Chatting with Web Sockets

Lecture Question

Task: Write a Web Socket Server for Direct Messages (DMs)

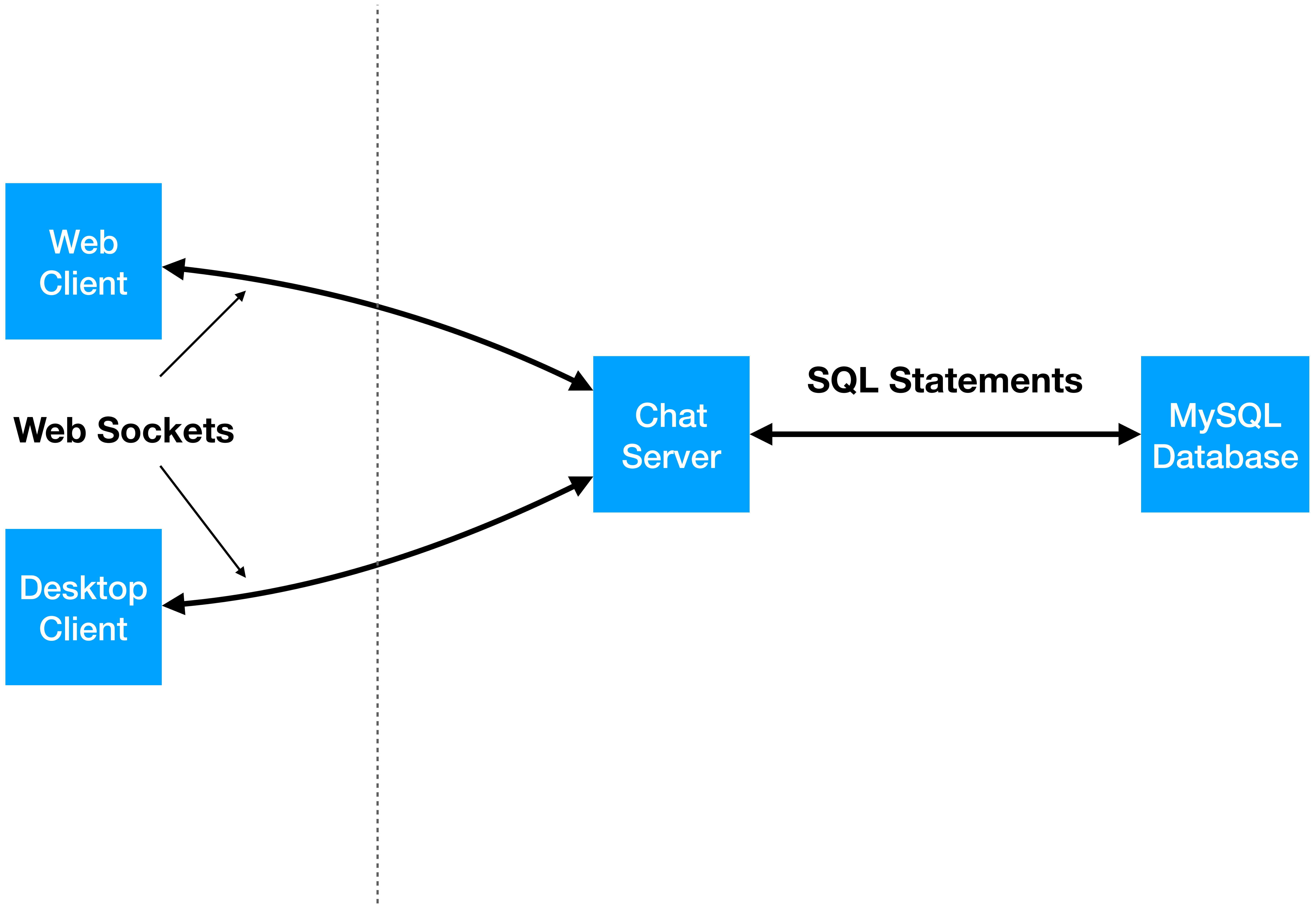
In a package named server, write a class named DMServer that:

- When created, sets up a web socket server listening for connections on localhost:8080
- Listens for messages of type "register" containing a username as a String (Use data structures to remember which socket belongs to which username)
- Listens for messages of type "direct_message" containing a JSON string in the format {"to":"username", "message":"text"}. When such a message is received:
    - Send a message of type "dm" to the "to" username containing a JSON string in the format {"from":"username", "message":"text"}
- Example: If 2 different users connect to the server and send:
    - emit("register", "Aesop") and emit("register", "Rob")
    - User "Aesop" sends emit("direct_message", '{"to": "Rob", "message": "Happy to be on the food chain at all"}')
- User "Rob" will receive a message from the server of type "dm" containing the string '{"from": "Aesop", "message": "Happy to be on the food chain at all"}'

Chat Demo

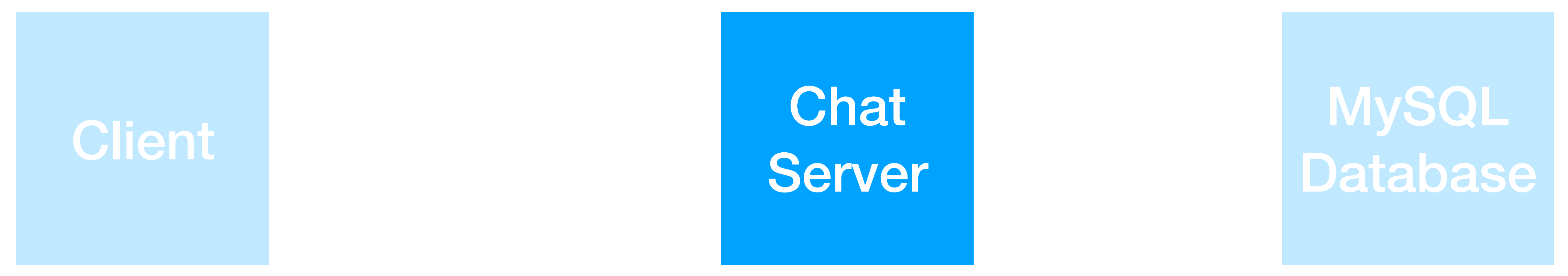
- Let's build a chat app!
  - Code is in the repo
- Users can connect to the chat server
  - Use a web or desktop front end
  - Server doesn't care what type of app a client is using
- All connected users can communicate through text messages

Chat Architecture



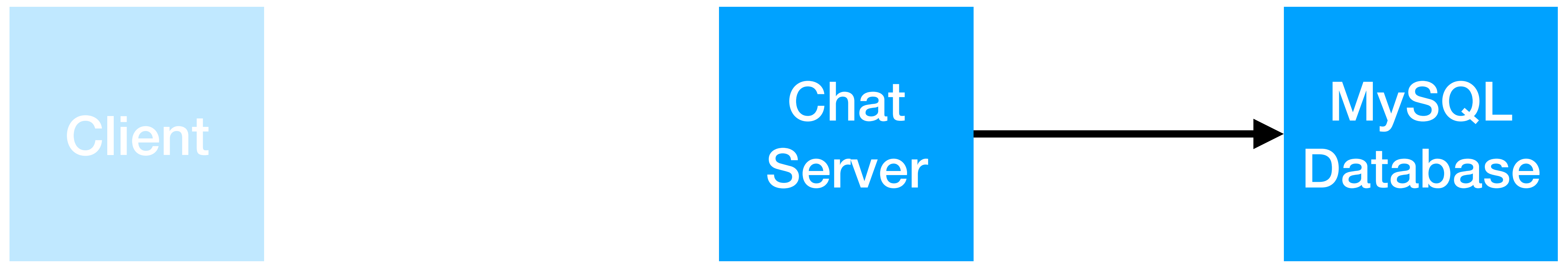
Chat App

- Chat server starts up
- Listens for WebSocket connections on port 8080
- Initialize data structures that will store reference to each WebSocket



