Software Requirements Specification & Analysis

for

Commercial Online Auction System

Version 1.0

October 24, 2022

Abbreviations	
IP	Internet Protocol
COAS	Commercial Online Auction System
SRS	Software Requirement Specification
API	Application Programming Interface
MAD	Modern Android Development
SMTP	Simple Mail Transfer Protocol
FTP	File Transfer Protocol
HTTP	Hypertext Transfer Protocol
TCP	Transmission Control Protocol
NF	Non-functional requirements
FR	Feature
WAN	Wide area network
LAN	Local area network
WEB	World Wide Web
DESC	Description
DEP	Dependency
RAT	Rationality
APK	Android Package Kit
ADK	Android Development Kit
SDK	Software Development Kit
AVD	Android Virtual Device
JDK	Java Development Kit

Contents

Introduction

1. Purpose

The commercial online web-based auction system is a popular system nowadays. This requirement analysis introduces and highlights best practices for analyzing and designing an online web-based and mobile-based auction system. The proposed Commercial Online Auction System (COAS) is a web-based and mobile-based application to help users buy or sell their goods. They can trade whatever they want by posting an advert. This application allows users to show their goods for auction. Auctioners can register and bid on any available goods. There are some existing applications that allow users to auction, but the product is not available in your region, you cannot review the product you are going to buy. With the COAS, the user will be able to auction for the product available in his region.

This document is a requirements analysis for a COAS. The purpose of this document is to reveal the functions, components, and rules on which our COAS will be built. The requirements analysis consists of seven separate sections: introduction, general description, external interface requirements, system specifications, non-functional system requirements, and system models. This document includes use case diagrams, an object model consisting of a class diagram, dynamic models, and state diagrams to demonstrate system functionality and sequence diagrams that show the flow of events for specific scenarios.

2. Product Scope

We will design the user interface and system functionality for our COAS. The system will consist of three stakeholders. The stakeholders are Bidders, Sellers, and Admin. The seller is the one that runs the auction and is one that set the starting price of the product. The seller is someone who initiates an auction for goods. It is they who determine the features of the auction. The bidder is the one that makes an offer for a good or service. The admin is the someone who runs the system, manages the product, verify posts, edits user information, edits auction details, etc. Full authorization will be give to the admin.

Online auction systems have already achieved great success in the market. However, most of them do not run in real-time or do not provide the user with enough up-to-date information to simulate a real-time auction. Our COAS will provide the sellers and bidders with up-to-date information on the status of the Auction in real-time. Our system also gives the auctioneer a wide variety of options for how the auction will be run.

This system will work on the internet due to the dynamic nature of the internet and everyone will be able to access it from smart phones, computers, personal digital assistants and many other digital devices. This is a proposed plan that the system will serve many people in the country and will reach the whole world in the future.

Overall Description

3. Product Perspective

COAS is structured around the concept of an sellers. The admin acts as the referee between the sellers and the bidder particapant for the auction site. When an auction is created, the sellers conducts the auction according to specifications defined by the sellers. When a bidder makes a bid, the sellers receives the bid and determines whether the bid is acceptable. If the bid is acceptable and better than the previous best bid, the system notifies the sellers and bidders that a new best bid is available and what that bid is. The bidder is also notified when they already have the best bid. If the offer is not accepted, only the bidder is informed and the status of the auction is not changed.- At the end of the auction, all parties are informed that the auction has ended and they are told who has won. The sellers will also contact the winning bidder and the auctioneer with information on how the transaction will be settled, via their preferred contact method.

4. Product Functions

3 stakeholders (Admin, Bidder and Seller) will be interacting with the proposed system; each one can do the following:

1. Admin
    - Admin can manage products
    - Admin can manage users

- Admin can manage auction
- Admin can create reports

2. Bidder
    - Bidder can search for a product
    - Bidder can view product details
    - Bidder can modify bid amount
    - Bidder can make a bid for a product
    - Bidder can edit profile information

3. Seller
    - Seller can post a product
    - Seller can specify time and price of the bidding
    - Seller can view bidding information
    - Seller can edit profile information

5. User Types and Characteristics

There are three types of users interacting with the system as described above. Each of these three types of users has a different use of the system, so each has its own requirements. We have two types of users: sellers and bidders. Sellers can also be bidders, bidders can also be sellers. Bidders can search for products from the sites or application by using the filter options, and by doing this, they can find the advertisement that matchs their criteria. Seller needs to fill out the form to post new listing, so seller needs to provide information about the type of production and this form may vary with their product and seller has to submit multiple images for the product. Thus, the advertisement will run successfully after the admin approves the request of advertisement.

6. Operating Environment

The server-side components of the software system must operate within a Windows operating system environment. Operating environment for the COAS is as listed below.

Database:

Microsoft SQL Server, Sqlite for Android

Operating Systems:
Windows, Android OS

platform: 1. Backend - .NET/ Multi layered architecture
2. Mobile Application - Android/Kotlin / Clean architecture

7. Design and Implementation Constraints

Design constraints will described in detail later. Implementation constraints described below:

1.Language – C#/ Kotlin
2. Framework/Library - .NET CORE/ ASP.NET CORE/ Android/ Android Jetpack Library

3. Database – MSSQL

4. Timescales – ≈12 month

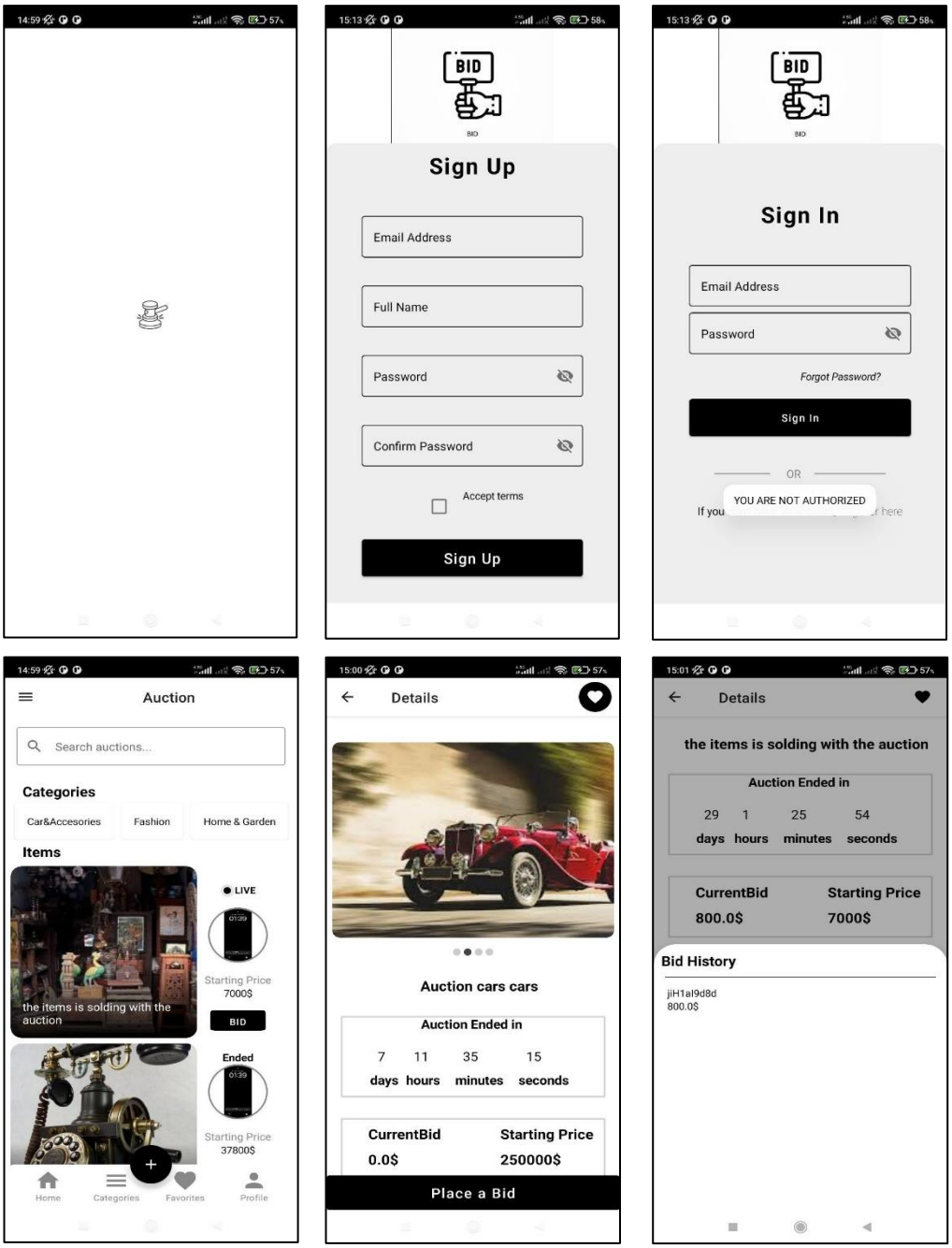
5. Bugfixing - Fix it as part of the ongoing work. If the bug is more difficult to fix, create a task within the relevant story.

