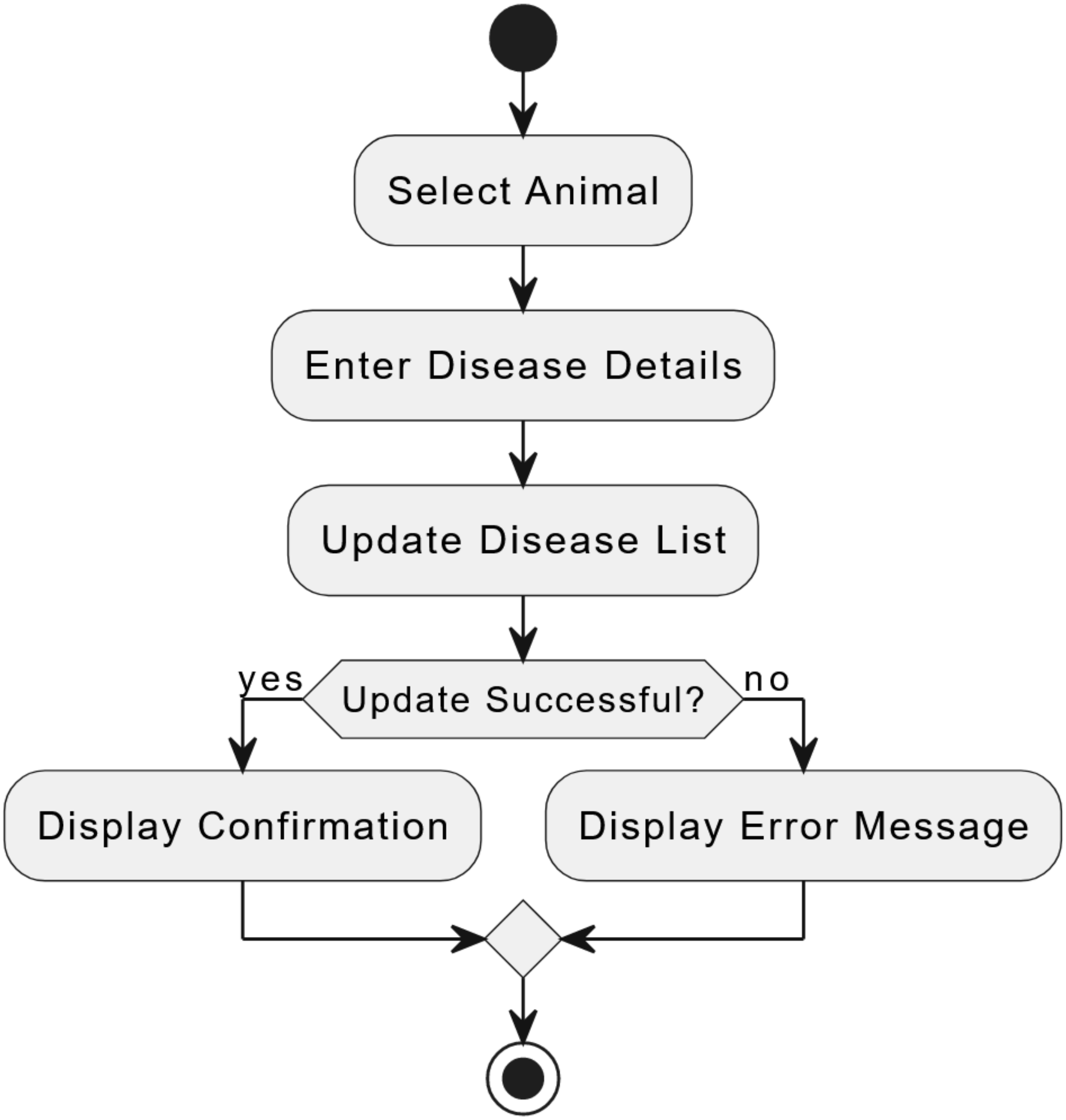
- **Add Feed Log Activity Diagram**



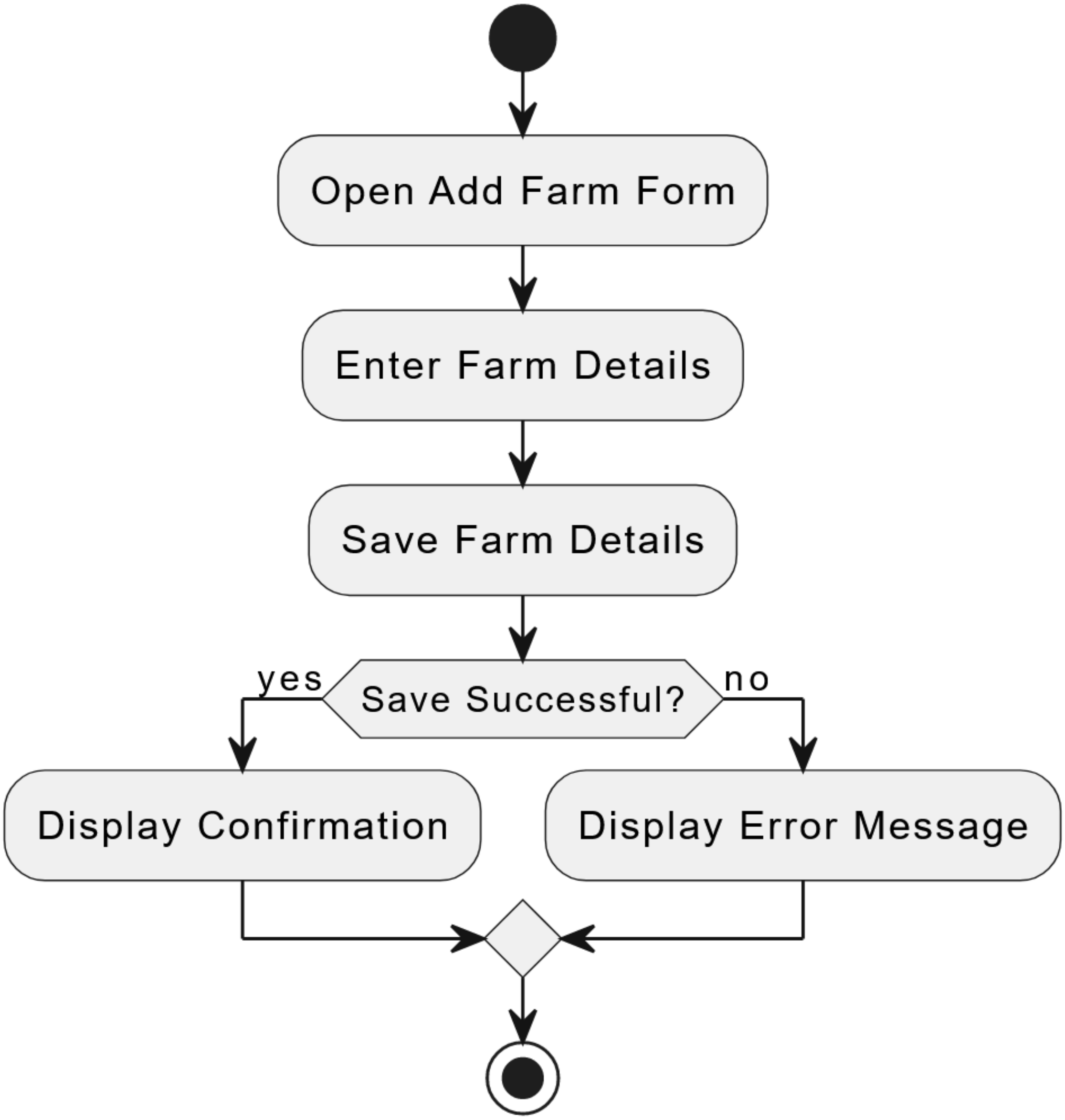
- **Add Health Record Activity Diagram**