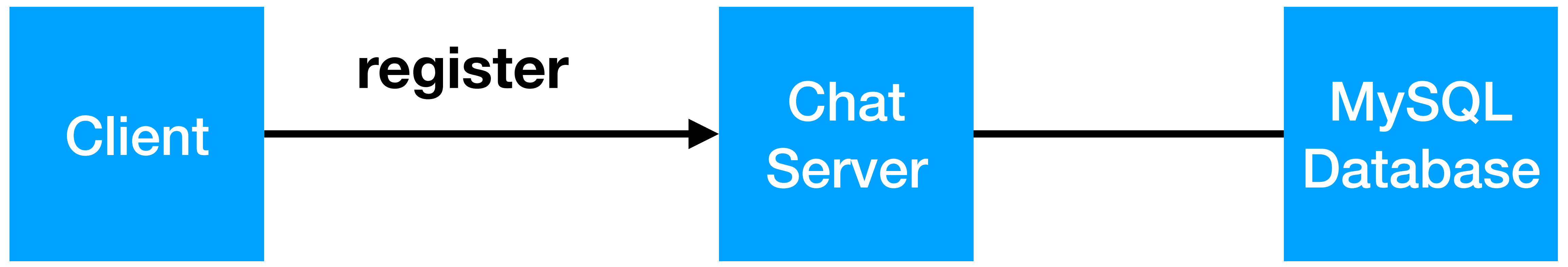
Chat App

- Server connects to a MySQL database to store the chat history
- Communicates via SQL statements
  - MySQL reacts to the event of receiving a statement
- More details on MySQL in a later lecture



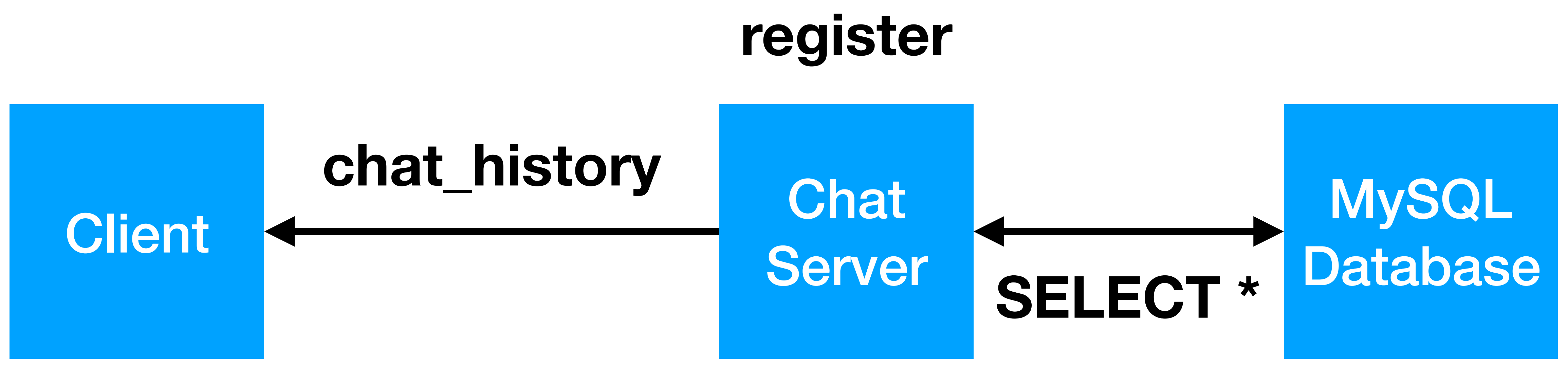
Chat App

- Clients connect to the server using WebSockets
  - Client could be web or desktop
- After the connection is established:
  - Client sends a message of type register containing their username



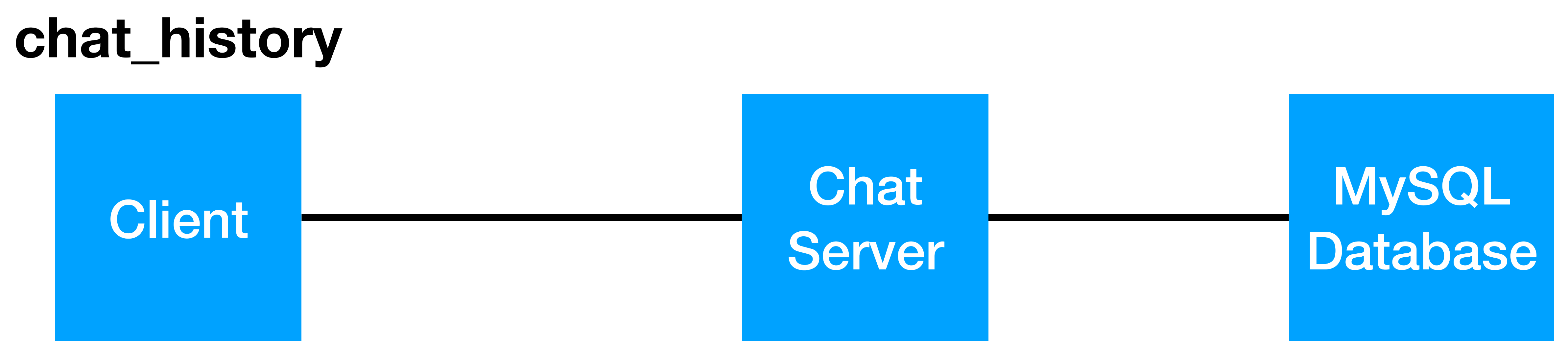
Chat App

- The server receives the register message and reacts to this event
- Adds the new user to the data structures
  - Data structure remember the username associated with this socket
- Retrieve the chat history from the database and send it to the client



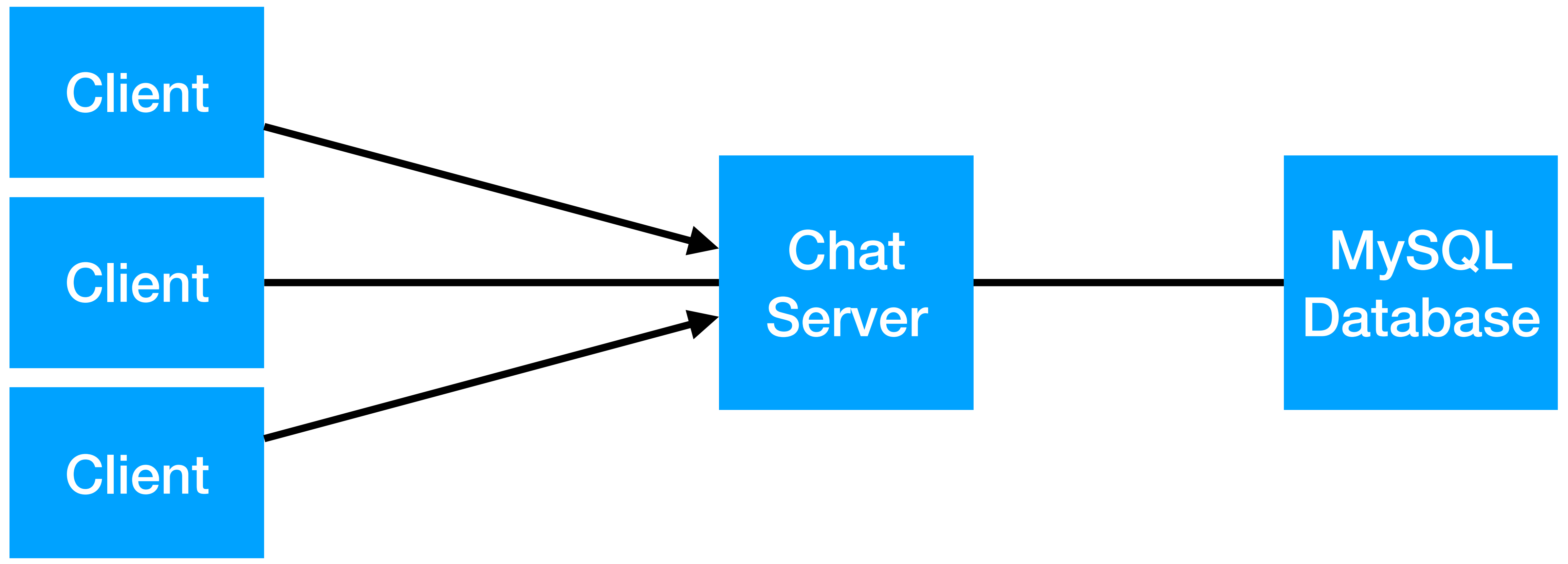
Chat App

- Client reacts to the chat_history message
  - Renders all the content and displays it to the user