8. User Documentation

The system will have customer service to contact the customer. Customer service will help users solve problems of both seller and bidder. Also, the system will have a manual explaining documentation how to use the system. Users can learn the system in about 15 minutes using short video tutorials.

External Interface Requirements

9. User Interface

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Art&Craft
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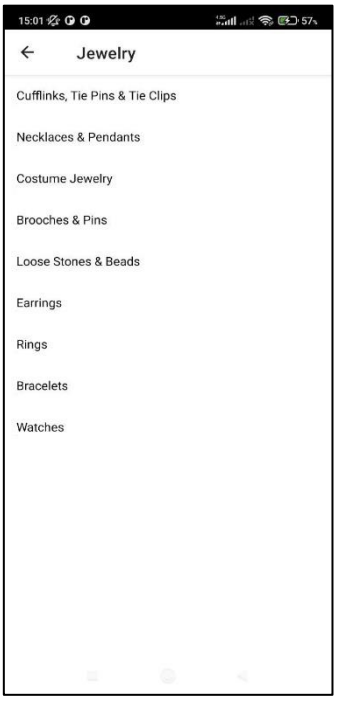
Fashion
Home & Ga...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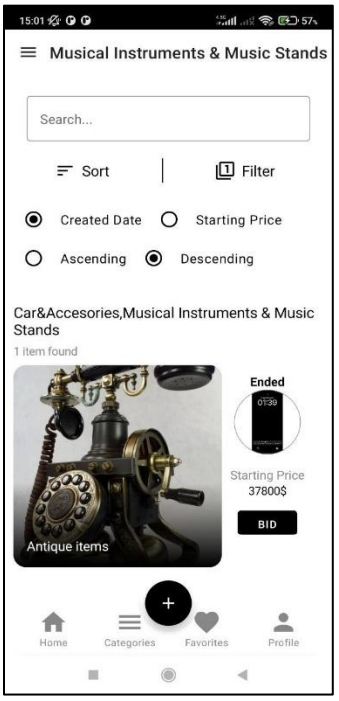
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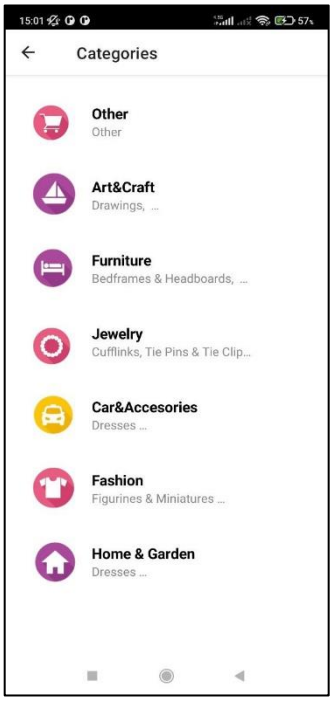
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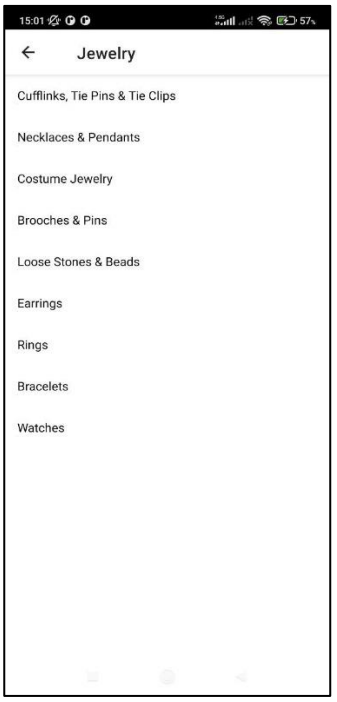
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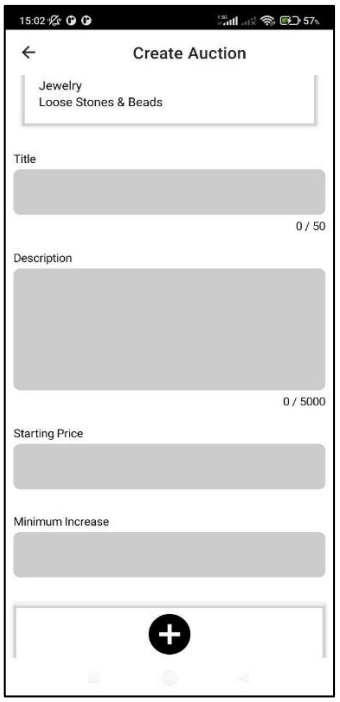
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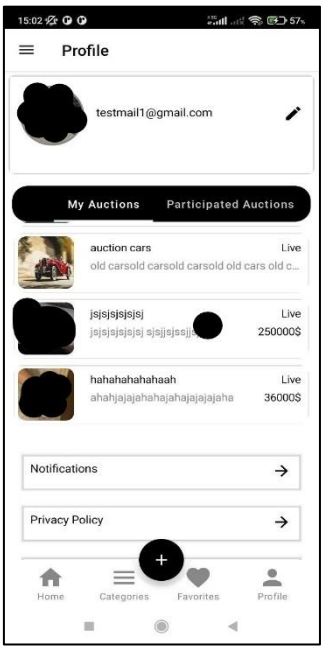
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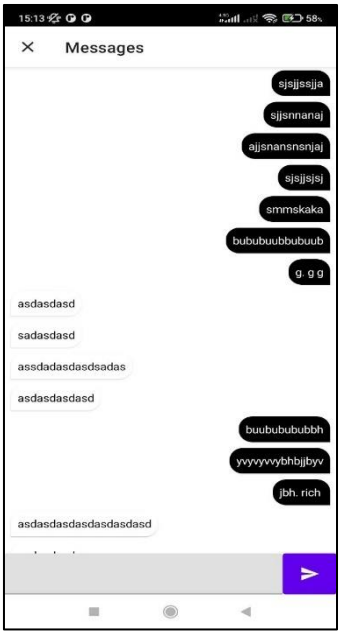
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10. Hardware Interfaces

This system will work as a website and mobile application. For the current situation, it will only be published on the android platform as native. Of course, IOS application can be developed for the future. This is the best option for now, as the Android operating system uses more platforms than IOS. Since the application must run over the internet, all the hardware shall require to connect internet will be hardware interface for the system. As for e.g. Modem, WAN – LAN, Ethernet Cross-Cable. No other hardware is required.

11. Software Interfaces

For the mobile application, it will only need an Android version 4.0 or higher in order to perform. For the web-based application, it only need desired browser and operating system.

12. Communications Interfaces

Since the application is a web-based application, we will create a Web API to communicate with the database. And we will use the HTTP protocol for client and server communication. We will use the SMTP protocol for the e-mail service and we will need the FTP protocol for file exchange. Our backen

will do simple CRUD operations. The mobile application will also use the Web API to communicate withthe database.

System Features

The use case diagram is a visualization of a use-case the auction system interaction with the users. In the proposed COAS the use case mainly consists of register case, post product case, search product case, make a bid for product case, view product details case, edit profile information case, view bidding history case, specify time and price of bidding. Seller and Bidder can do different action in the system. Figure 5 shows the use case diagram for the actions that the actors (Sellers, Bidders and Admin) can perform in an auction

