Assignment #2 – Template

Software Requirements

Specification

Revision History

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1. Purpose

This document outlines the requirements for the Communication System Project (CSP)

1.1. Scope

This document will catalog the user, system, and hardware requirements for the Communications System Project. It will not, however, document how these requirements will be implemented.

1.2. Definitions, Acronyms, Abbreviations

CSP - Communications System Project

Complete definitions of terms and concepts are provided in Section 5 *Research Specification Document.*

- User - RS-001
- Administrator - RS-002
- Client - RS-003
- Server - RS-004
- Chatroom Manager - RS-005
- User Manager - RS-006
- Log Manager - RS-007
- Alternate Flow *x* (AF*x*) - RS-008

1.3. References

Section 6 *Use Case Specification Document*

Section 7 *UML Use Case Diagrams*

Section 8 *UML Class Diagrams*

Section 9 *UML Sequence Diagrams*

Group 7 Software Design Document

1.4. Overview

The CSP is the communication system for a large organization that enables users to communicate both directly and in chat rooms using text-based messages. Communication can occur both synchronously and asynchronously, with all messages being transmitted over the TCP/IP networking protocol. All messages will be logged for viewing by the administrators of the system, meaning that privacy between user messages will be minimized. Users will interact with the system through a user-friendly GUI and will retrieve their login credentials from the administrators of the system.

2. Overall Description

2.1. Product Perspective

2.2. Product Architecture

The system will be organized into 5 major modules: The Server/Client module, the User module, the Log module, the Chat module, and the GUI module.

2.3. Product Functionality/Features

The high-level features of the system are as follows (see section 3 of this document for more detailed requirements that address these features):

2.4. Constraints

2.4.1 Communications System can only be accessed by current employees of the company/organization.

2.4.2 The main server module is the only accessible server.

2.5. Assumptions and Dependencies

2.5.1 Users are given their username and passwords by the administrators of the large organizations.

2.5.2 It is assumed that the maximum number of users at a given time is x.

2.5.3 It is assumed that the User/Admin has access to an internet connection.

3. Specific Requirements

3.1. Functional Requirements

3.1.1. Common Requirements:

3.1.1.1 Users should have to authenticate themselves with the system before being able to use any functionality.

3.1.2. Server/Client Module Requirements:

3.1.2.1 The server must be able to handle multiple incoming connections from multiple clients

3.1.2.2 All messages should be sent over the TCP/IP protocol

3.1.2.3 The client and server must maintain both an inbound and outbound connection with each other.

3.1.2.4 The server should facilitate communication between all system components.

3.1.3. Users Module Requirements:

3.1.3.1 All Users should be allowed to log in using their issued username and password given by the administrator, with the password consisting of numbers only

3.1.3.2 All users should be able to log out from the communications system

3.1.3.3 Users can send text-based messages to other users asynchronously so that offline users can still receive and read the messages next time they log into the system.

3.1.3.4 Users should be able to send text-based messages to each other synchronously such that all involved users will receive the messages in order and not at different times

3.1.3.5 Users can create, join, and leave chat rooms for group chatting

3.1.3.6 The User Manager should be able to retrieve and store the data of all users.

3.1.3.7 Admins should be able to create, edit, and delete user accounts.

3.1.3.8 Admins should be able to access and read all logs from both direct messages between users and from chat rooms.

3.1.3.9 Users should be able to add other users to their chatroom

3.1.3.10 No additional Admin accounts can be created

3.1.4. Log Module Requirements:

3.1.4.1 All messages are to be logged and timestamped in a structured format.

3.1.4.2 All logged messages cannot be deleted or altered.

3.1.4.3 Admin has access to read from the log.

3.1.4.4 Each logged message will correspond to a specific Chatroom

3.1.4.5 The Log Manager should be able to retrieve and store log data.

3.1.5. Chat Module Requirements:

3.1.5.1 Messages between users will only be text-based.

3.1.5.2 Each Chatroom will be assigned an unique ID as an identifier.

3.1.5.3 Every Chatroom can contain multiple User members.

3.1.5.4 Once all members of a chatroom leave, a chat room is deleted.

3.1.5.5 Chatrooms should store and display a list of ordered messages sent in the chat.

3.2. External Interface Requirements

3.2.1 The format of the logs should consist of the messenger, the message itself, the chatroom ID, and the date (day/month/year/hour/minute)

3.2.2 The communications system should be accessible via a GUI interface such that first-time users should report minimal confusion navigating the system.