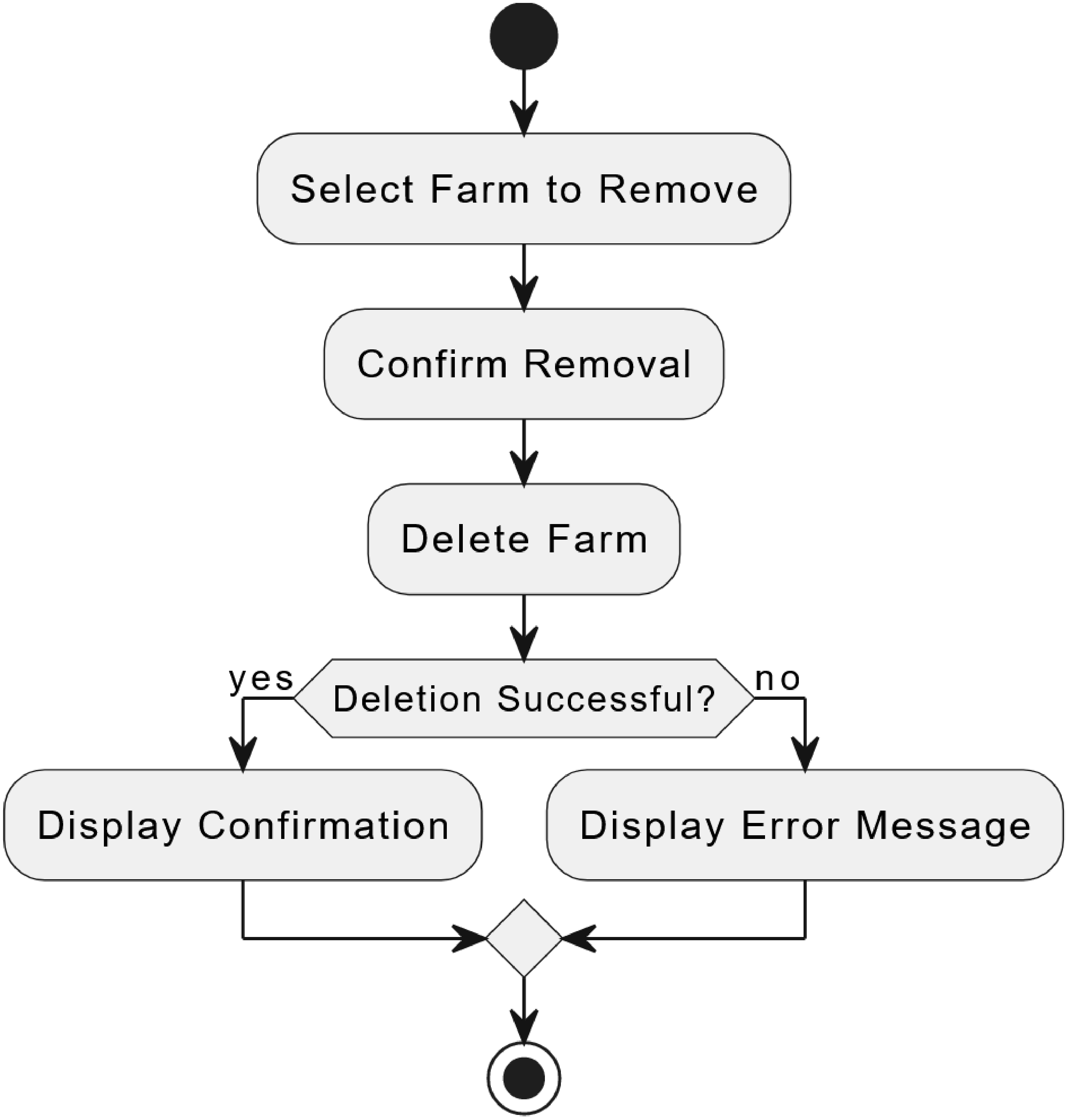
- **Add Disease Activity Diagram**



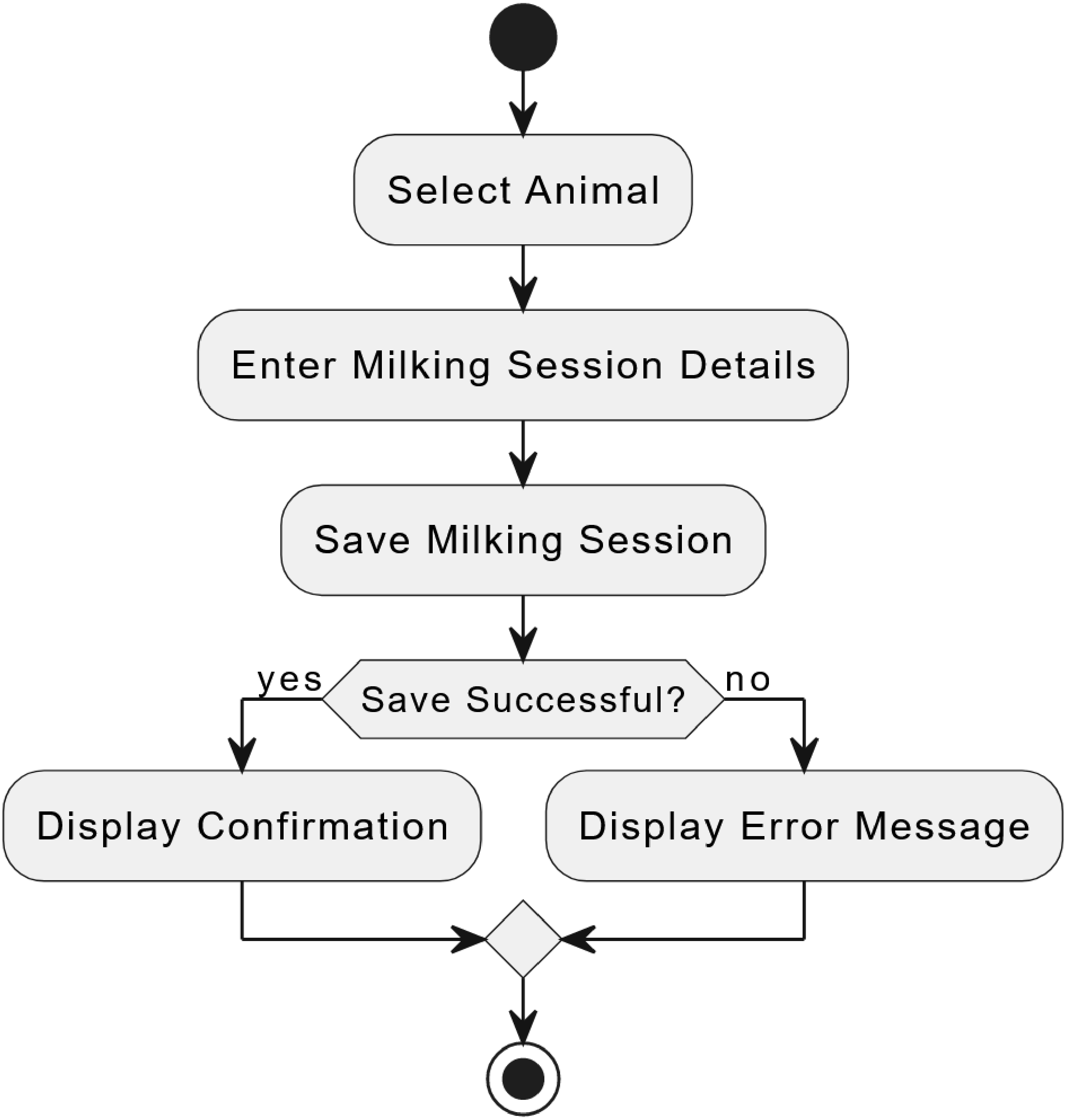