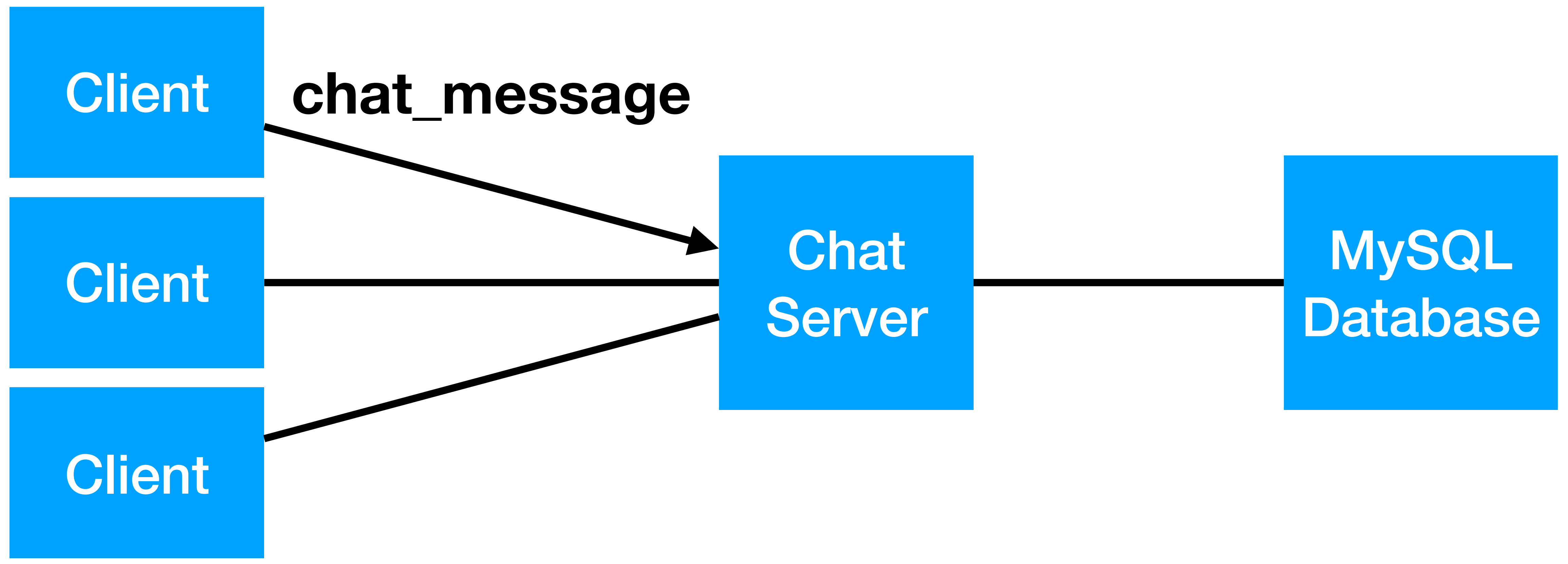
Chat App

- Multiple clients can be connected simultaneously
- Each client sends their username in a register message
- Chat servers maps usernames to sockets for all connections



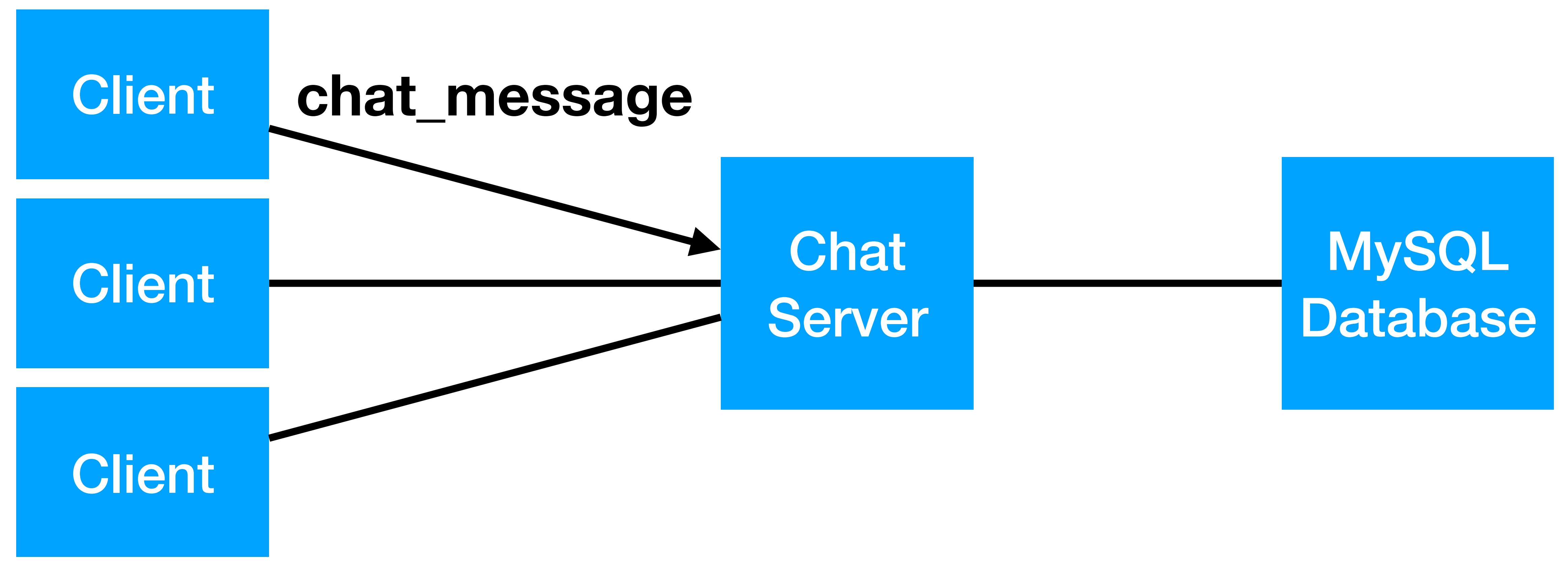
Chat App

- All users can send messages of type chat_message to the server



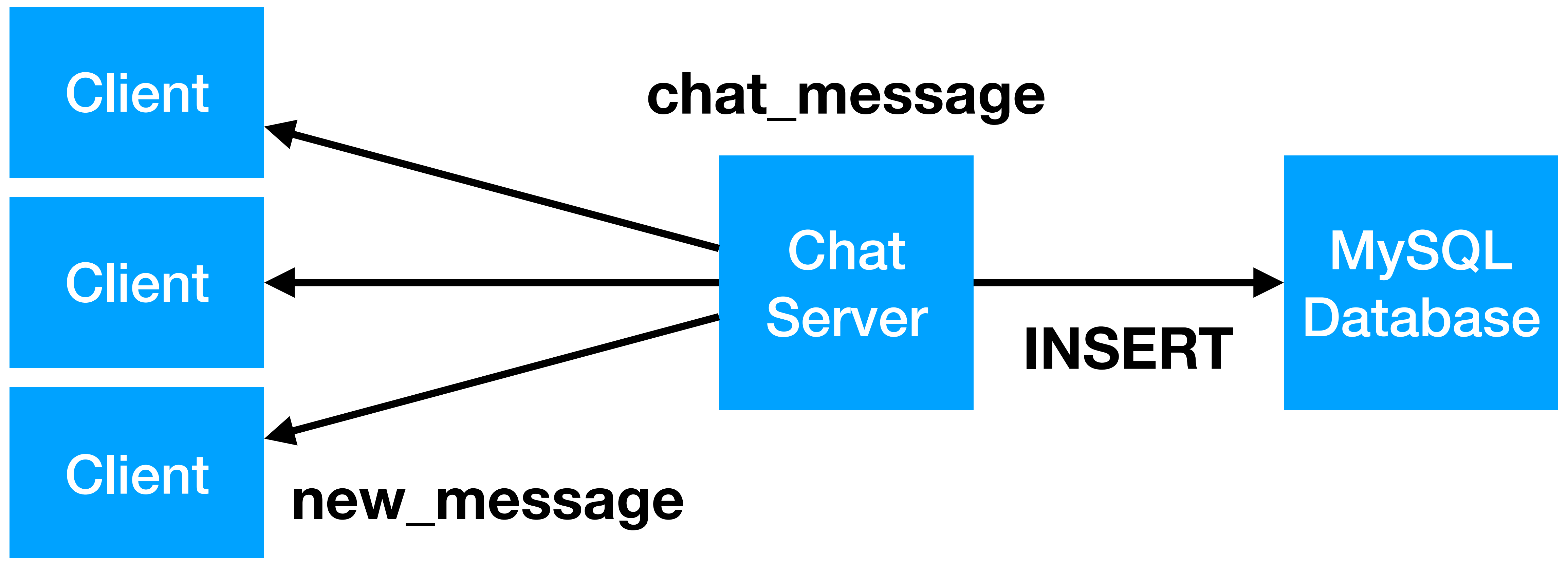
Chat App

- All users can send messages of type chat_message to the server
  - Message is sent when a user sends a message using the GUI
- This message only contains the message (No username)