3.2.3 Users should be able to see all the chat rooms that they are associated with

3.2.4 Users should be given the option to create their own chat room through the interface

3.2.5 Users should be able to add other users to their chat rooms

3.2.6 Users should be able to see the names of all other Users

3.2.7 Users should be able to see all of their involved chatrooms

3.3. Internal Interface Requirements

3.3.1 The system must process a data-feed to retrieve and store a list of User objects. The information contained in each User object will be the authentication information, the message inbox from asynchronously sent messages, the User's unique ID, and the list of chat room IDs that the user is involved in.

3.3.2 The system must process control commands from both the client/server GUIs as well as from any internal modules.

3.3.3 The system must process a data-feed to retrieve and store a list of logs for every message.

3.3.4 The system must synchronize sent messages between all involved online users.

4. Non-Functional Requirements

4.1. Security and Privacy Requirements

4.1.1 User credentials consist of a username and a password that will be stored by the User Manager.

4.1.2 The User will verify their credentials by sending an authentication request to the User Manager.

4.1.3 The server must restrict access to certain data and functionalities based on whether the user is an Admin or a User.

4.2. Environmental Requirements

4.2.1 The server and client must run on two separate applications.

4.2.2 The server will take advantage of multi-threading to service clients.

4.3. Performance Requirements

4.3.1 Synchronous messaging must not have a delay of no more than 1 second between users.

4.3.2 The server must be able to handle an unlimited number of users without dropping any connections.

4.3.3 The system must respond to user commands within 2 seconds.

5. Requirements Specification Document

- **RS-001:** <u>User</u> - An individual who sends and receives messages within the CSP.
- **RS-002:** <u>Administrator</u> - A user with elevated permissions who manages users and oversees the system's operations.
- **RS-003:** <u>Client</u> - End-user application that interacts with the server to send and receive messages.
- **RS-004:** <u>Server</u> - Backend component that processes requests from clients; handles data storage and message delivery.
- **RS-005:** <u>Chatroom Manager</u> - Responsible for managing chatroom functionalities, including logging messages and maintaining chatroom state.
- **RS-006:** <u>User Manager (UM)</u> - Responsible for managing user accounts, including user retrieval, authentication, and permissions within the CSP.
- **RS-007:** <u>Log Manager</u> - Responsible for managing system logs, allowing Users to view and search through logs for monitoring and auditing purposes.
- **RS-008:** <u>Alternate Flow x (AFx)</u> - Alternate flows (numerically ordered) for use cases.

6. Use Case Specification Document

1. **Use Case ID:** UC-001
   Use Case Name: Asynchronous Message Delivery
   Relevant Requirements: RS-001, RS-002, RS-003, RS-005
   Primary Actor: User

Pre-conditions:

    a. User is logged in to the CSP.
    b. User has an active internet connection.
    c. User has at least one contact or group to message.

Post-conditions:

    a. The message is stored via Chatroom Manager.
    b. The recipient(s) are notified of the new message.
    c. The User can view the sent message.

Basic Flow or Main Scenario:

    a. The User selects a contact or group to send a message.
    b. User types the message in the input field.
    c. User sends the message by clicking "Enter".
    d. CSP processes the message and stores it via Chatroom Manager.
    e. System delivers the message to the recipient(s) asynchronously.

Extensions or Alternate Flows:

a. *Alternate Flow 1:* If the recipient is offline, CSP stores the message and is delivered when they come online.
b. *Alternate Flow 2:* If the message fails to be delivered, CSP logs the failure and notifies the User.