- **Add Farm Activity Diagram**



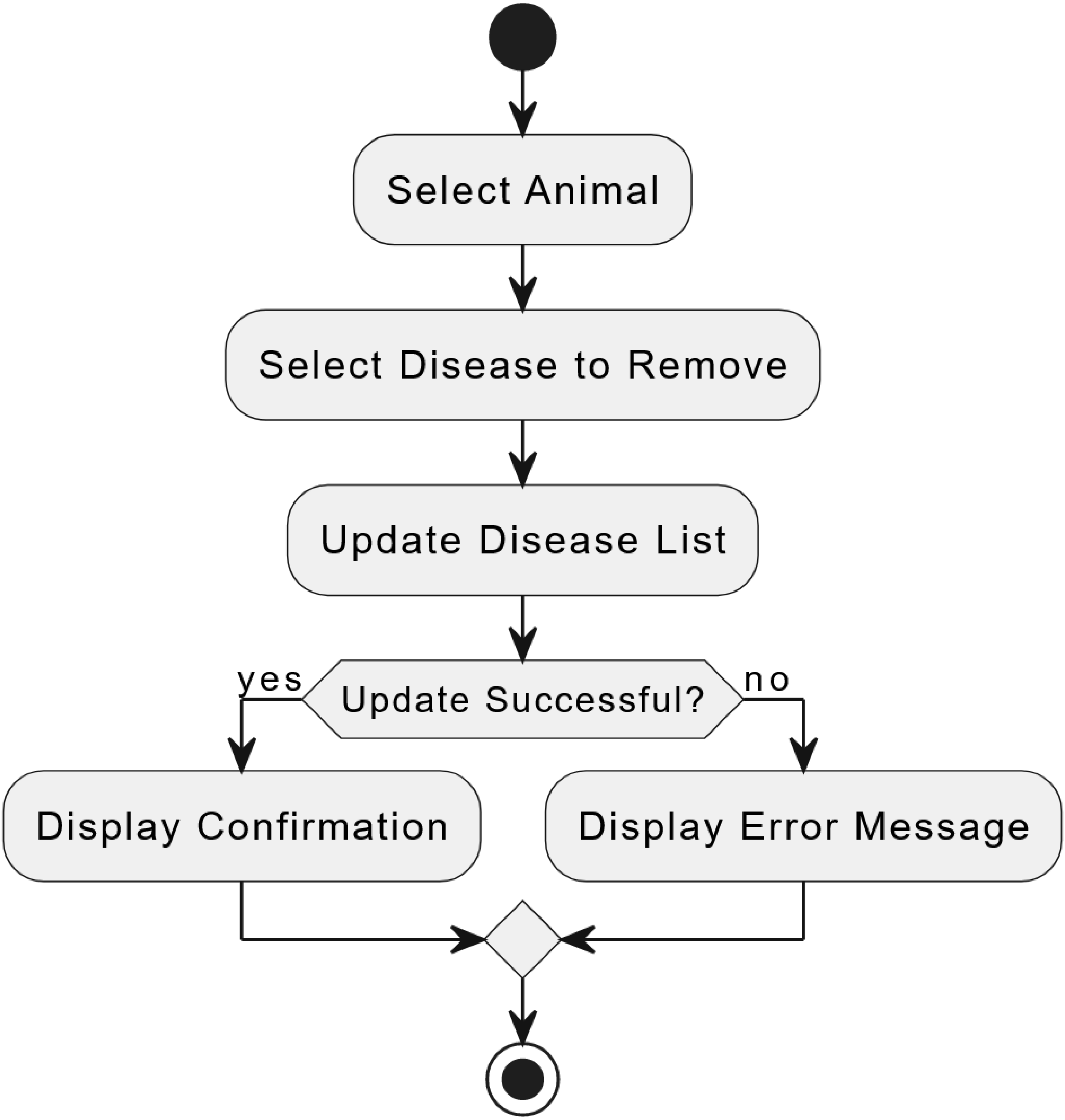
- **Remove Farm