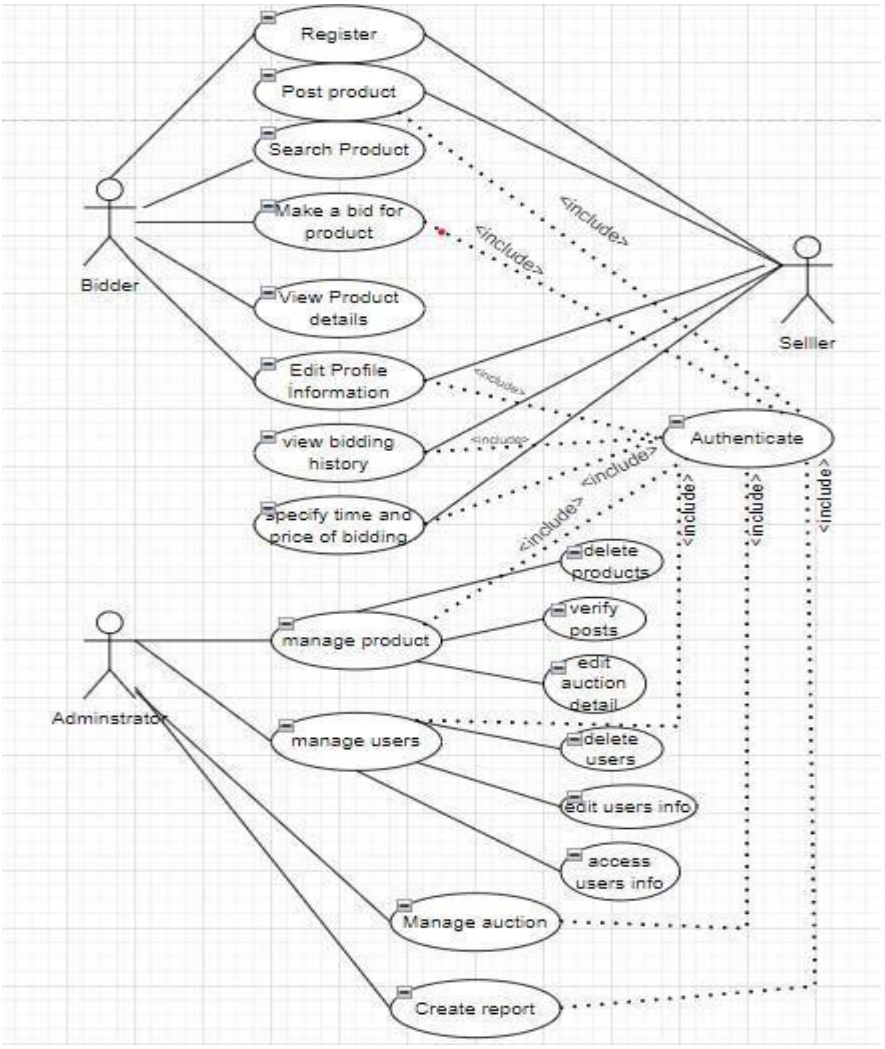

Figure 5: Use-case diagram of the online auction syst

13. Use Case

1.13.1.1. Description and Priority

1. Manage products(9 points)
2. Manage users(7 points)
3. Create reports(5 points)
4. Manage auction(3 points)

1.13.1.2. Stimulus/Response Sequences

1. Register new admin
2. Manage users
3. Manage products
4. Create reports
5. Manage auctions

1.13.1.3. Functional Requirements

ID: FR1
TITLE: Manage products
DESC: The admin can ability to manage, verify products or posts.
RAT: In order for prevent fraud and make a trustworthy environment.
DEP: None

ID: FR2
TITLE: Manage users
DESC: Users' e-mail and phone numbers cannot be changeable by users. If the user needs to change their contact information, they must notify the administrator.
RAT: In order for a seller to more accurately communicate with bidders.
DEP: None

ID: FR3
TITLE: Register new admin
DESC: The administrator can register a new administrator with the same privileges to the system.
RAT: It is necessary to know who made the changes.
DEP: None

ID: FR4
TITLE: Create reports
DESC: The administrator should be able to generate reports about each auction or all auctions from the system.
RAT: It is necessary to monitor the system
DEP: FR1

ID: FR5
TITLE: Manage auction
DESC: The administrator can manage auctions such as editing product details, changing the starting price, informing the user about the product via the comment section.

RAT: In order to prevent fraud
DEP: FR1

1.13.2 Seller

Register - Seller must be register from the system in order to post a product and create a auction. User need to submit first name, last name, phone number, home address, e -mail, and picture.

Post product - In order to create an auction, the seller must create an auction with the desired product. For this reason, the user is required to provide detailed information about the product and it is mandatory. Product details may vary according to different categories, the user must fill this entry in detail and in accordance with the purpose, and the user must give the starting price here.

Edit profile information - The user can update their profile information, but this does not include email and phone number. Because the phone number and e-mail can only be changeable by the admin. This allows both the seller and the bidders to communicate comfortably with each other.

View bidding history - The seller must view the offer history. Because the seller needs to know the history and which offer he accepted. In addition, the system automatically selects the best bid within the specified date.

Specified date and price of bidding - After the advertisement is published, the seller can change the specified date and starting price of the product. However, it is not published immediately, it is set to pending mode until the administrator verify the changes.

1.13.2.1. Description and Priority

1. Register(9 points)

2. Post product(9 points)

3. Edit profile information(5 points)

4. View bidding history(7 points)

5. Specified date and price of bidding(5 points)

1.13.2.2. Stimulus/Response Sequences

1. Register

2. Post product

3. Edit profile information

4. View bidding history

5. Specified date and price of bidding

1.13.2.3. Functional Requirements

ID: FR6
TITLE: Register
DESC: Seller must be register to publish post
RAT: Required for publishing post
DEP: None

ID: FR7
TITLE: Post product
DESC: The seller can create and start an auction with the desired product.
RAT: In order for a seller can create auction
DEP: FR6

ID: FR8
TITLE: Edit profile information

DESC: The seller can change the basic user information.
RAT: In order for correct mistakes
DEP: FR6

ID: FR9
TITLE: View bidding history
DESC: Seller can track the bidding progress
RAT: It is necessary to seller know progress of auction
DEP: FR7

ID: FR10
TITLE: Specified date and price of bidding
DESC: The seller can change the starting price and expiry date of the item being auctioned.
RAT: In order to the auction to arrange correctly.
DEP: FR7

1.13.3 Bidder

Register - In order for the bidder to bid on the auction product, it is necessary to register in the system. User needs to submit first name, last name, phone number, home address, email address and picture.

Search product - Bidders can search for auctions. The bidder can select criteria to track open auctions using the filter option. Bidders can also follow the closed auction to have knowledge auction of the product.

Make a bid for product - In order to participate in the auction, the bidders must submit a bid. In addition, bidders can monitor the progress of the auction.

Edit profile information - The user can update their profile information, but this does not include email and phone number. Because the phone number and e-mail can only be changeable by the admin. This allows both the seller and the bidders to communicate comfortably with each other.

1.13.3.1. Description and Priority

1. Register(9 points)

2. Search product(9 points)

3. Edit profile information(5 points)

4. Make a bid for product(8 points)

1.13.3.2. Stimulus/Response Sequences

1. Register

2. Search product

3. Edit profile information

4. Make a bid for product

1.13.3.3. Functional Requirements

ID: FR11
TITLE: Register
DESC: Bidders must be register to give offer
RAT: In order for give offer
DEP: None

ID: FR12
TITLE: Search product

DESC: The bidders can search products with their criteria
RAT: In order for the bidders and seller can find each other
DEP: FR11

ID: FR13
TITLE: Edit profile information
DESC: The bidders can change the basic user information.
RAT: In order for correct mistakes
DEP: FR11

ID: FR14
TITLE: Make a bid for product
DESC: Bidders can give offer about the product.
RAT:In order to seller can sell product and bidder can buy product
DEP: FR11

Nonfunctional System Requirements

14. Performance Requirements

The COAS for online auction management system should have the following abilities and capabilities.

ID: NF1
TAG: Verify posts <=1 hour
ID: FR1
TITLE: Manage Products
GIST: The time of the verifying post
SCALE: The time of a completeness of veryfing post
METER: Admins delegation should have the ability to verify post in 1 work hour.
MUST: No more than 1 hour
WISH: No more than 45 minutes

ID: NF2
TAG: Creating report <= 30 minutes
ID: FR4
TITLE: Generating report
GIST: The fastness of the generating system report
SCALE: The response time of generating report
METER: System report should generate in 30 minutes
MUST: No more than 30 minutes
WISH: No more than 20 minutes

ID: NF3
TAG: Register <= 3 seconds
ID: FR6, FR11
TITLE: Register
GIST: The fastness of the register after user submit user information
SCALE: The response time of completing register
METER: API need to be response in 2 seconds
MUST: No more than 3 seconds
WISH: No more than 1 seconds

ID: NF4
TAG: Post product <= 5 seconds
ID: FR7
TITLE: Post product
GIST: The fastness of the posting product
SCALE: The response time of posting product
METER: API need to be response in 5 seconds
MUST: No more than 5 seconds
WISH: No more than 3 seconds

ID: NF5
TAG: Search product <= 5 seconds
ID: FR12
TITLE: Search product
GIST: The fastness of the refreshing search list
SCALE: The response time of refresh time
METER: API need to be response in 5 seconds
MUST: No more than 5 seconds
WISH: No more than 3 seconds

ID: NF6
TAG: Specified time and price of bidding <= 1 hour
ID: FR12
TITLE: Update product details
GIST: The fastness of the updating product details
SCALE: The response time of updating product details
METER: Admins delegation need to verify changes less than 1 hour
MUST: No more than 1 hour
WISH: No more than 45 minutes

15. Safety Requirements

To satisfy legal requirements, we will have a Terms of Service that users of the system must agree to during registration before they can use the system. If the Terms of Service changes, the user of the system will be required to agree to them again at login.

Administrator need ability to control an auction. This will allow the administrators to remove auctions as well as users that are deemed inappropriate such as pet auction.

16. Security Requirements

The proposed COAS should have the following security requirements:

- Users' sensitive information, such as passwords, must be encrypted
- Admin needs full authority control
- It is planning to integrate intrusion detection tools with system, such as anti-malware, anti-denial, etc
- The website will provide users with a secure login option to prevent unauthorized access to the system and information
- The website will always provide valid information to users.

17. Software Quality Attributes

The system should have the following qualities:

Responsive - There are cases where it slows down, hangs, or freezes for significant periods of time, or takes too long to process input. In such cases, the proposed COAS will create a child thread or giving the user the option to terminate the process. These things allow to keep the main thread running or to conclude that the system.

Availability - The proposed COAS should be always available to users. However, there are times when the system must be down. It's hard to say when the system will down which time period. For this reason, after the system takes its place in the market, it is necessary to take into account the user traffic and calculate the time period with low traffic. After these conclusions, we can consider these time periods and find this time period accordingly.

Testability, Maintainability - Testability of requirements is an important concept when designing tests that ensure all requirements are met and match the specification. The most important thing in testing and maintenance is to obey with software architecture principles. And the system will comply with these rules in both the web-based system and the mobile-based system.