Exceptions:

a. If the message content exceeds the character limit, CSP displays an error message, and the User is prompted to shorten the message.
b. If CSP experiences an error during message delivery, the User is notified, and the message is not sent.

Related Use Cases:

    ● UC-002: Synchronous Message Delivery
    ● UC-007: Create Chat

2. **Use Case ID:** UC-002
   Use Case Name: Synchronous Message Delivery
   Relevant Requirements: RS-001, RS-002, RS-003, RS-005
   Primary Actor: User

Pre-conditions:

   a. User is logged in to the CSP.
   b. User has an active internet connection.
   c. User has at least one contact or group to message.

Post-conditions:

   a. The message is sent and received by the recipient in real-time.
   b. The recipient(s) are notified of the new message.
   c. The User can view the sent message.

Basic Flow or Main Scenario:

   a. The User selects a contact or group to send a message.
   b. User types the message in the input field.
   c. User sends the message by clicking "Enter".
   d. CSP immediately sends the message to the server.
   e. Server processes the message and delivers it to the intended recipient(s).
   f. The recipient(s) receive the message in real-time.

Extensions or Alternate Flows:

   a. *Alternate Flow 1:* If the message fails to be delivered, CSP logs the failure and notifies the User.

Exceptions:

   a. If the message content exceeds the character limit, CSP displays an error message, and the User is prompted to shorten the message.
   b. If CSP experiences an error during message delivery, the User is notified, and the message is not sent.

Related Use Cases:

   ● UC-001: Asynchronous Message Delivery
   ● UC-007: Create Chat

3. **Use Case ID:** UC-003
   Use Case Name: User Login
   Relevant Requirements: RS-003, RS-006
   Primary Actor: User, Administrator

Pre-conditions:

   a. The User or Administrator has a registered account.
   b. The User or Administrator is on the login page of the application.
   c. The User or Administrator has access to the internet.

Post-conditions:

   a. The User or Administrator is successfully logged in and granted access to the CSP.
   b. The CSP records the login event via User Manager.
   c. The User or Administrator can access their dashboard or main interface.

Basic Flow or Main Scenario:

   a. The User or Administrator navigates to the login page.
   b. The User or Administrator enters their username and password.
   c. The User or Administrator clicks the "Login" button.
   d. The CSP validates their credentials.
   e. If credentials are valid, the system grants access and redirects to the User dashboard.

Extensions or Alternate Flows:

   a. *Alternate Flow 1:* If the User forgets their password, they must verify their identity with an Administrator for a password reset.
   b. *Alternate Flow 2:* If the User or Administrator enters invalid credentials, the CSP displays an error message indicating invalid username and password and the User is prompted to re-enter their credentials.

Exceptions:

   a. If the CSP is experiencing downtime, the User or Administrator sees an error message indicating the service is temporarily unavailable and is encouraged to try again later.
   b. If the User or Administrator account is locked (e.g. due to too many failed login attempts), the CSP displays a message indicating the account is locked.

Related Use Cases:

   ● UC-004: User Logout
   ● UC-008: Join Chat

4. **Use Case ID:** UC-004
   Use Case Name: User Logout
   Relevant Requirements: RS-003, RS-006
   Primary Actor: User, Administrator

Pre-conditions:

   a. The User or Administrator is logged in to the CSP.
   b. The User or Administrator is on any page of the application.

Post-conditions:

   a. The User or Administrator is successfully logged out of the system.
   b. The session data is cleared, and the User is returned to the login page.
   c. Any sensitive information is no longer accessible.

Basic Flow or Main Scenario:

   a. The User or Administrator clicks the "Logout" button in the application interface.
   b. The CSP prompts for confirmation to logout.
   c. The User or Administrator confirms the logout action.
   d. The CSP terminates the session and clears session data.
   e. The CSP redirects the User or Administrator to the login page.