Activity Diagram**



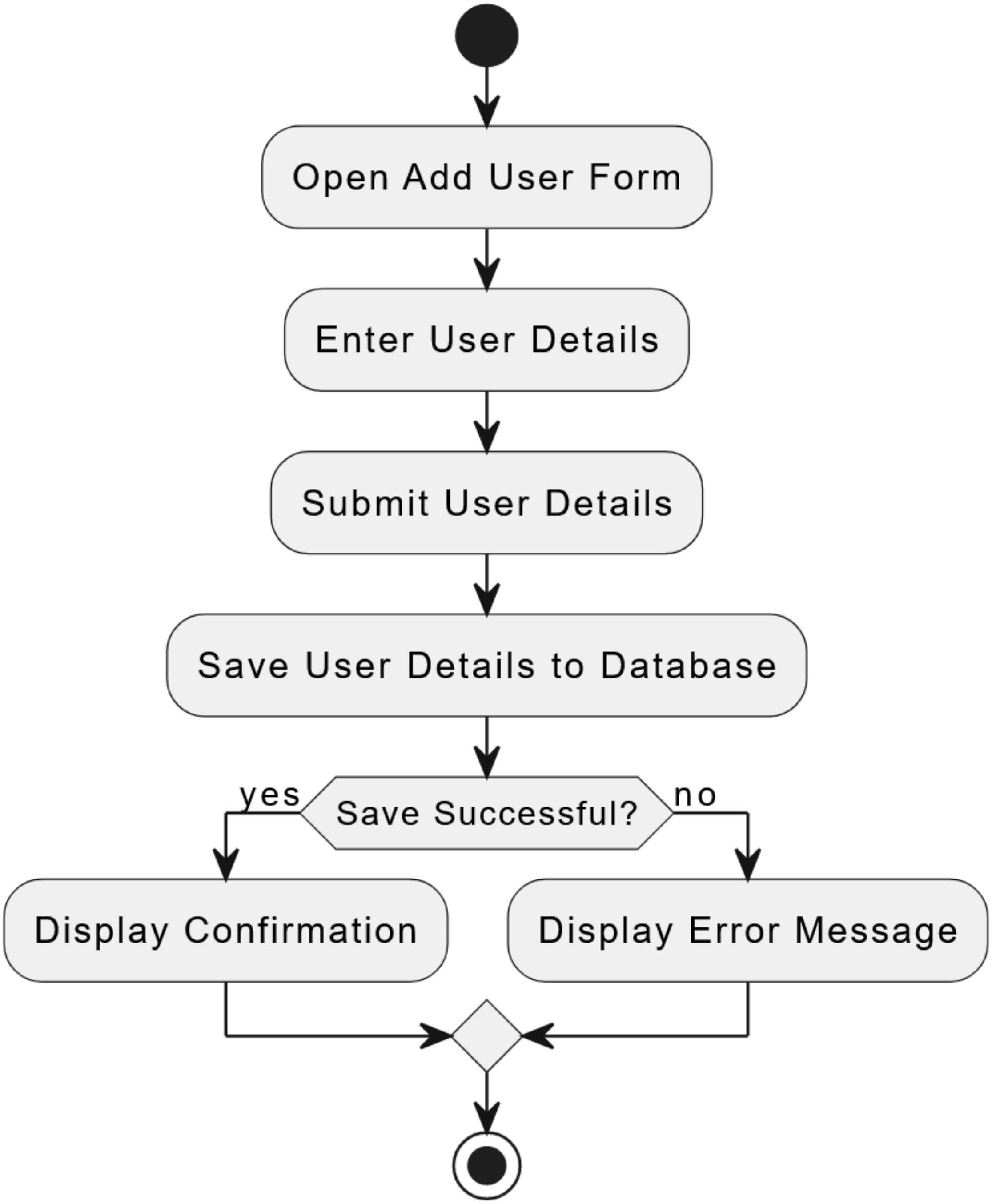
- **Add Milking Session Activity Diagram**