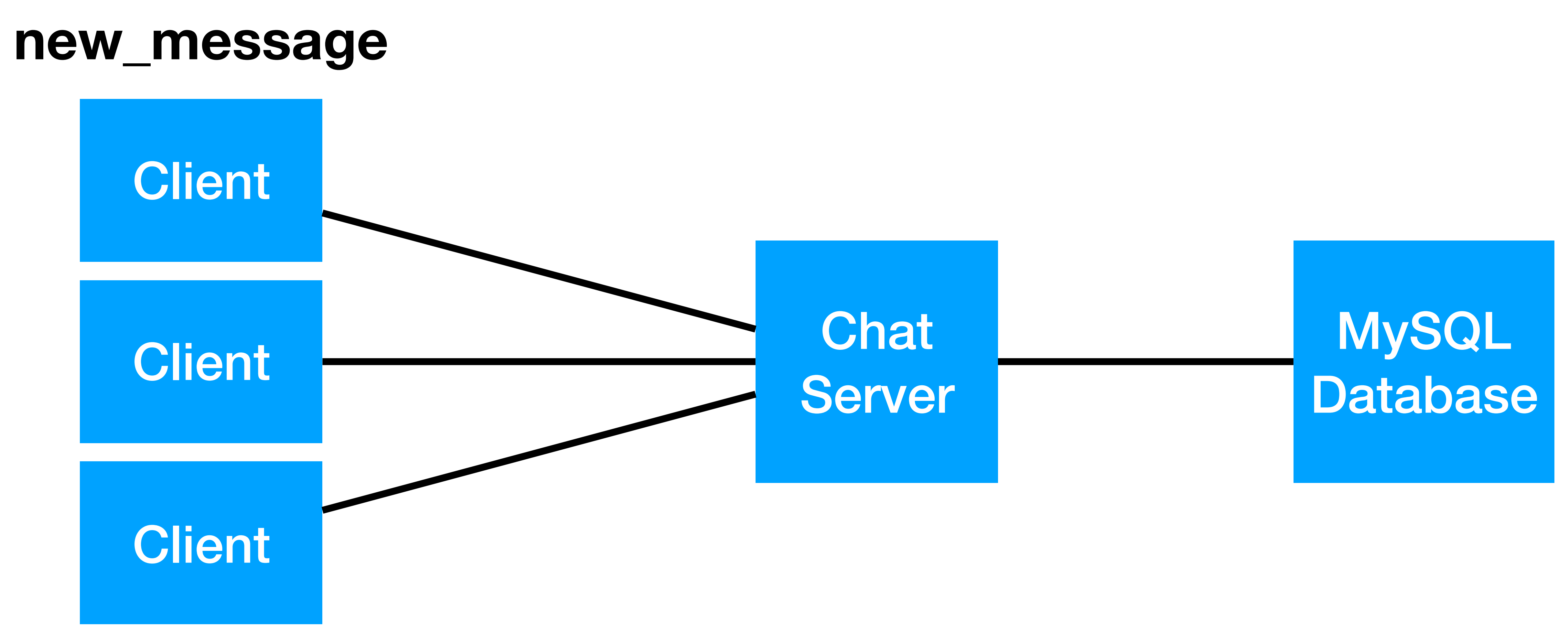
Chat App

- When the server receives a chat_message:
  - Lookup the username for the sending socket
  - Store username/message in the database
  - Send username/message to all connected sockets in a message of type new_message