Extensions or Alternate Flows:

   a. *Alternate Flow 1:* If the User or Administrator cancels the logout, the CSP does not log the User or Administrator out and returns them to the previous page.
   b. *Alternate Flow 2:* If the logout process encounters an error, the CSP displays an error message indicating that logout was unsuccessful, and the User or Administrator is prompted to try logging out again.

Exceptions:

   a. If the CSP is experiencing downtime during the logout attempt, the User or Administrator sees an error message indicating that the logout could not be completed and is encouraged to try logging out later.
   b. If the User or Administrator attempts to log out while a session timeout is in progress, the CSP displays a message indicating that the session has expired and redirects the User to the login page.

Related Use Cases:

   ● UC-004: User Login
   ● UC-009: Leave Chat

5. **Use Case ID:** UC-005
   Use Case Name: View Log
   Relevant Requirements: RS-002, RS-007
   Primary Actor: Administrator

Pre-conditions:

    a.   Administrator is logged in to the CSP.

Post-conditions:

    a.   The Administrator is able to view messages sent to group chats and individual users via Log Manager.

Basic Flow or Main Scenario:

    a.   The Administrator clicks the "View Logs" button in the application interface.
    b.   The CSP retrieves the log entries via Log Manager.
    c.   The Administrator is able to view all recent logs displayed on the log window.

Extensions or Alternate Flows:

a.   *Alternate Flow 1:* If there are no logs available, the system displays a message indicating "No log entries found."

Exceptions:

a.   If the CSP experiences an error retrieving logs, the CSP will display an error message and prompt the Administrator to try again.

Related Use Cases:

- UC-006: Search Log
- UC-010: Log Message Sent To User

6. **Use Case ID:** UC-006
Use Case Name: Search Log
Relevant Requirements: RS-002, RS-007
Primary Actor: Administrator

Pre-conditions:

    a. Administrator is logged in to the CSP.

Post-conditions:

    a. The Administrator is able to view messages sent to group chats and individual users via Log Manager.
    b. The Administrator is able to search through chat logs with a unique Log identifier.

Basic Flow or Main Scenario:

    a. The Administrator clicks the "View Logs" button in the application interface.
    b. The CSP retrieves the log entries via Log Manager.
    c. The Administrator is able to view all recent logs displayed on the log window.
    d. The Administrator is able to search the logs of the past 30 days by inputting a unique Log identifier into a search text field.
    e. All matching logs from the unique Log identifier are displayed on the log window.

Extensions or Alternate Flows:

a. *Alternate Flow 1:* If there are no logs available, the system displays a message indicating "No log entries found."

Exceptions:

a. If the CSP experiences an error retrieving logs, the CSP will display an error message and prompt the Administrator to try again.

Related Use Cases:

- UC-006: Search Log
- UC-011: Log Message Sent To User

7. **Use Case ID:** UC-007
   Use Case Name: Create Chat Room
   Relevant Requirements: RS-001, RS-005
   Primary Actor: User

Pre-conditions:

   a. The User is logged in to the CSP.
   b. The User has the necessary permissions to create a chat room.

Post-conditions:

   a. A new chat session is created and available for the user.
   b. The User can send and receive messages within the chat.

Basic Flow or Main Scenario:

   a. The User selects the option to create a new chat room from the main interface.
   b. The system prompts the User to enter the chat room name.
   c. The User submits the information.
   d. The CSP validates the input (e.g. checks for duplicate room names).
   e. The CSP creates the new chat room.
   f. The User is redirected to the new chat room.

Extensions or Alternate Flows:

   a. *Alternate Flow 1:* If the User chooses a room name that is already in use, the CSP will display an error message.

Exceptions:

   a. If the CSP experiences a temporary outage during the chat room creation process, an error message is displayed and the User is encouraged to try again later.

Related Use Cases:

   ● UC-008: Join Chat Room
   ● UC-009: Leave Chat Room

8. **Use Case ID:** UC-008
   Use Case Name: Join Chat Room
   Relevant Requirements: RS-001, RS-005
   Primary Actor: User

Pre-conditions:

    a.   The User is logged in to the CSP.
    b.   The User has permissions from the chat room they wish to join.