18. Business Rules

It has been determined that there is the possibility of an auction ending with no winner. This can happen if the open auction is not met or if the auction ends with no bids being made, either through reaching the end time or through inactivity for longer than the length of the "dead-time". Then all bidders and the creator will be notified that there is no winner.

The auction can be in two different modes, "Open" and "Closed". In an "Open" auction, a minimum or maximum price must be met for a sale to be completed. If this price is not met, the seller will not sell the product. If the auction is a "Closed" auction, the best bidder wins when the auction ends, regardless of the bid amount. However, the bid amount must be greater than the starting price of the product.

The system keeps track of all users and the two best bidders to determine the winner of the auction. If the primary best bidder is disqualified, the second best bidder will be the winner. If someone wins the auction, all active bidders, including the winner and the auctioneer, are notified. The auction site will be notified of the end of the auction and the winning price. A notification will appear on the bidder' s screen informing you that the auction has ended and who has won. If the auction ends without a winner, all parties will be informed about it.

In order to bid, a user of the system must join an auction. This can be before or after an auction has started. A list of current and future auctions will be provided after the user logs into the auction site. The user can select any auction and choose to join that auction. If a user creates an auction, they can join it to monitor the status. However, they will not be allowed to bid.

Other Requirements

The system doesn't care about the end of the auctions. When the auction is over, the expected and normal behavior of users is to contact their phone number or email address. The seller and the winning bidder must meet physically. And the winning bidder must buy the product and the seller must sell the product. Apart from normal behavior, users can report to the administrator with their proven documentation. Admin must respond to this report within 3 days. If the report is not correct, nothing will happen. If the report is correct, the complained user is disqualified from the system.

System Models

19. System Context

A system to be developed almost does not stand on its own, it is connected with its environment. Thus, COAS will also connected to some environments. This environment is described below:

1. From the above conversations, proposed COAS needs admin panel to have full authority on the system. Thus, COAS will be connected to the Admin Panel, which will be developed by us.

2. COAS will report on auctions as described above. COAS will be connected to the reporting system.

3. COAS needs to inform users about some conditions described above, so we need email service.

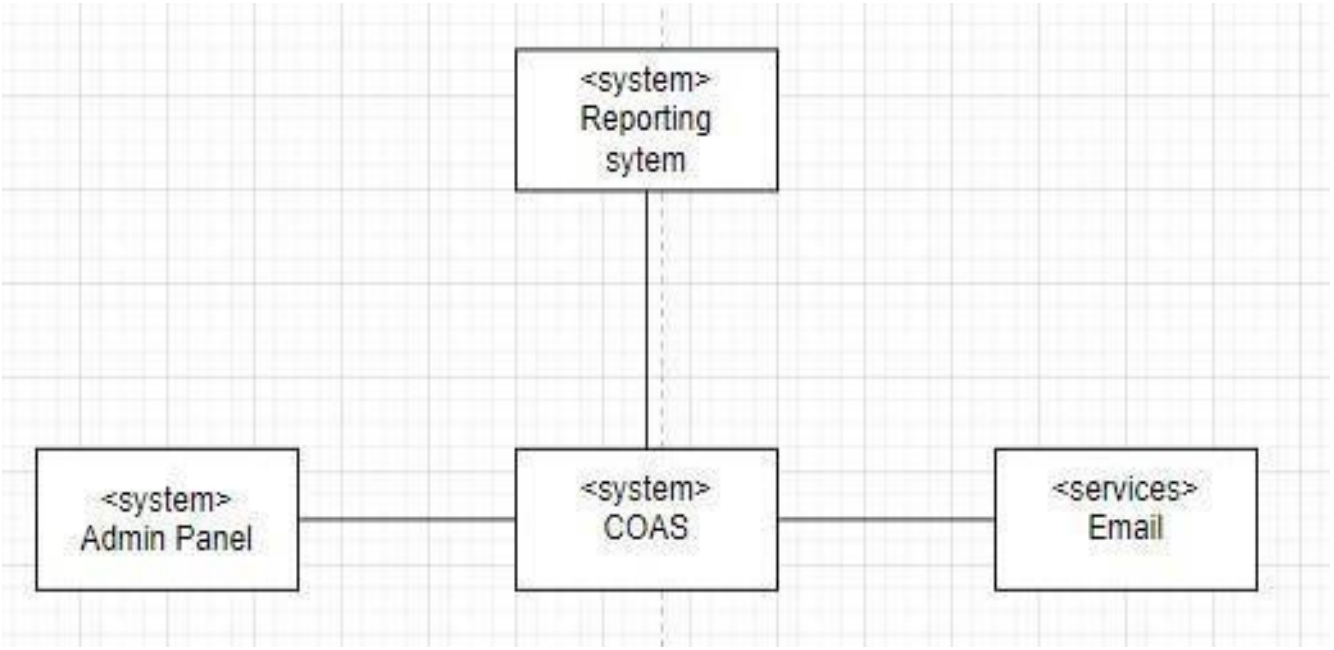

Figure 6: System context of the COAS

Interaction Models

Use-Case Models

1.19.1.1. COAS: Sellers' operations

	COAS: Sellers
Actors	Seller
Description	In order to become a seller, it is necessary to register in the system. After that, the seller can post, provide detailed information about products, view offer history and edit basic user information.
Data	
Stimulus	User command issued by medical receptionist
Response	Confirmation that PRS has been updated
Comments	The receptionist must have appropriate security permissions to access the patient information and the PRS.

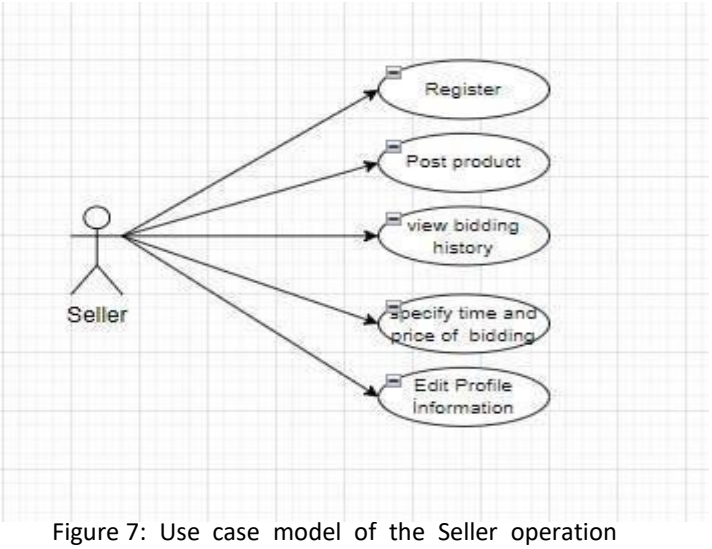

Figure 7: Use case model of the Seller operation

1.19.1.2. COAS: Bidders operations

COAS: Bidder operations

Actors	Bidders
Description	In order to be a candidate, it is necessary to register in the system. The bidder can then search for products, view product details, bid and edit profile information. And at the end of the auction, the highest bidder wins and gets the item.
Data	Sellers' information, auction information, product details, bidders' information
Stimulus	Bid amount by bidders
Response	Successful registration, publishing posts, sell products, and errors
Comments	Sellers should provide detailed information about the product detail as much as possible. Otherwise, the lack of information about the product will be removed from the product list.

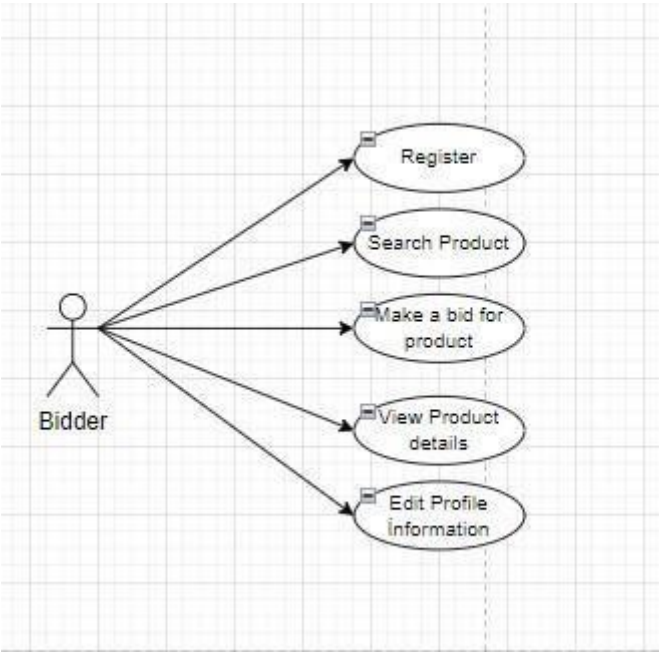

Figure 8: Use case model of the bidder operation

7.1.1.3 COAS: Admin operation

COAS: Admin operations

Actors	Admin

Description	In order to become a seller, it is necessary to register in Admin can manage products, manage users, manage auctions, create reports.
Data	All users information, auctions information, reports
Stimulus	Seller and bidders activity
Response	Seller and bidders actions
Comments	Admin delegation have the full authority on the system.