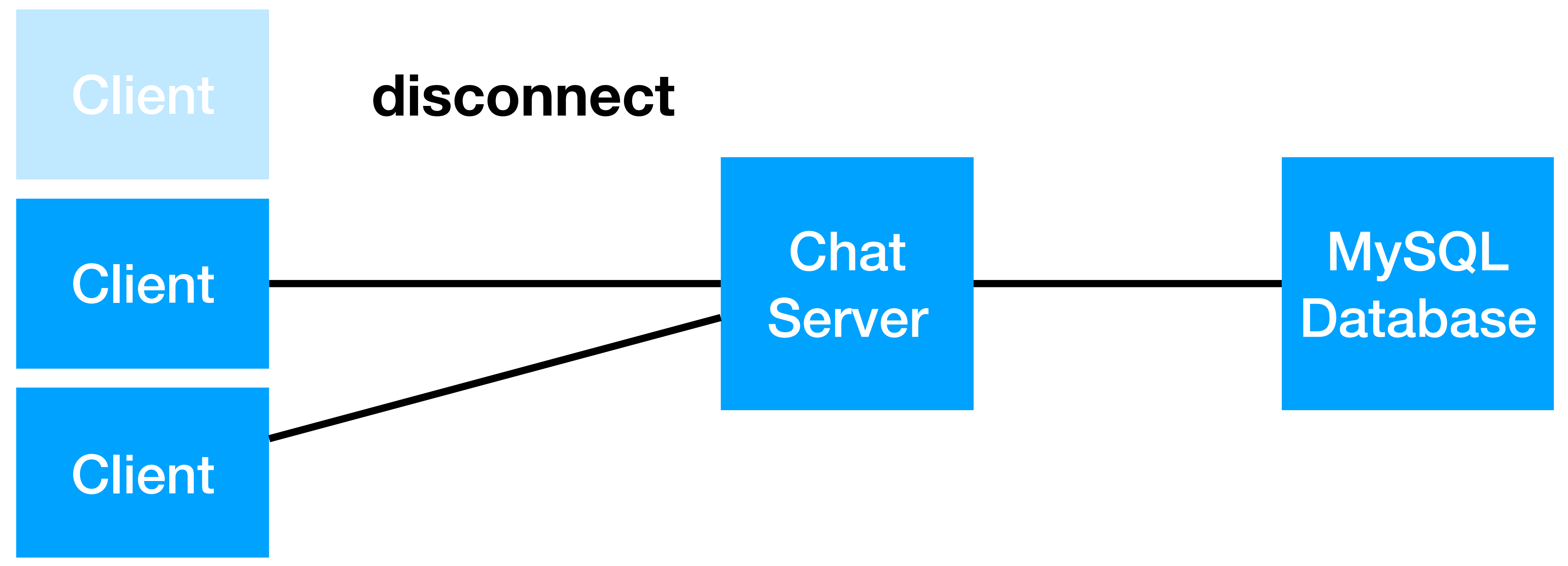
Chat App

- Clients receives the new_message
- Add it to the GUI for the user to read



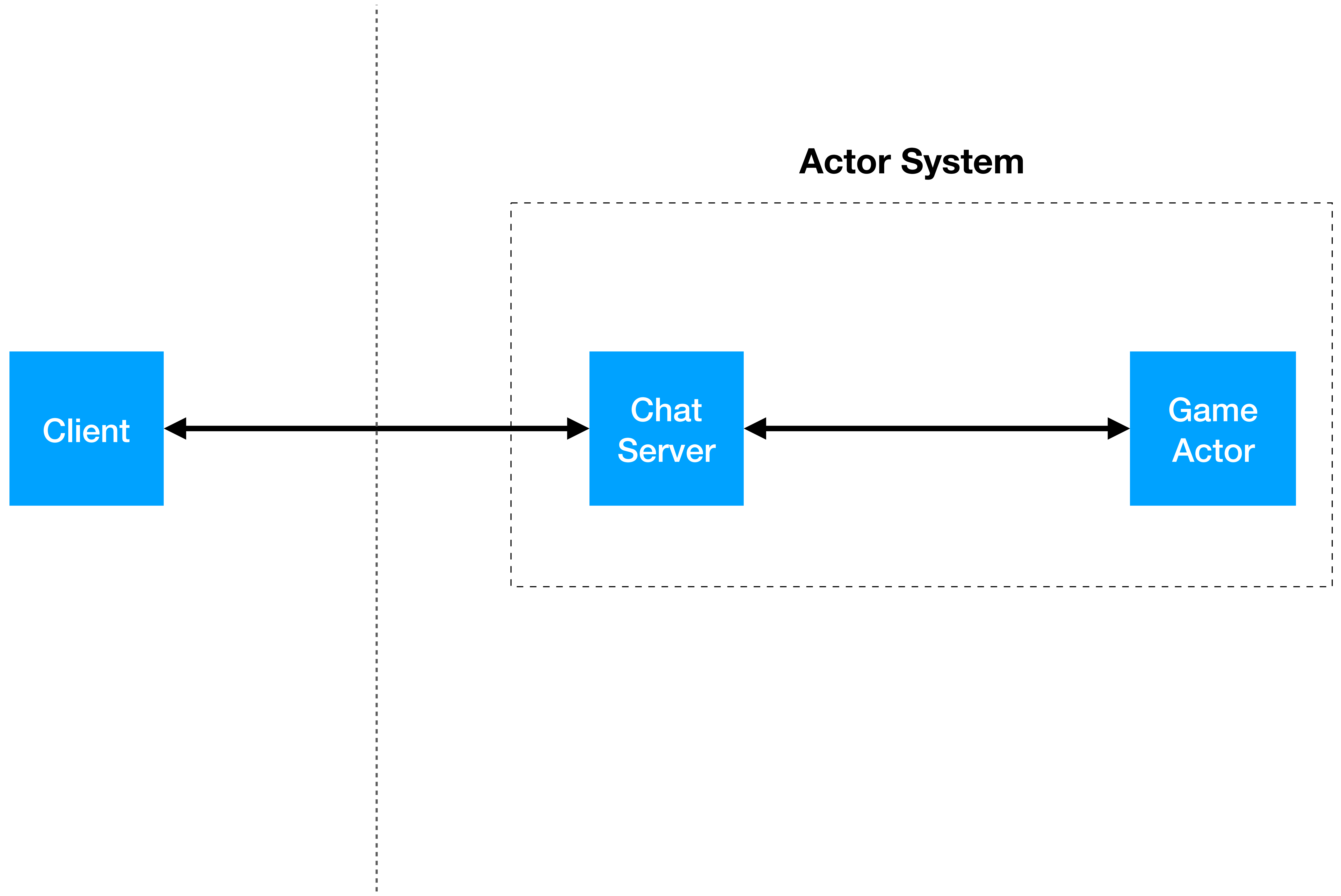
Chat App

- When a client disconnects the server reacts to the disconnect event
- Remove the user from data structures



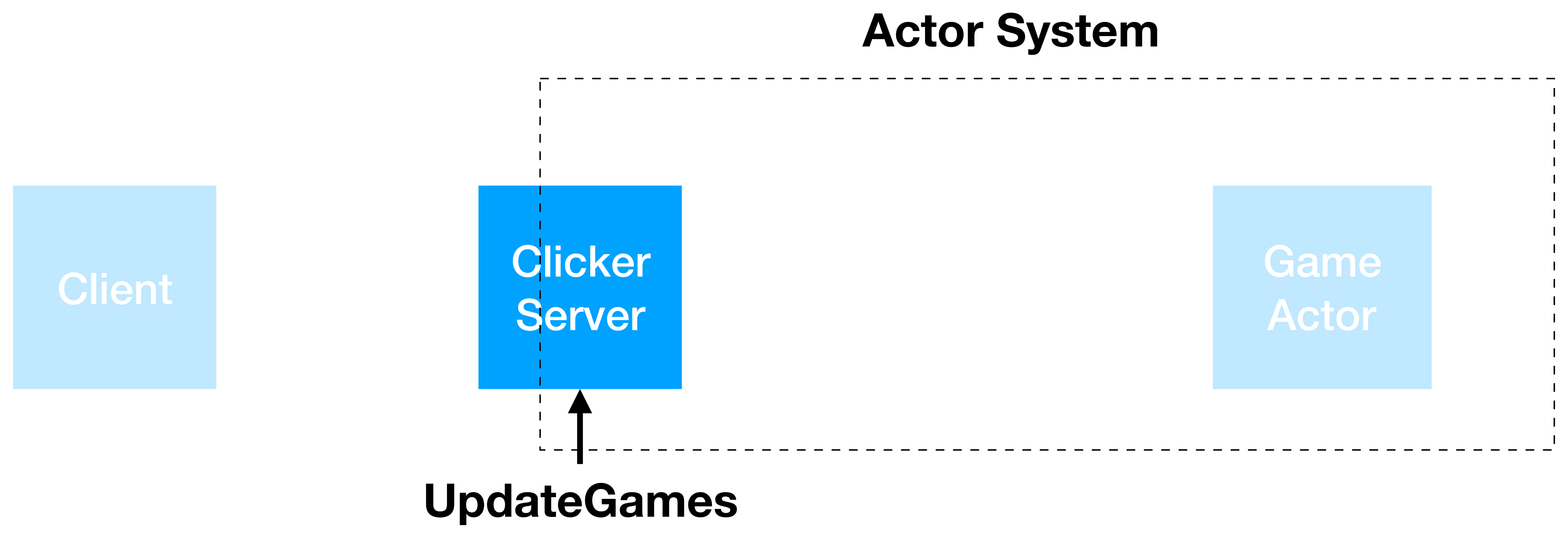
To the Code

Clicker Architecture



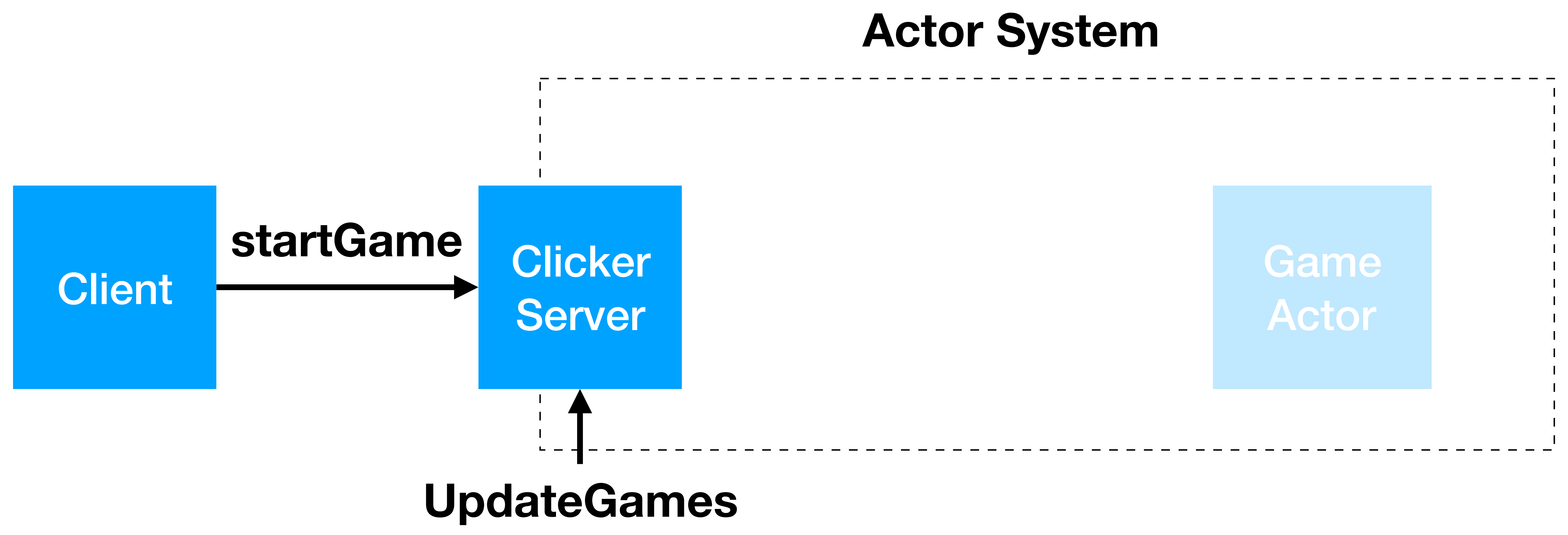
Clicker App

- When the app starts
  - An actor system is created
  - A ClickerServer actor is added to the system
  - UpdateGames message is sent to the server at regular intervals