Post-conditions:

    a.   The User is successfully added to the chat room and can participate in conversation.

Basic Flow or Main Scenario:

    a.   The User navigates to the chat room directory.
    b.   The User locates the desired chat room from the list or by entering the chat room ID.
    c.   The User selects the chat room to join.
    d.   The CSP verifies that the User has the necessary permissions to join the chat room.
    e.   The CSP adds the User to the chat room.
    f.   The User is directed to the chat room interface and can begin sending and receiving messages.

Extensions or Alternate Flows:

a.   *Alternate Flow 1:* If the User attempts to join a chat room that has reached its participant limit, the system displays an error message and the User is encouraged to try again later.
b.   *Alternate Flow 2:* If the User attempts to enter a chat room they do not have permissions to, the system displays an error message.

Exceptions:

a.   If the CSP experiences a temporary outage during the joining process, an error message is displayed and the User is encouraged to try again later.

Related Use Cases:

    ●   UC-007: Create Chat Room
    ●   UC-009: Leave Chat Room

9. **Use Case ID:** UC-009
   Use Case Name: Leave Chat Room
   Relevant Requirements: RS-001, RS-005
   Primary Actor: User

Pre-conditions:

   a. The User is logged in to the CSP.
   b. The User is currently in an active chat room.

Post-conditions:

   a. The User is removed from the chat room.
   b. The User can no longer send or receive messages in that chat room.

Basic Flow or Main Scenario:

   a. The User is in an active chat room and decides to leave.
   b. The User selects the option to leave the chat room from the chat interface.
   c. The CSP prompts the User to confirm the action.
   d. The User confirms their intention to leave.
   e. The CSP removes the User from the chat room.
   f. The User is redirected to the main interface.

Extensions or Alternate Flows:

   a. _Alternate Flow 1:_ If the User decides not to leave after the confirmation prompt, they can select "Cancel" and the User remains in the chat room.

Exceptions:

   a. If the CSP experiences a temporary outage during the joining process, an error message is displayed and the User is encouraged to try again later.

Related Use Cases:

   ● UC-007: Create Chat Room
   ● UC-008: Join Chat Room

10. **Use Case ID:** UC-010
    Use Case Name: Log Message Sent To Group
    Relevant Requirements: RS-001, RS-006, RS-007
    Primary Actor: Log Manager, Chatroom Manager

Pre-conditions:

    a.   User is logged in to the CSP.
    b.   User is participating in an active group chat.

Post-conditions:

    a.   The message sent by the User is logged successfully for auditing and retrieval purposes.
    b.   The log entry includes sender, message content, timestamp, Date, and User ID.

Basic Flow or Main Scenario:

    a.   The User sends a message in a group chat.
    b.   The Chatroom Manager captures the message and its metadata.
    c.   The Chatroom Manager invokes the Log Manager to log the message.
    d.   The Log Manager processes the logging request and stores the message in the log database.
    e.   The Log Manager confirms the successful logging of the message.

Extensions or Alternate Flows:

a.   *Alternate Flow 1:* If the Log Manager encounters an error while logging the message, it returns an error message to the Chatroom Manager. The Chatroom Manager will notify an Administrator about the logging failure.

Exceptions:

a.   If the CSP experiences a temporary outage during the logging process, an error message is displayed, and the message may not be logged.

Related Use Cases:

    ●   UC-011: Log Message Sent To User
    ●   UC-005: View Log

11. **Use Case ID:** UC-011
    Use Case Name: Log Message Sent To User
    Relevant Requirements: RS-001, RS-006, RS-007
    Primary Actor: Log Manager, Chatroom Manager

Pre-conditions:

   a. User is logged in to the CSP.
   b. User is actively receiving messages from other Users.

Post-conditions:

   a. The message sent to the User is logged successfully for auditing and retrieval purposes.
   b. The log entry includes message content, sender's User ID, timestamp, and recipient's User ID.