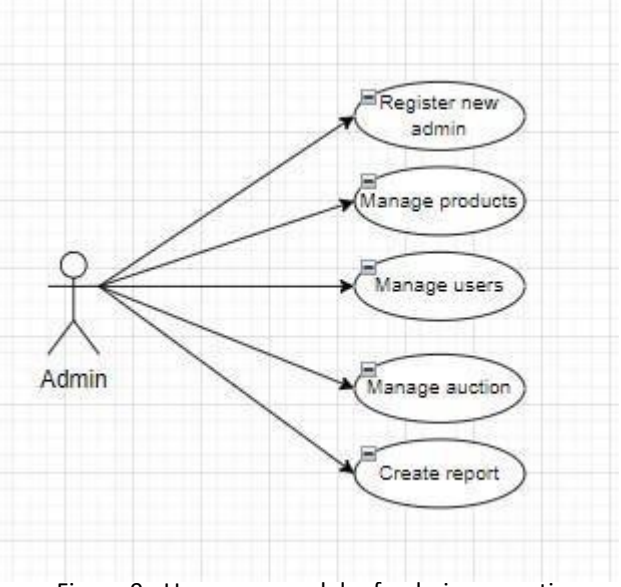

Figure 9: Use case model of admin operation

7.1.1.3 COAS: Activity of the system

COAS: Activity of the system

Actors	Admin, Seller, Bidder
Description	In order to become a seller, it is necessary to register in Admin can manage products, manage users, manage auctions, create reports.
Data	All users information, auctions information, reports
Stimulus	Seller and bidders activity
Response	Seller and bidders actions
Comments	Admin delegation have the full authority on the system.

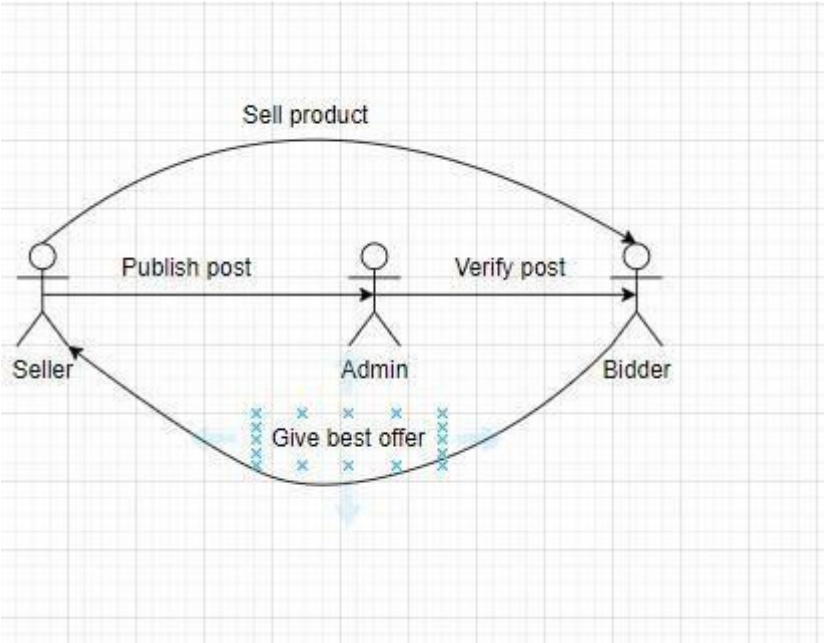

Figure 10: Use case model of the primary activity of the system

1.19.1.3. Log in to the COAS

Figure 11 shows what happens when a user attempts to log in to the auction site, successful and fail cases.
1. The User (user can be bidder or seller) connects to the system
2. The COAS requests user to login, and requests username and password, confirms terms of service(as described above in detail)
3. The User accepts and submits information
4. The COAS requests verification of username and password from DB
5. DB signals to the system that the User is valid or invalid(2 alternatives)
6. If correct user direct to the home page
6. Otherwise, "Invalid username or password" message displayed to User

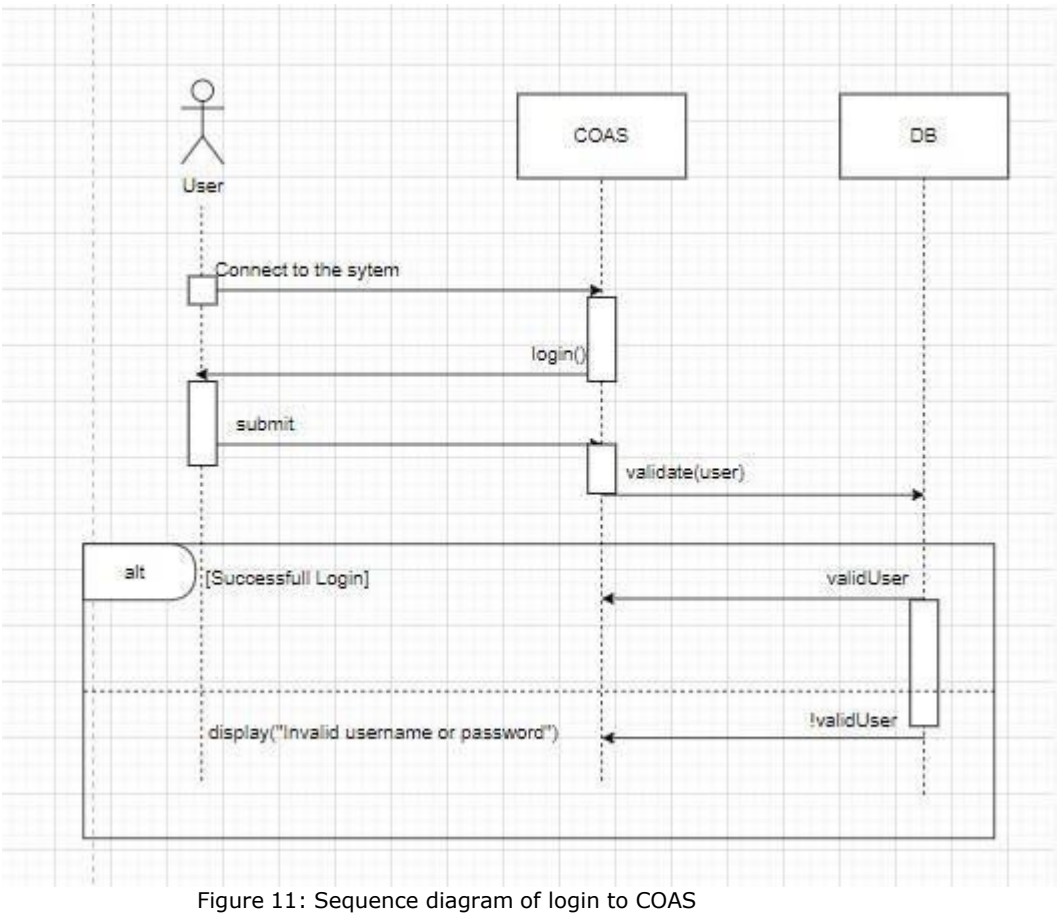

Figure 11: Sequence diagram of login to COAS

7.1.1.4 Joining auction

Figure 12 shows what happens when a bidder joins an auction and give offer to product.
1. The User connects to the COAS
2. The COAS requests user to login, and requests username and password with the login() method
3.The User accepts terms of service and submits information
4.The COAS requests verification of username and password from DB
5.DB signals the Auction Site that the User is valid (validUser)
6. The COAS displays a list of auctions
7. The bidder Selects an Auction to join, and joins the auction
8. COAS displays auction screen to bidder
9. Bidder Makes Bid and it is sent to Seller
10. Seller validates best offer via DB
11. DB signals to Seller that the it is best bid
12. Seller notifies the bidder of the best bid
13. Bidder requests to withdraw from the auction
14. Seller notifies the bidder that they are the current best bidder and that they are still responsible for purchasing the item if they remain the best bid when auction ends.