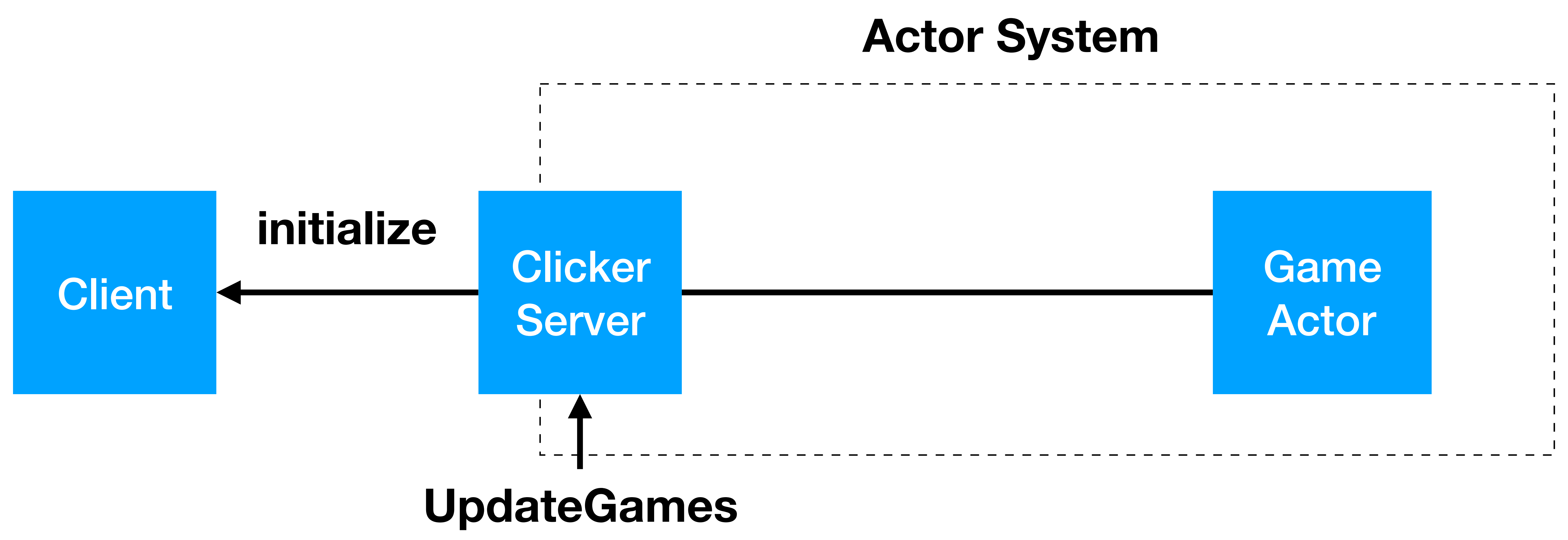
Clicker App

- When a client connects and chooses a username
    - This username is sent to the server in a WebSocket message of type startGame



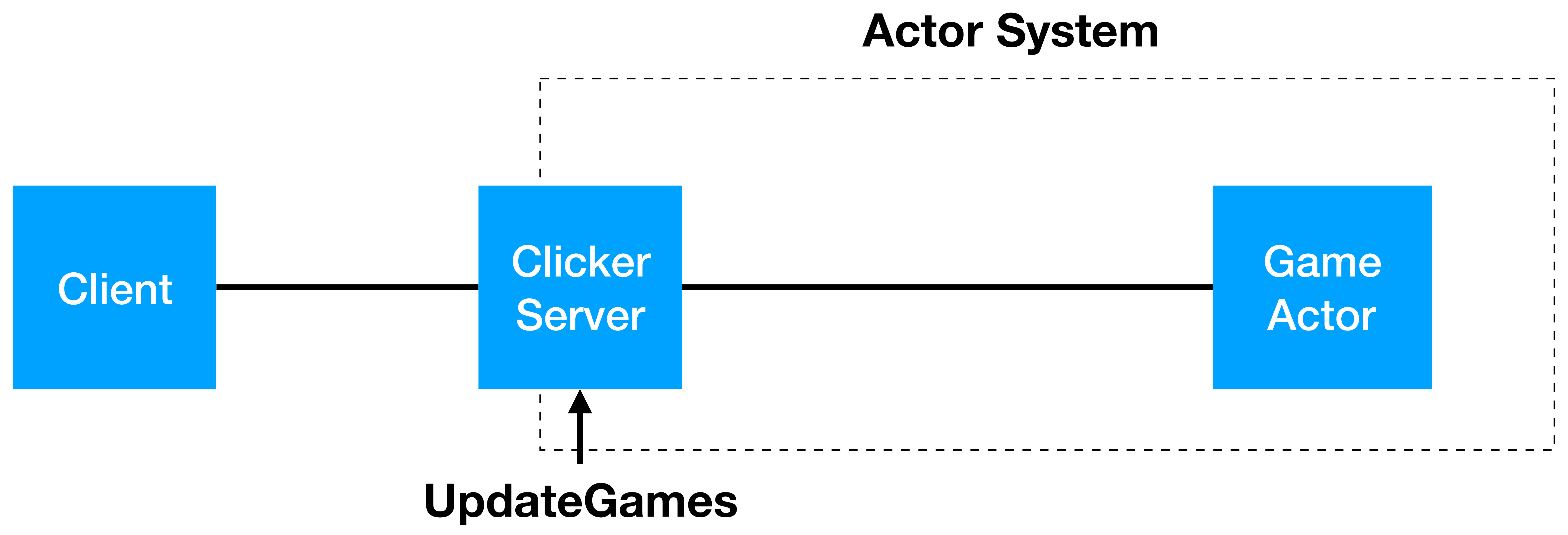
Clicker App

- In response to receiving the gameStart message, the server:
  - Sends the client the game configuration in a message of type initialize
  - Creates a GameActor in the actor system
  - Updates data structure to remember that this game actor is associated with this web socket



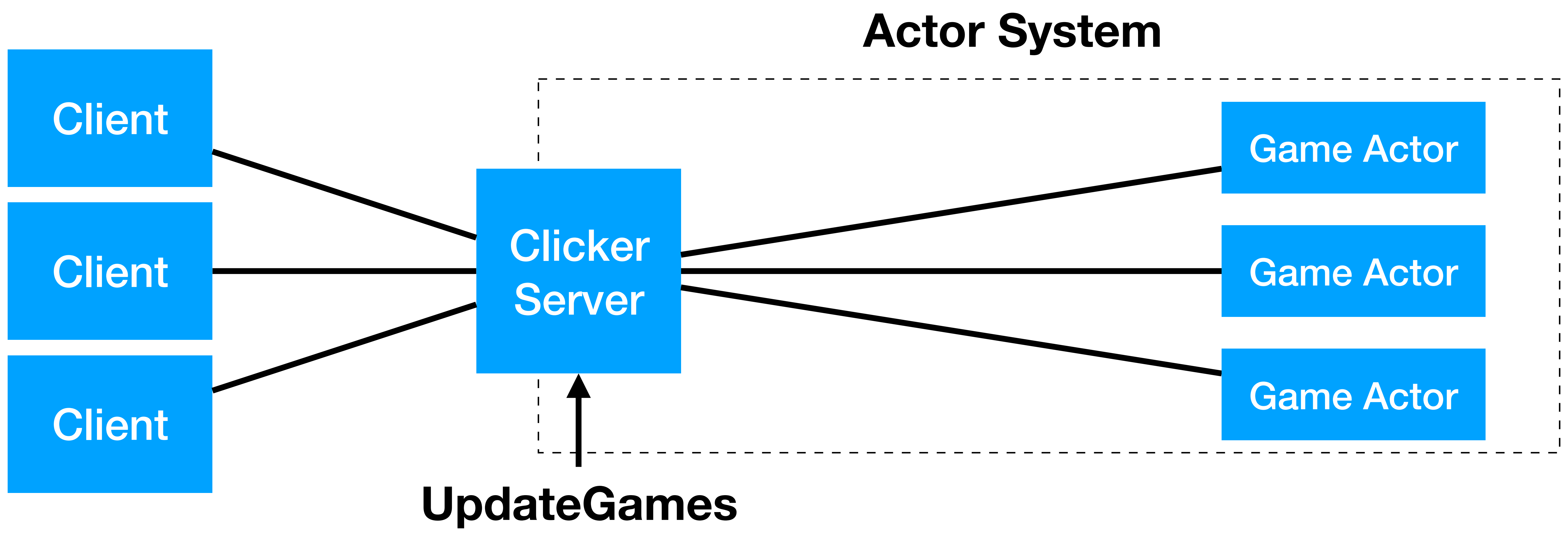
Clicker App

- To create a new Actor
  - Use the context variable of any actor
  - Use this context the same as the actor system
  - Ex. clickerServer.context.actorOf...