- **Remove Disease Activity Diagram**



- **Add User Activity Diagram**



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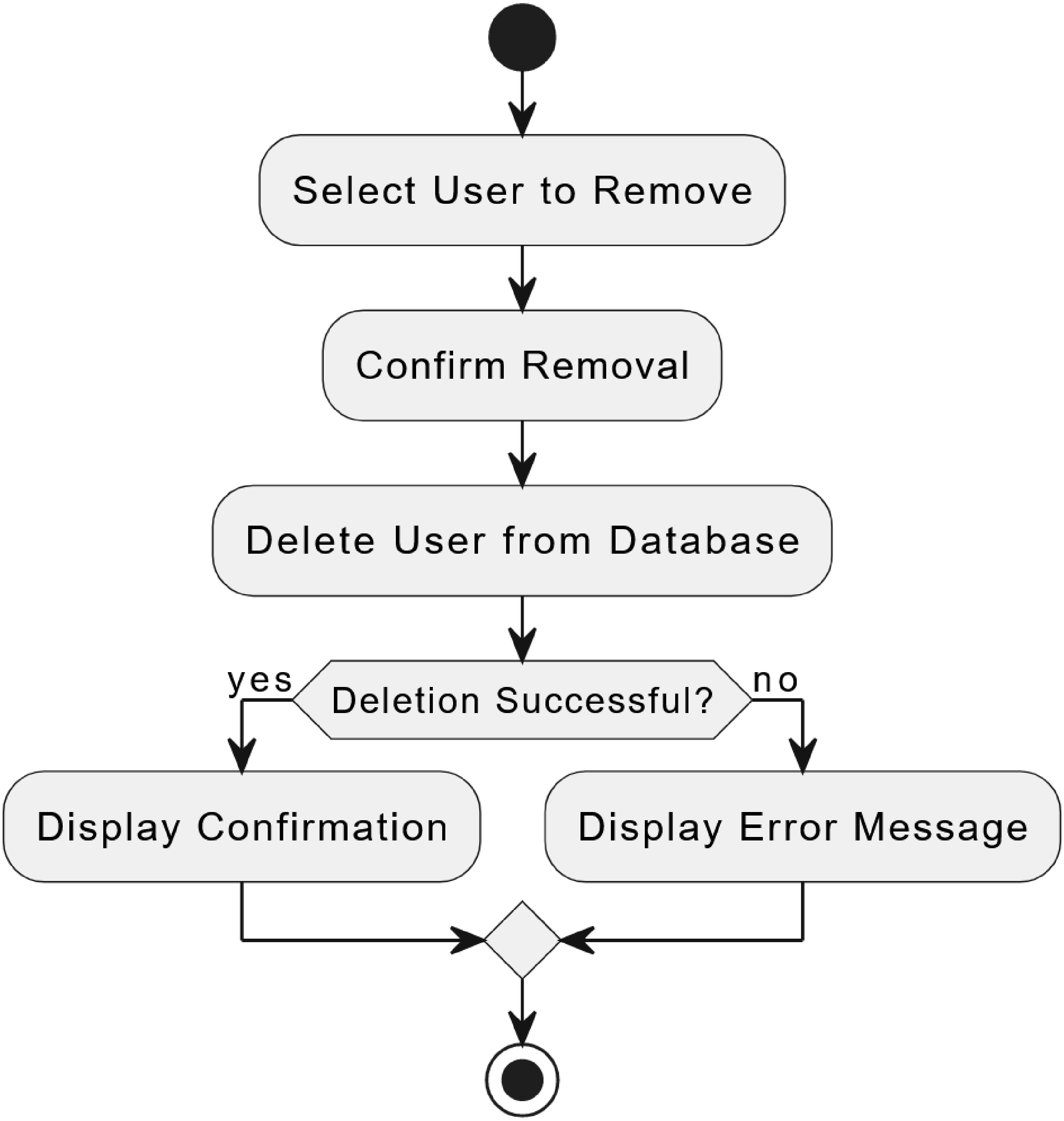
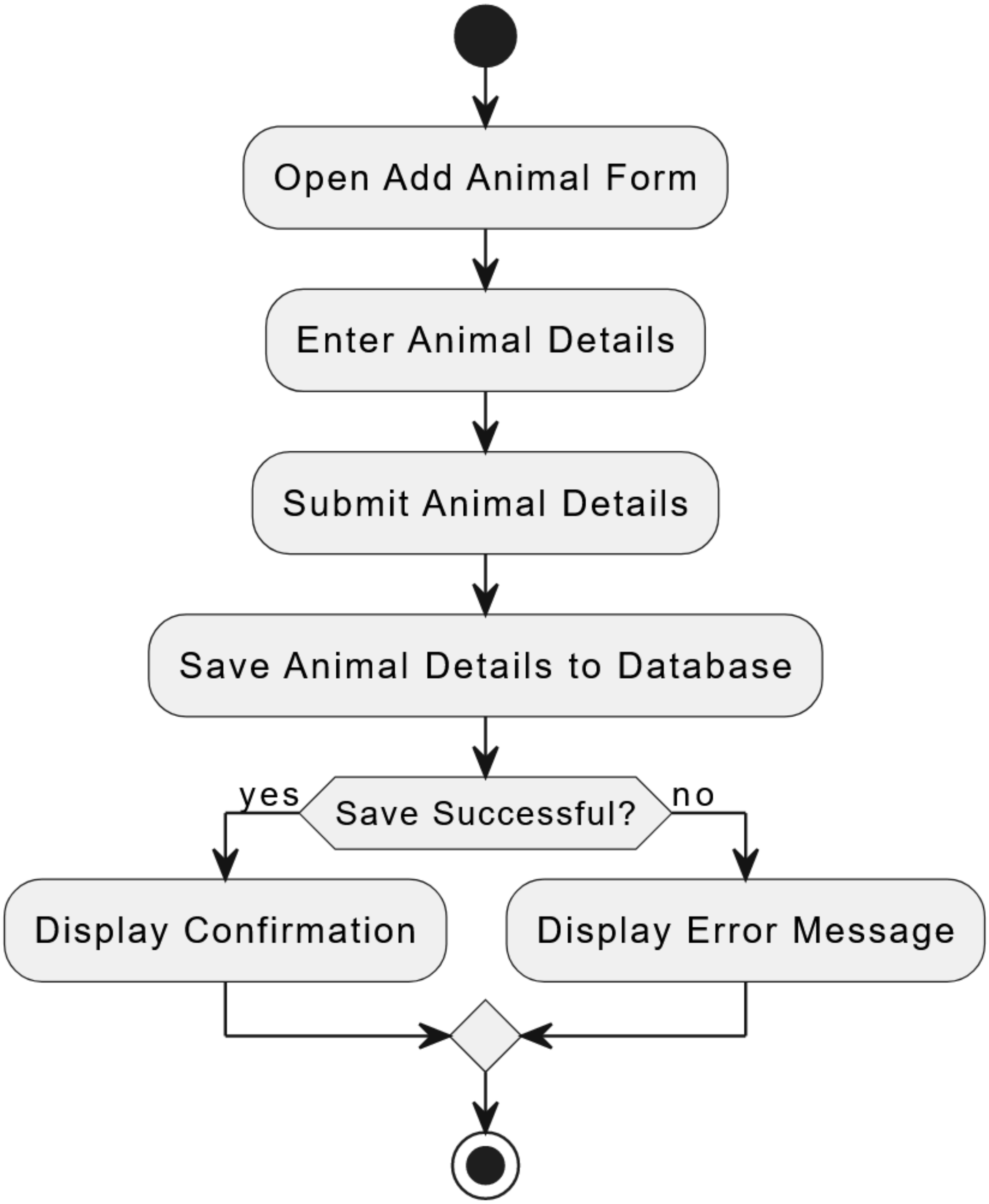
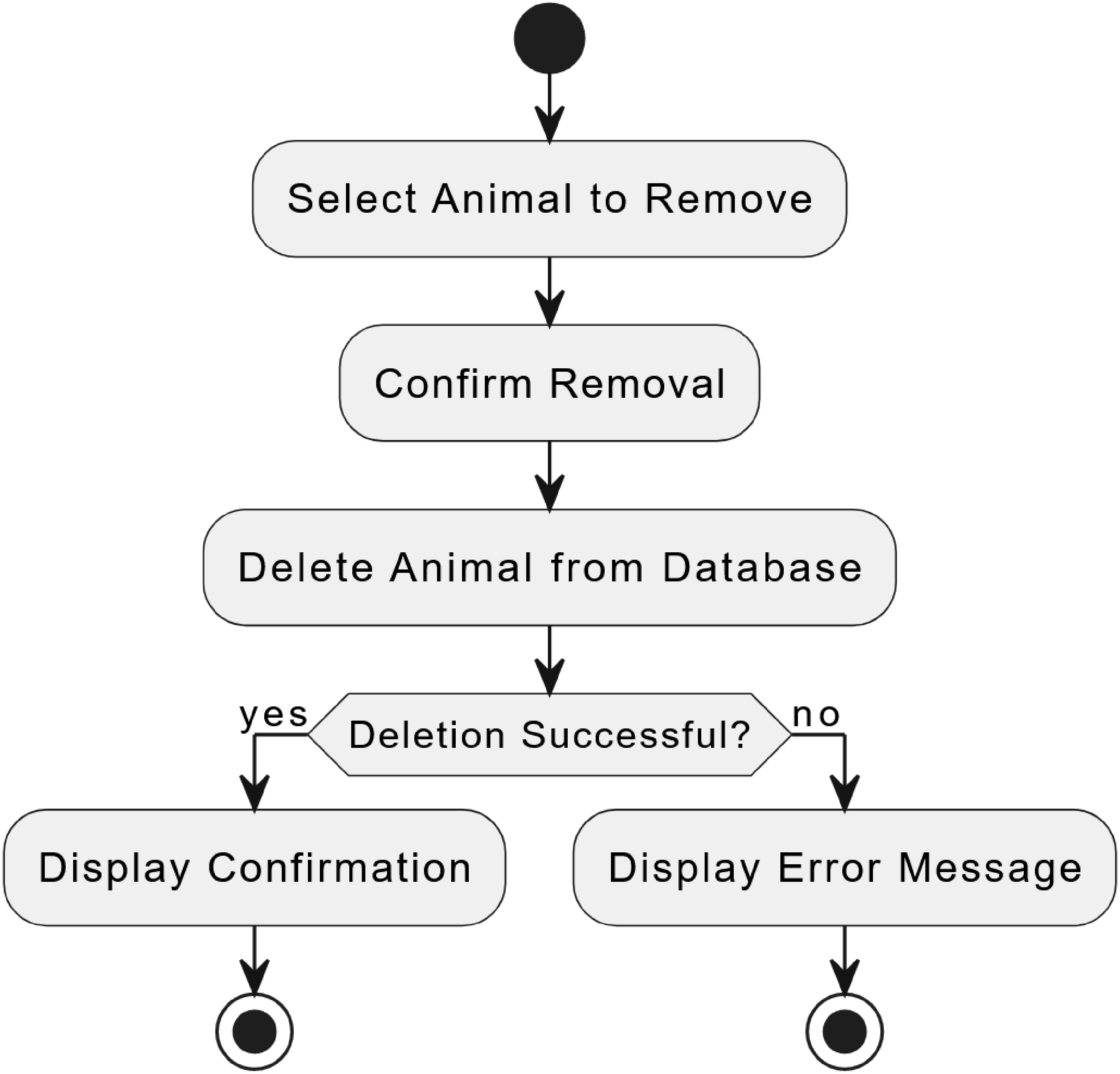
- **Remove User Activity Diagram**