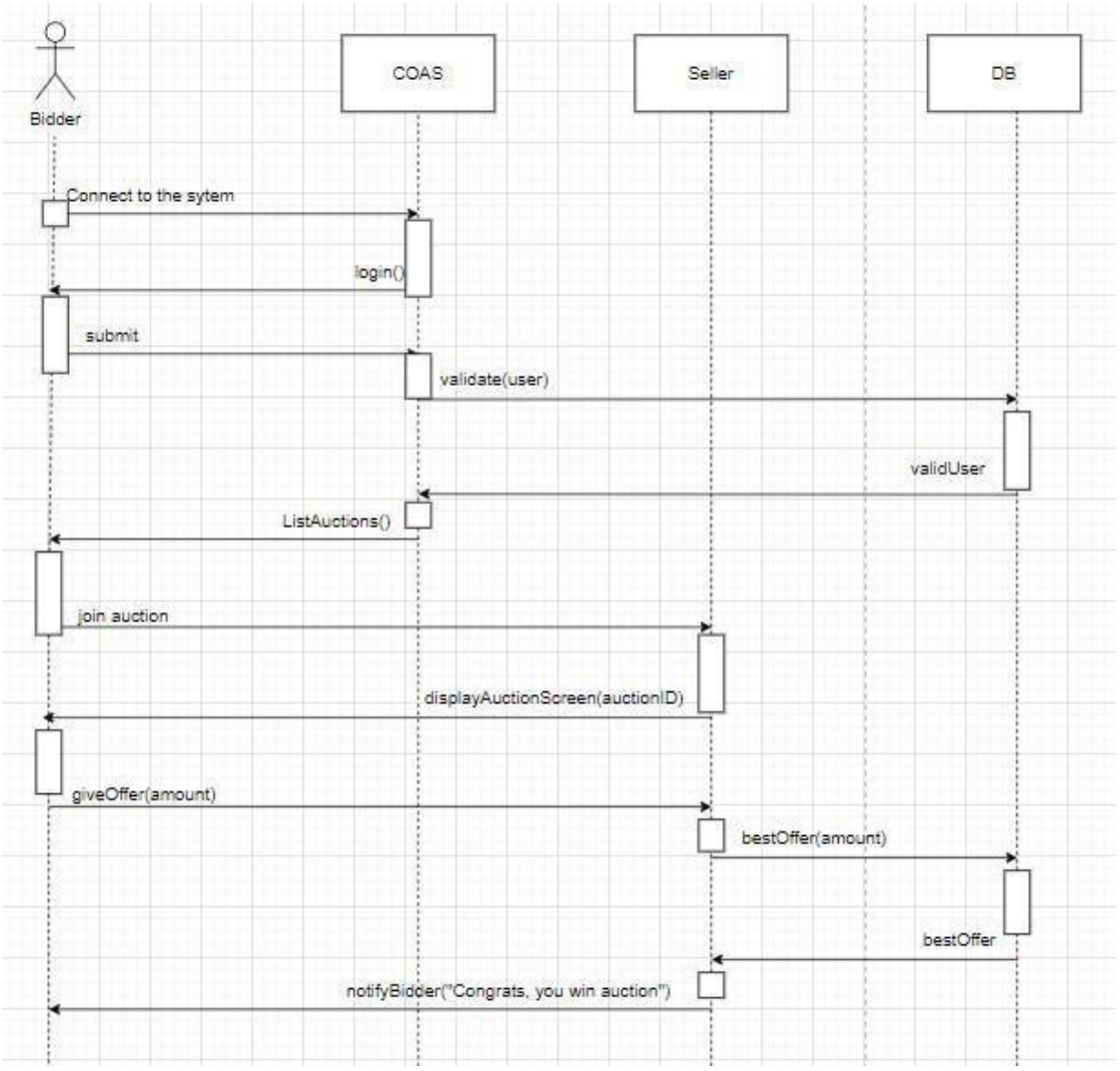

Figure 12: Sequence diagtam of the bidder give offer

7.1.1.5 Create Auction

Figure 13 shows what happens when a seller create an auction.

1. The User connects to the system
2. The COAS requests username and password with the Login() method
3. The Seller accepts terms of service and submits information
4. The COAS verifies username and password via DB
5. DB signals to Auction Site that User is valid (validUser)
6. The COAS displays the create auction button
7. The seller click create auction
8. The COAS requests for auction information(such as product details); displays the create Auction screen
9. The Seller submits the form
10. The COAS set auction to pending mode and sent to the admin
11. After admin verify post, it published
12. The seller give offer to the product
13. DB notifies Seller that the offer is not valid (seller can not give offer or buy own product).

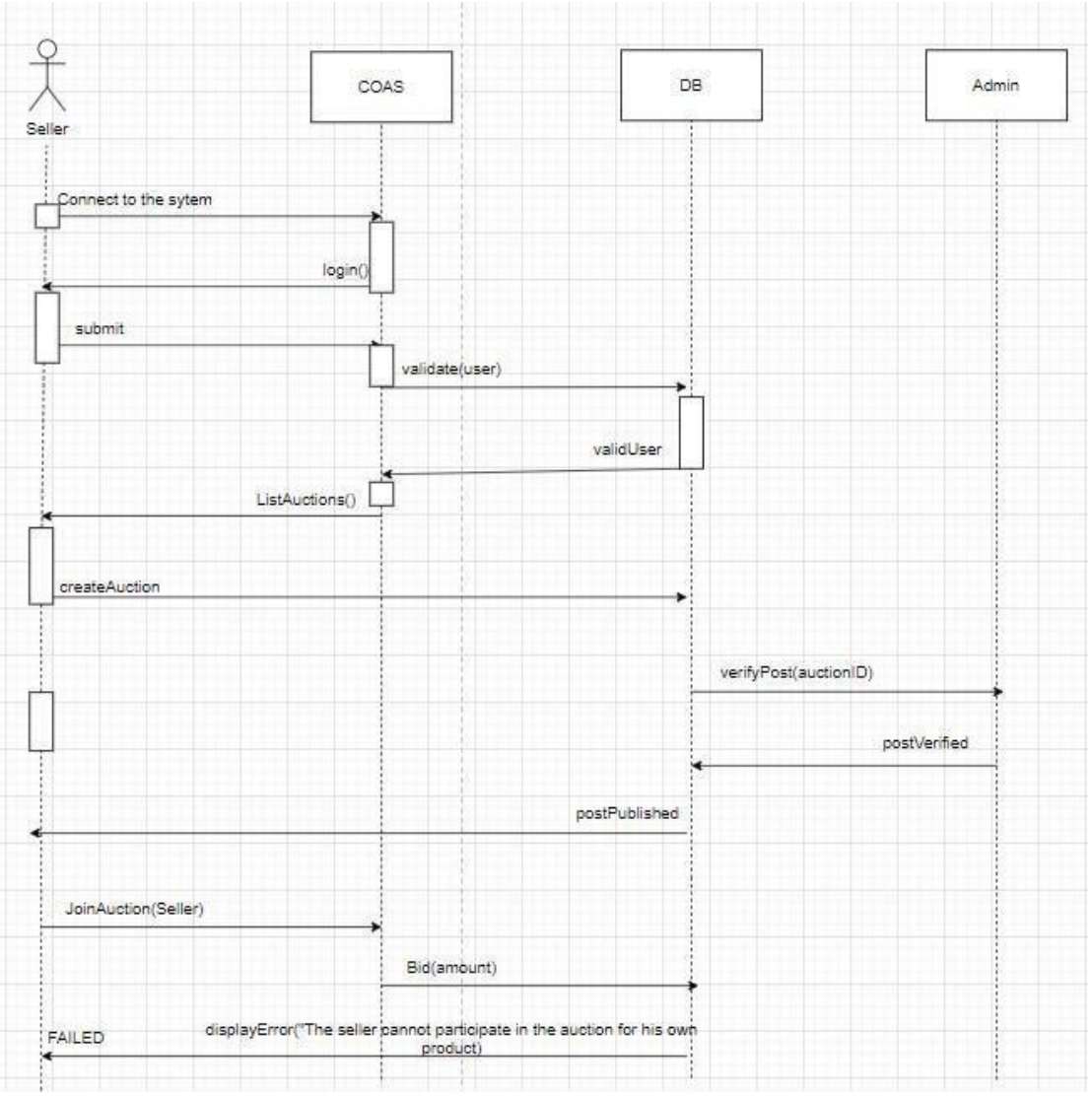

Figure 13: Sequence diagram of the creating auction and seller give offer on own product

20. Structural Models

Object and Class Model

Figure 14 shows the COAS entities, such as admin, product, bidder, seller, auction, and its relationships.