Basic Flow or Main Scenario:

   a. A message is sent from one User to another.
   b. The Chatroom Manager captures the message along with its metadata.
   c. The Chatroom Manager invokes the Log Manager to log the message.
   d. The Log Manager processes the logging request and stores the message in the log database.
   e. The Log Manager confirms the successful logging of the message.

Extensions or Alternate Flows:

   a. *Alternate Flow 1:* If the Log Manager encounters an error while logging the message, it returns an error message to the Chatroom Manager. The Chatroom Manager will notify an Administrator about the logging failure.

Exceptions:

   a. If the CSP experiences a temporary outage during the logging process, an error message is displayed, and the message may not be logged.

Related Use Cases:

   ● UC-010: Log Message Sent To Group
   ● UC-005: View Log

12. **Use Case ID:** UC-012
    Use Case Name: Read Asynchronous Message
    Relevant Requirements: RS-001
    Primary Actor: User

Pre-conditions:

    a. The User is logged in to the CSP.
    b. The User has received asynchronous messages that are available to read.

Post-conditions:

    a. The User successfully views the contents of the asynchronous message.
    b. The CSP updates the status of the message.

Basic Flow or Main Scenario:

    a. The User navigates to the messaging interface.
    b. The User selects the asynchronous message they wish to read.
    c. The CSP retrieves the message details from the database.
    d. The CSP displays the message content, along with relevant metadata.
    e. The CSP updates the message status to indicate that it has been read.

Extensions or Alternate Flows:

a. *Alternate Flow 1:* If the User selects a message that no longer exists, the system displays an error message.

Exceptions:

a. If the CSP experiences a temporary outage during the retrieval process, an error message is displayed, and the User is encouraged to try again later.

Related Use Cases:

- UC-001: Asynchronous Message Delivery

13. **Use Case ID:** UC-013
    Use Case Name: Retrieve User For Credentials
    Relevant Requirements: RS-001, RS-006, RS-004
    Primary Actor: User Manager, Server

Pre-conditions:

    a. The Server has access to the UserManager instance.
    b. The User's identifier is known and provided as input.

Post-conditions:

    a. The User's credentials are retrieved from the UserManager.
    b. The credentials can be used for further actions, such as authentication or password changes.

Basic Flow or Main Scenario:

    a. The Server receives a request to retrieve user credentials based on the User's identifier.
    b. The Server invokes the UserManager to find the User.
    c. The UserManager searches its list of users for the specified identifier.
    d. If the User is found, the UserManager retrieves the User's credentials.
    e. The UserManager returns the User's credentials to the Server.

Extensions or Alternate Flows:

a. *Alternate Flow 1:* If the specified User cannot be found, the UserManager returns an error message to the Server.

Exceptions:

a. If the UserManager encounters an error during the retrieval process, it returns an error message to the Server.

Related Use Cases:

- UC-014: Authorize User For Login
- UC-015: Add User To List Of Users

14. **Use Case ID:** UC-014
    Use Case Name: Authorize User For Login
    Relevant Requirements: RS-006
    Primary Actor: UserManager

Pre-conditions:

      c.   The User is attempting to log in to the CSP.
      d.   The User provides a valid username and password.

Post-conditions:

      c.   The UserManager verifies the User's credentials, and the User is authenticated successfully, granting them access to the system.

Basic Flow or Main Scenario:

      f.   The User inputs their username and password to the login interface.
      g.   The Server receives the login request and invokes UserManager with the provided username and password.
      h.   The UserManager verifies the credentials against its list of users.
      i.   If the credentials are valid, the UserManager returns a success response to the Server.
      j.   The Server grants access to the User.
      k.   The User is redirected to the main interface of the CSP.

Extensions or Alternate Flows:

  b.   *Alternate Flow 1:* If the username and password is incorrect, the UserManager returns an error response to the Server and will prompt the user to re-enter their credentials.

Exceptions:

  b.   If the UserManager encounters an error during the authentication process, it returns an error message to the Server, which then informs the User of the failure.