- **Add Animal Activity Diagram**

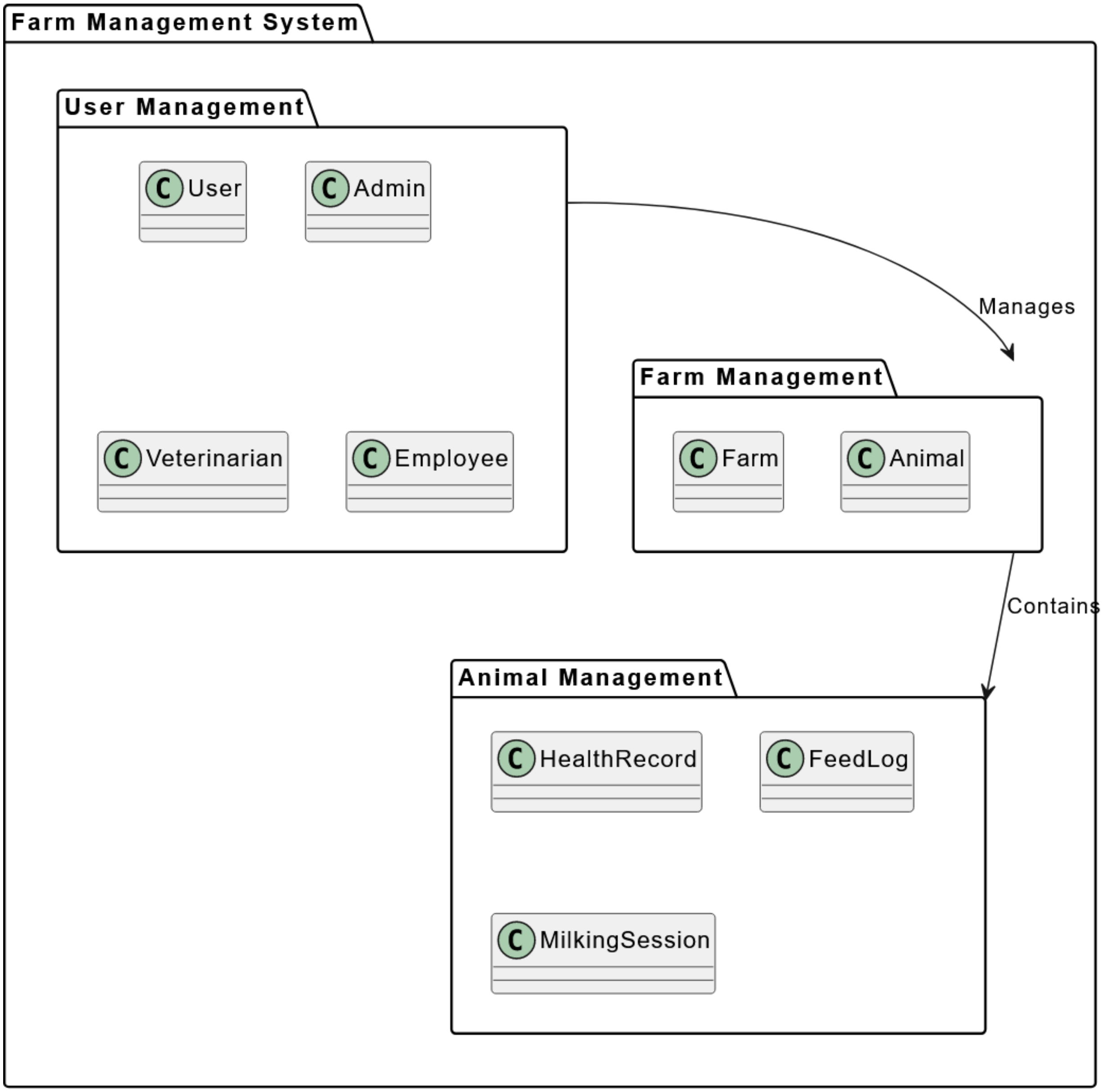


- **Remove Animal Activity Diagram**

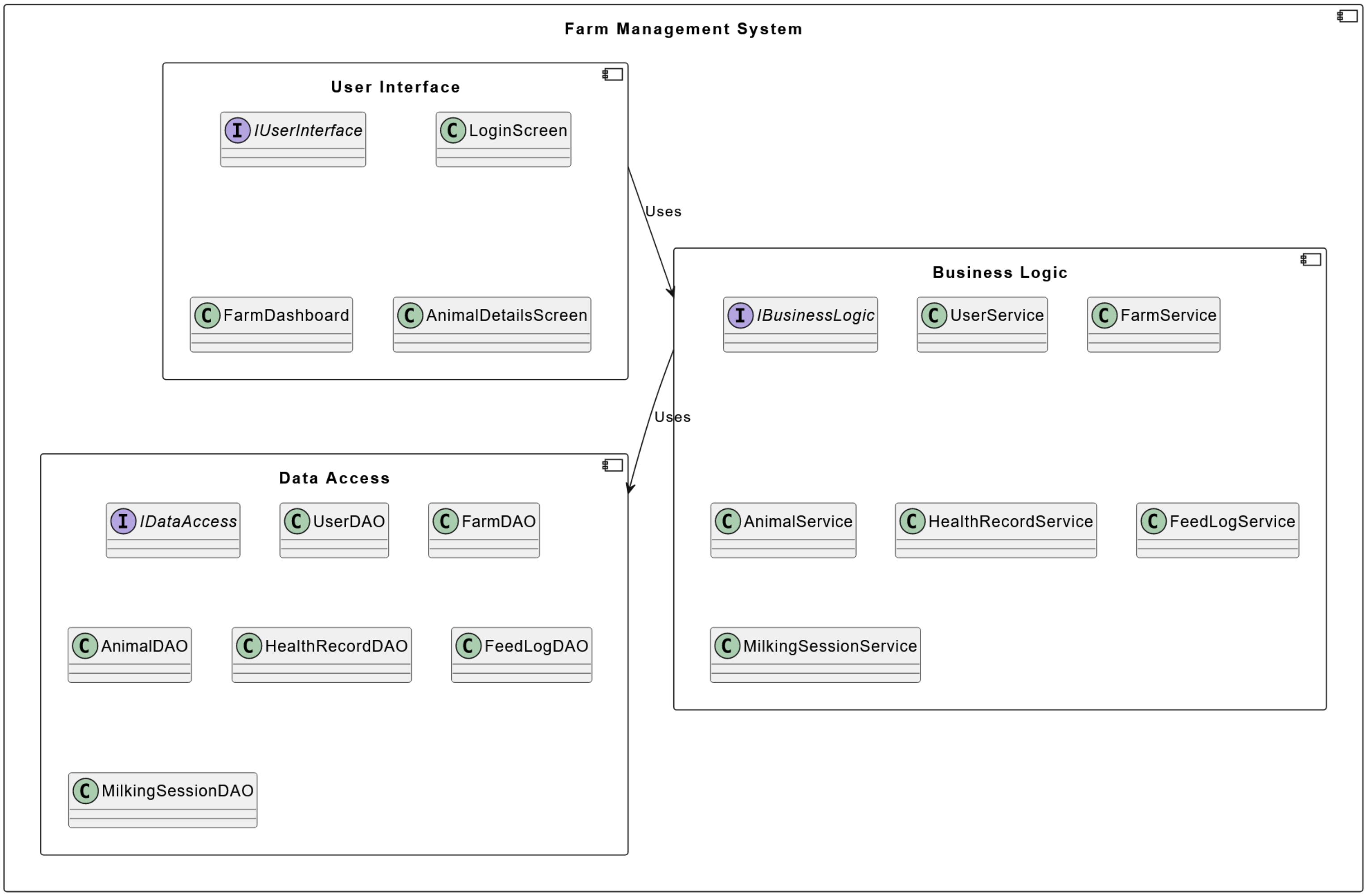


4 Software Architecture

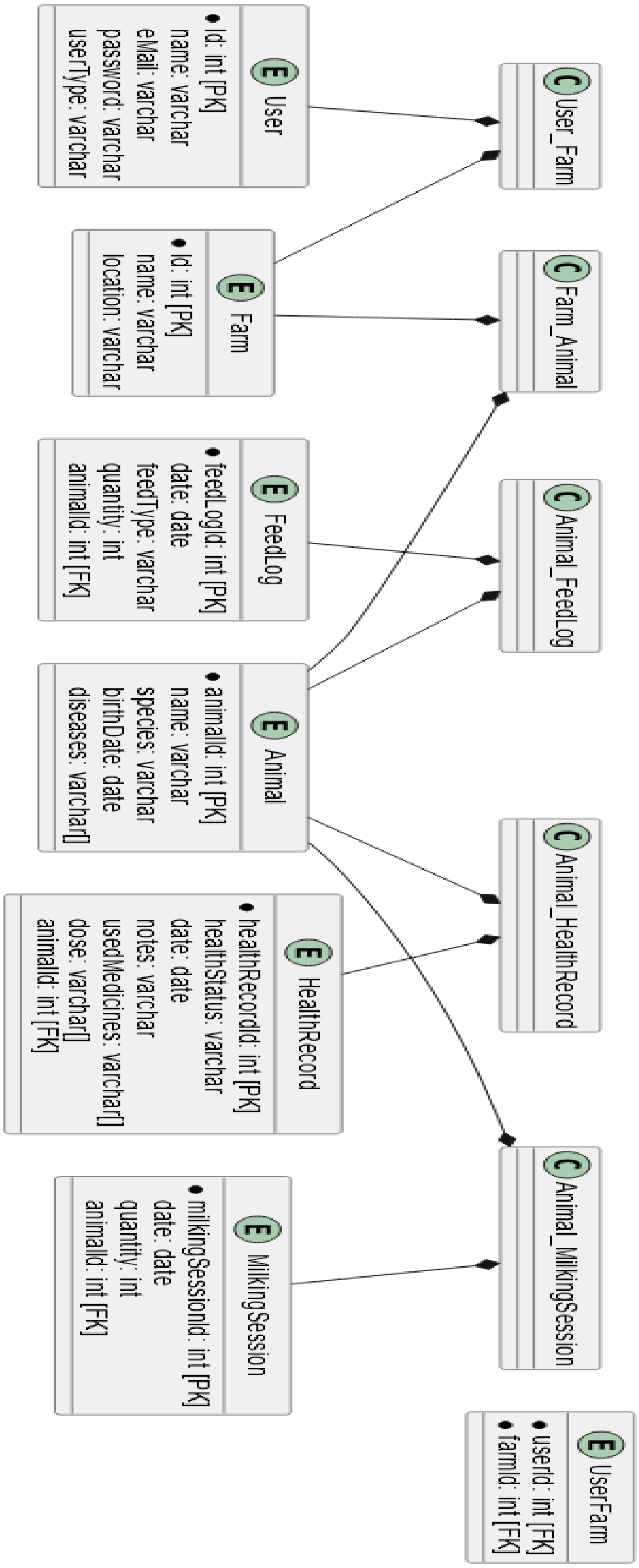
4.1 UML Package Diagram



4.1 UML Component Diagram



5. Entity Relationship Diagram



6 Glossary and References

1. Kumar, Garigipati & Jashuva, Pallikonda. (2021). SMART FARMING MANAGEMENT SYSTEM USING IOT. International Journal of Research in Science and Technology. 11. 10.37648/ijrst.v11i01.002.

2. G. B. N. Rao, K. V. Rao, R. Kamarajugadda, A. A. Reddy and P. P. Rani, "Smart Farming for Agriculture Management Using IOT," 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2023, pp. 540-544, doi: 10.1109/ICACCS57279.2023.10112839.