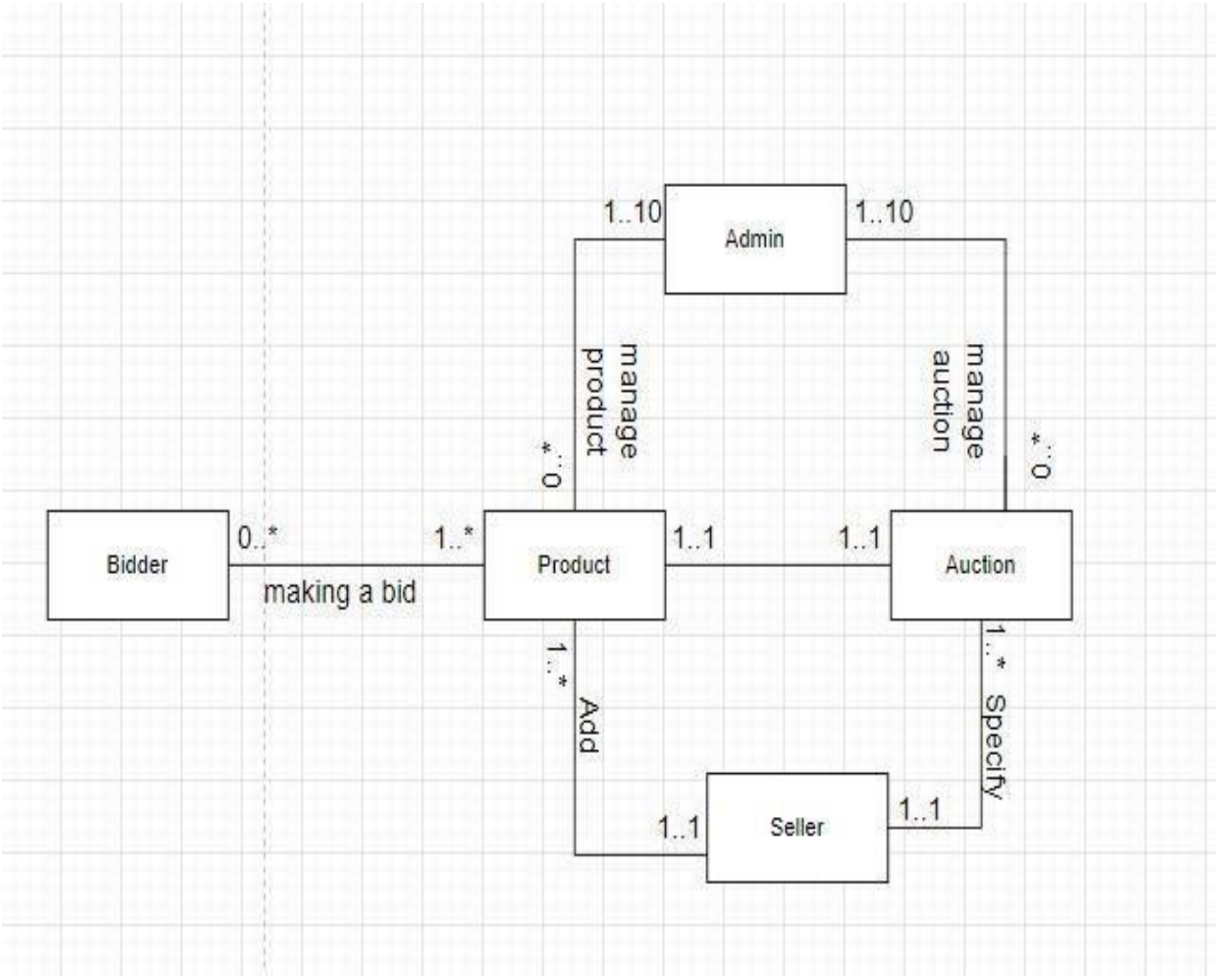

Figure 14: Object model of the COAS

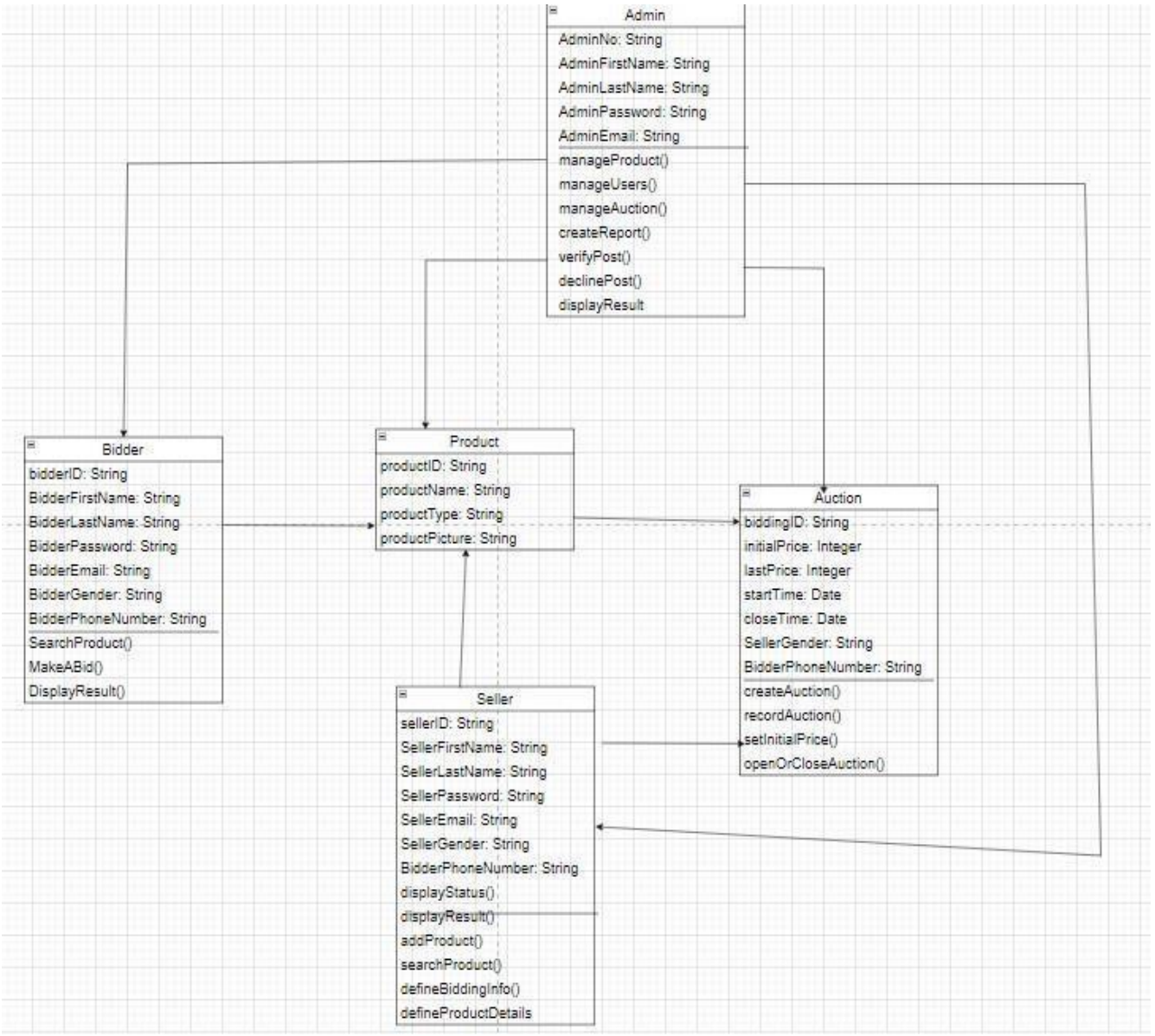

Figure 15: Class diagram of the COAS

1.20.1.1. Bidder Class

In the Bidder class, the class contains basic user information and contact information. And it has methods to perform the desired action.

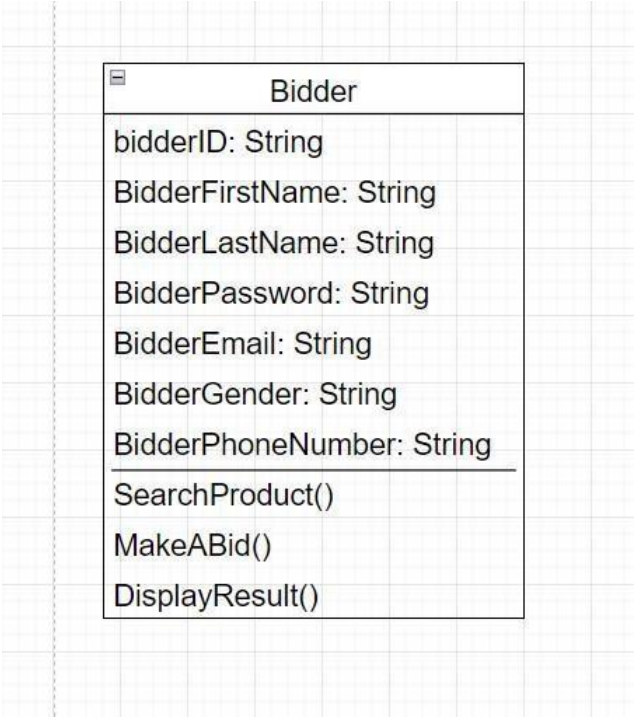

Figure 16: Bidder class

1.20.1.2. Seller class

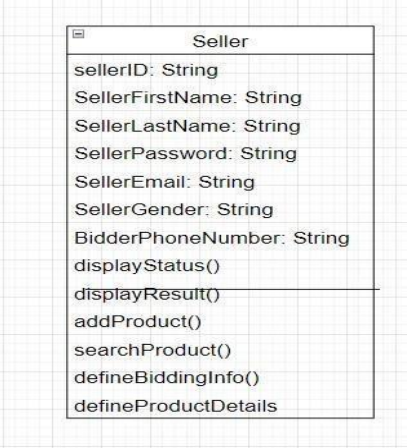

Figure 17: Seller class

21. Behavioral Models

Data Driven (Activity Diagrams / Sequence Diagrams)