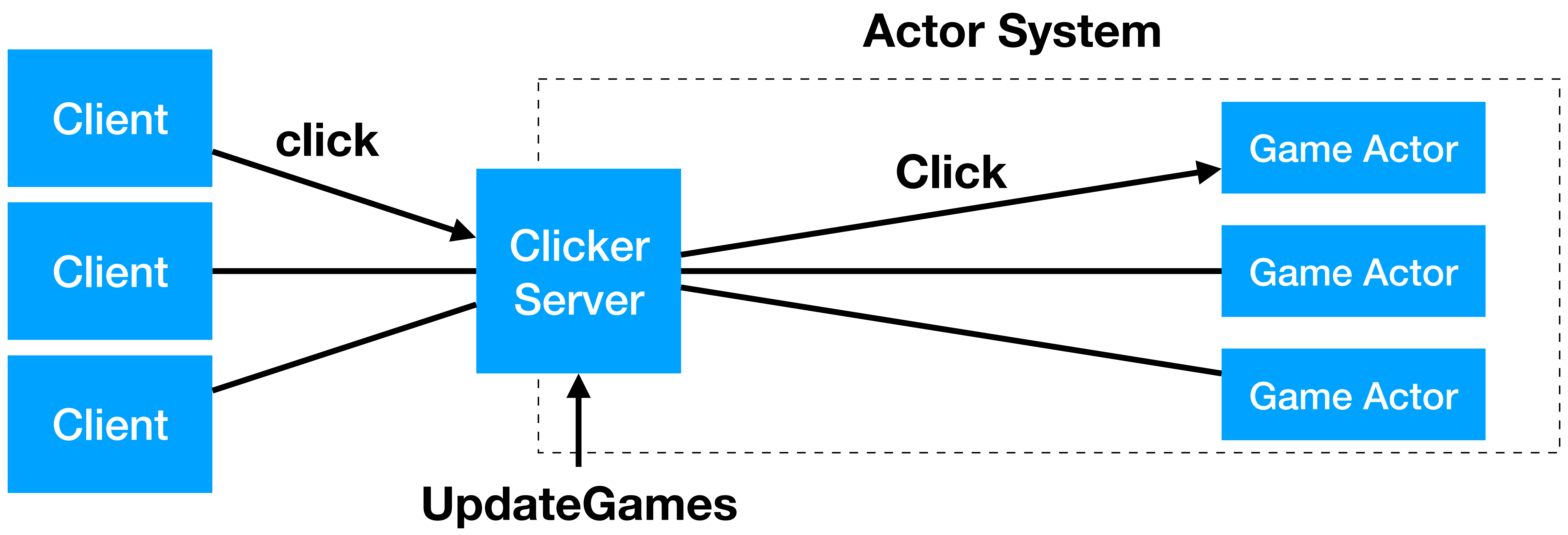
Clicker App

- An new game actor is created for each connected client
- Important to update all data structures to associate clients with their actors



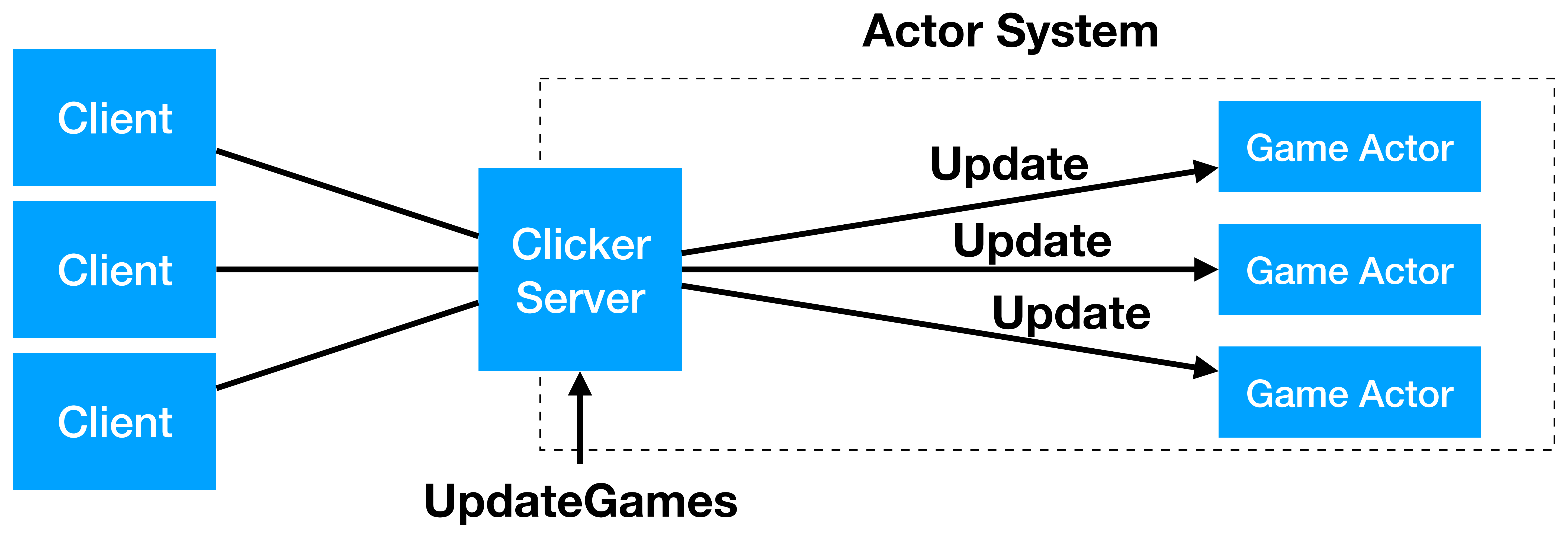
Clicker App

- When the server receives click and buy message from a web socket
  - Forward the action as an actor message to the appropriate actor
  - Game actor will update its state according to the configuration of the game



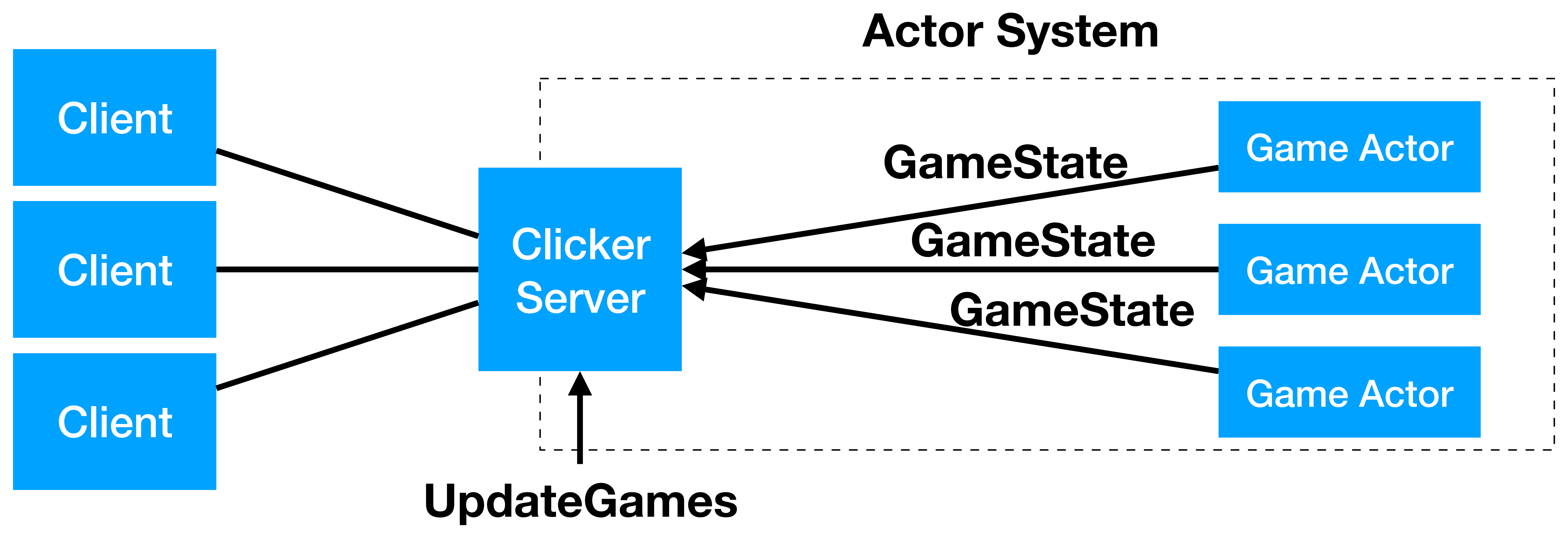
Clicker App - Update

- Each time the clicker server receives the UpdateGames actor message
  - Send an Update message to each game actor