Related Use Cases:

      ●   UC-013: Retrieve User For Credentials
      ●   UC-003: User Login

15. **Use Case ID:** UC-015
    Use Case Name: Add User To List Of Users
    Relevant Requirements: RS-006
    Primary Actor: UserManager

Pre-conditions:

    a.   An Administrator is logged in to the CSP with permissions to add users.
    b.   The Administrator provides a unique username and a temporary password for the new user.

Post-conditions:

    a.   A new User is added to the UserManager's list of users.
    b.   The User's credentials are stored securely in the system.

Basic Flow or Main Scenario:

    a.   The Administrator accesses the user management interface to add a new user.
    b.   The Administrator inputs the desired username and temporary password into the appropriate fields.
    c.   The Server receives the request and invokes UserManager with the provided username and password.
    d.   The UserManager checks if the username is unique.
    e.   If the username is unique, the UserManager adds the new User to its list and stores their credentials securely.
    f.   The UserManager returns a success response to the Server, confirming that the User has been added.

Extensions or Alternate Flows:

a.   *Alternate Flow 1:* If the provided username is already taken, the UserManager returns an error response prompting them to choose a different username.

Exceptions:

a.   If the UserManager encounters an error during the process, it returns an error message to the Server, which then informs the Administrator of the failure.

Related Use Cases:

    ●   UC-013: Retrieve User For Credentials
    ●   UC-014: Authorize User For Login

16. **Use Case ID:** UC-016
    Use Case Name: Server Listen For Connection
    Relevant Requirements: RS-003, RS-004
    Primary Actor: Server

Pre-conditions:

    a. The Server is running and initialized, ready to accept connections.
    b. The network interface is configured to listen for incoming client requests.

Post-conditions:

    a. The Server establishes a connection with the Client, allowing for communication.
    b. A session is created for the Client, enabling them to interact with the system.

Basic Flow or Main Scenario:

    a. The Server starts and initializes its network services to begin listening for incoming connections.
    b. The Server binds to the specified IP address and port, preparing to accept connections.
    c. The Server enters a listening state, awaiting incoming connection requests from Clients.
    d. When a Client attempts to connect, the Server accepts the connection request.
    e. The Server establishes a session for the Client, allocating necessary resources.
    f. The Server confirms the successful connection to the Client.

Extensions or Alternate Flows:

a. *Alternate Flow 1:* If a Client does not connect within a specified timeout period, the Server remains in the listening state, ready for future connections.

Exceptions:

a. If the Server encounters an error while trying to bind to the specific IP address or port (e.g. port already in use), it logs the error and enters a safe state.

Related Use Cases:

- UC-017: Client Attempt To Connect

17. **Use Case ID:** UC-017
    Use Case Name: Client Attempt To Connect
    Relevant Requirements: RS-003, RS-004
    Primary Actor: Client

Pre-conditions:

   a. The Client application is running and initialized.
   b. The Client has the server's IP address and port number.

Post-conditions:

   a. The Client successfully connects to the Server, establishing a communication channel.
   b. A session is initiated for the Client with the Server.

Basic Flow or Main Scenario:

   a. The Client launches the application and enters the server's IP address and port number.
   b. The Client attempts to establish a connection with the Server using the specified address and port.
   c. The Client sends a connection request to the Server.
   d. The Server receives the connection request and processes it.
   e. If the Server accepts the request, the connection is established, and the Client is notified of the successful connection.
   f. The Client receives a welcome message.

Extensions or Alternate Flows:

   a. *Alternate Flow 1:* If the connection attempt fails (e.g. incorrect IP/port), the Client displays an error message to the user and prompts them to check the connection details and retry.

Exceptions:

   a. If the Client encounters a network error during the connection attempt, it notifies the User of the failure.

Related Use Cases:

   ● UC-016: Server Listen For Connection

7. UML Use Case Diagrams

Refer to Group 7 Software Design Document, Section 2

8. UML Class Diagram

Refer to Group 7 Software Design Document, Section 3.1

9. UML Sequence Diagrams

Refer to Group 7 Software Design Document, Section 4