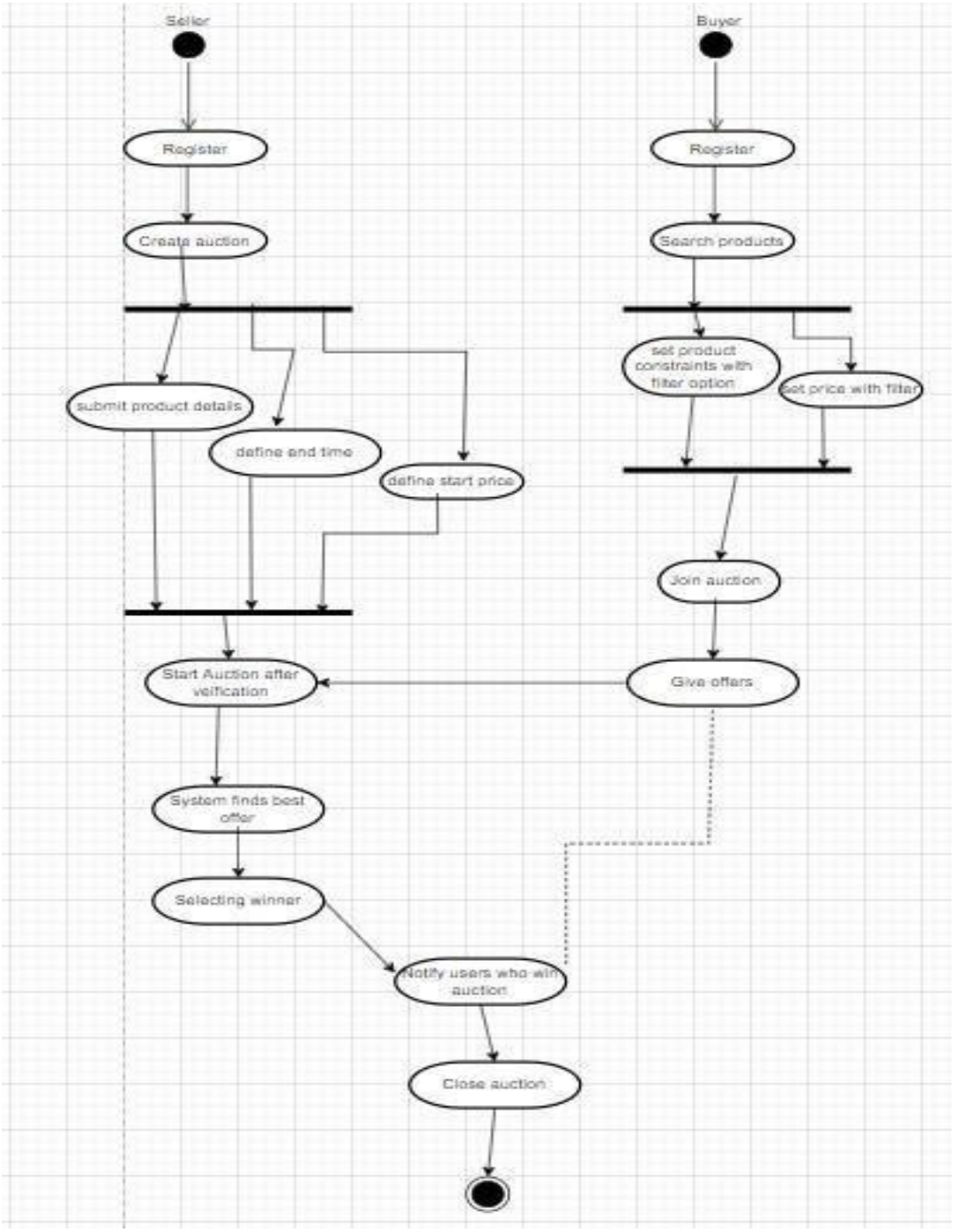

Figure 18: Activity diagram of the auction scenario

Data Driven (Sequence Diagrams)

1.21.1.1. Sequence diagram for order purchase

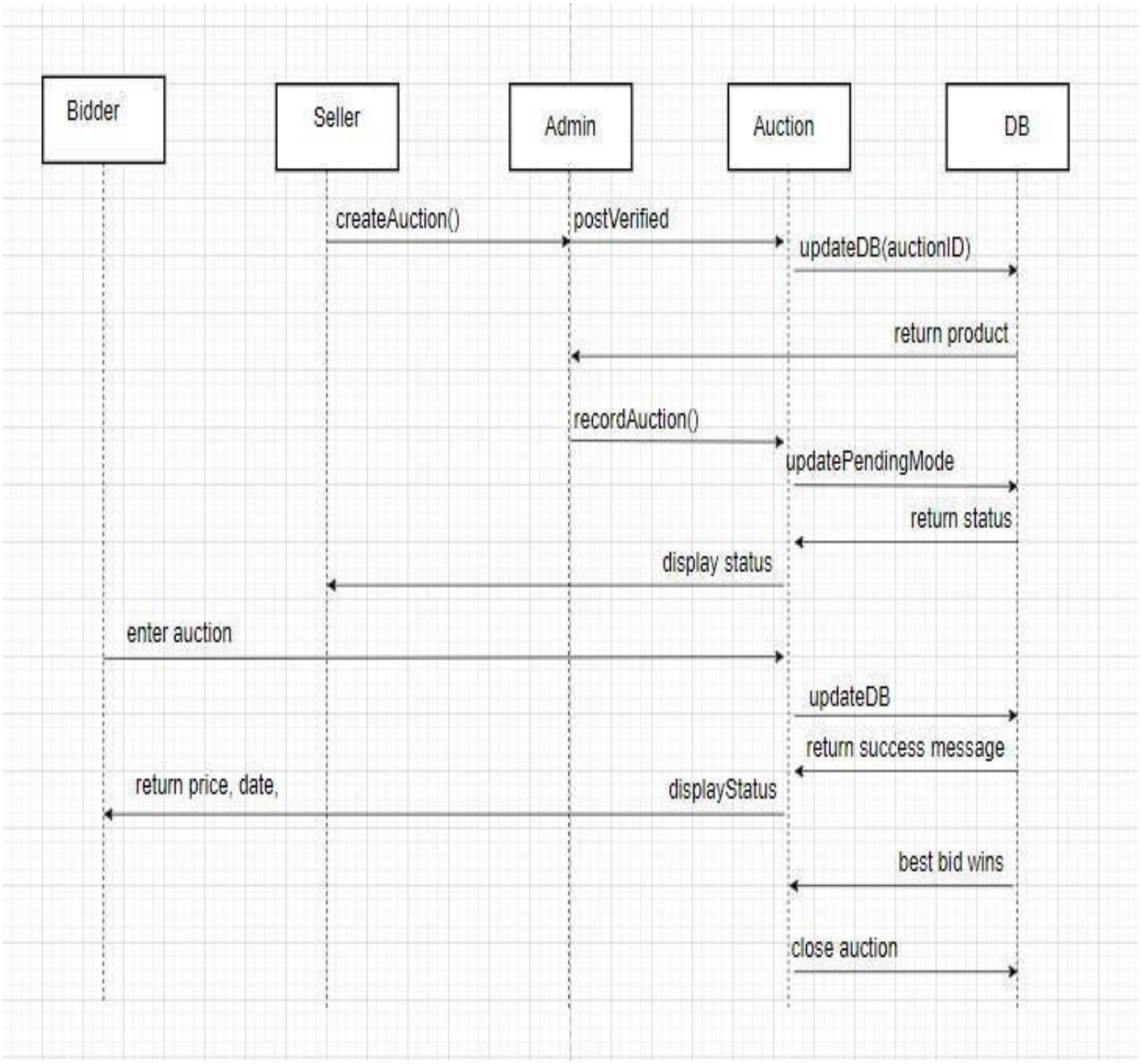

Figure 19: Sequence diagram of auction scenario

Event Driven Models (State Diagrams)

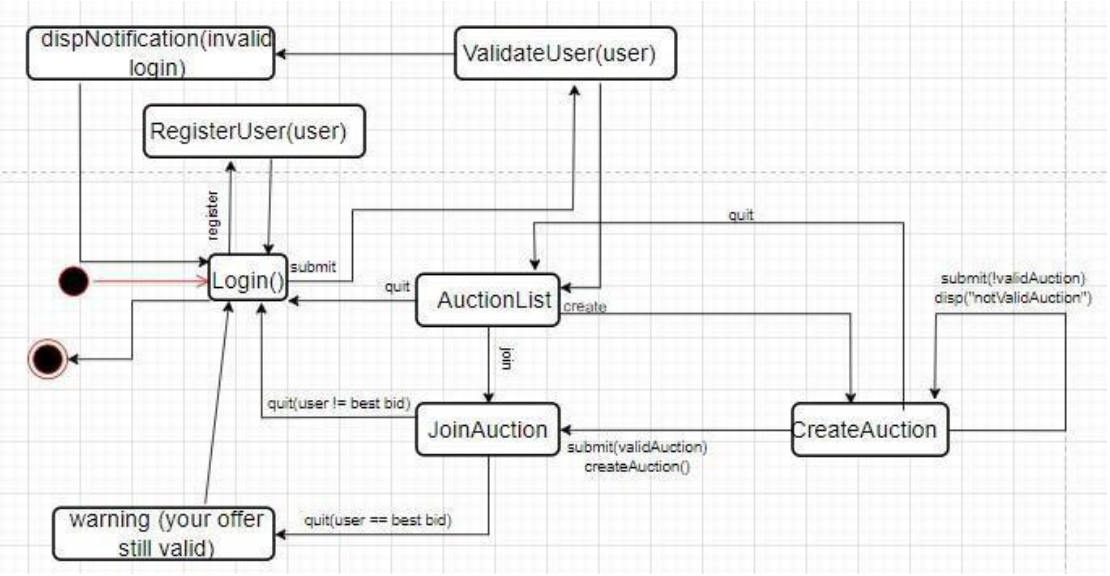

Figure 20: State diagram of the COAS scenario

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