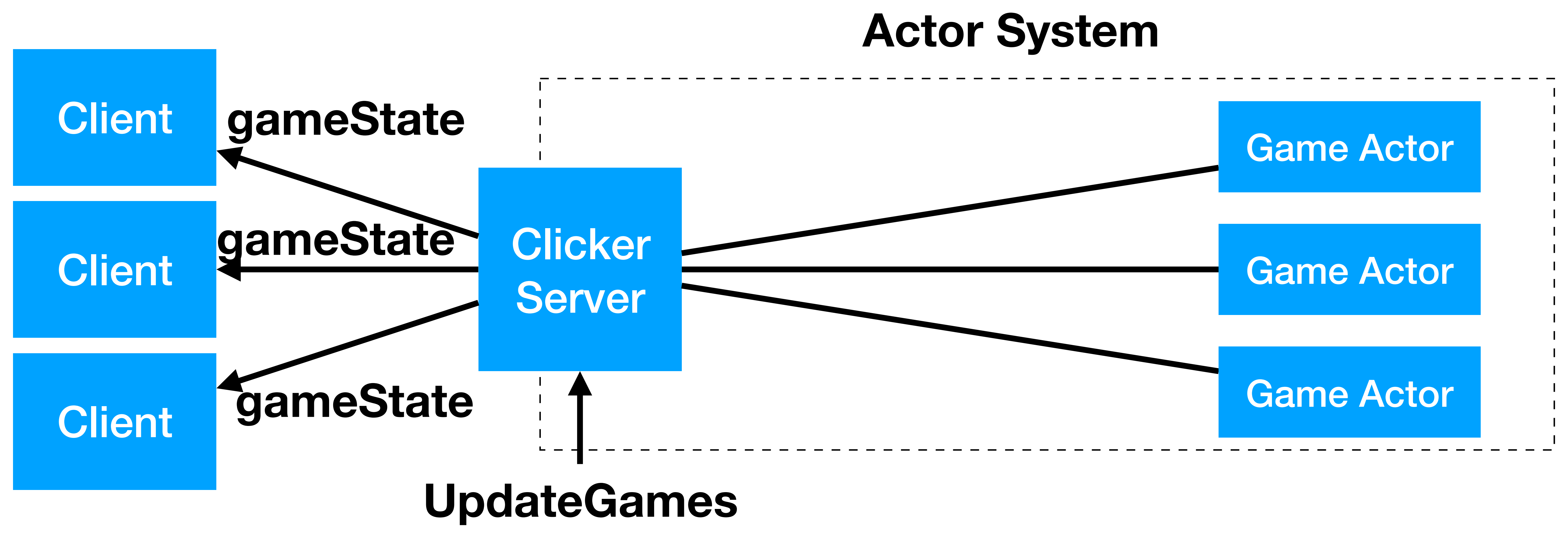
Clicker App - Update

- Each game actor responds with the GameState message (to the sender())
- GameState contains all information of the game in a JSON string



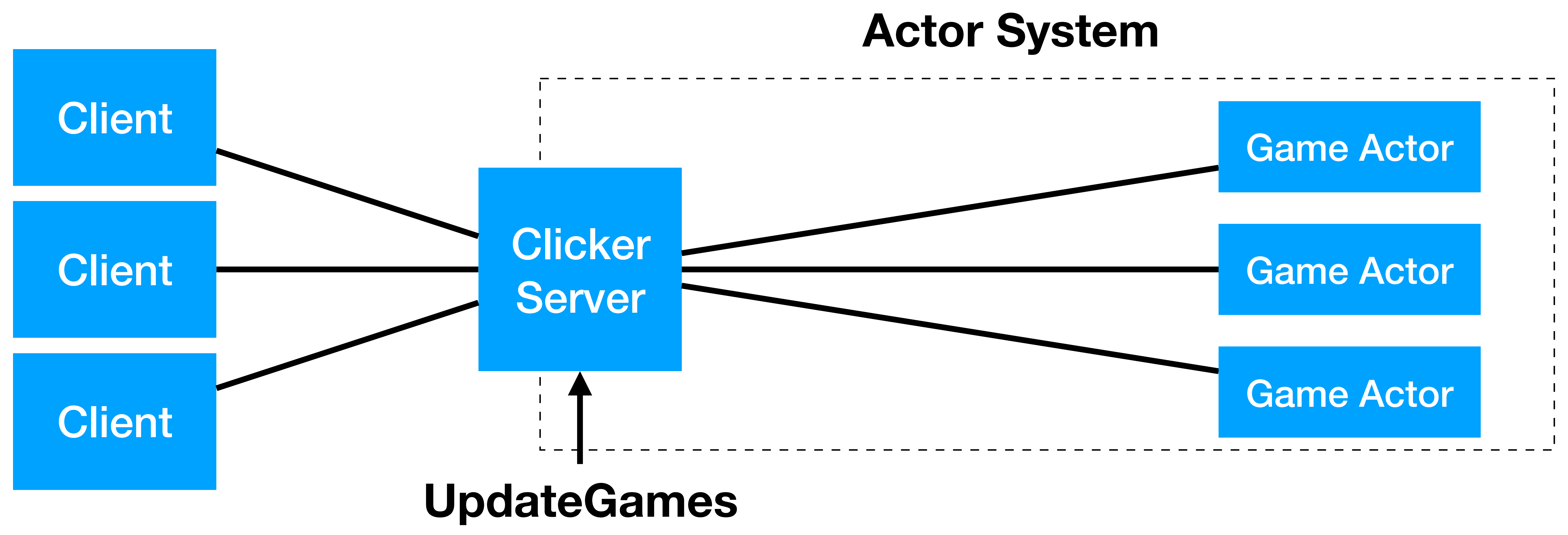
Clicker App - Update

- The clicker server forwards each game state to the appropriate client in a gameState message
- Each client parses the JSON string and updates the GUI for the user to see



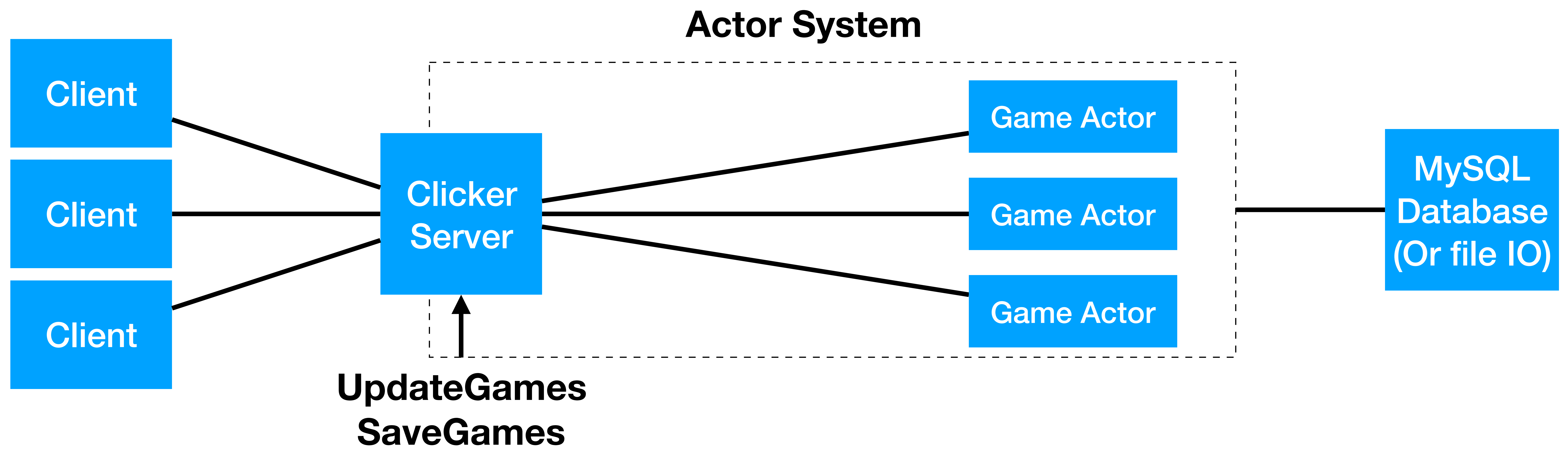
Clicker App - Update

- This update process occurs at regular intervals
    - 10 times/second in the handout code
- Notice that all the game logic occurs on the server
- Client only sends user inputs and renders the game state



Clicker App - Expansion

- Expansion objective - AutoSave
- Send messages to save all games at regular intervals
- Store all game states in a way that will persist
- If a user sends the startGame message with a username that has a saved game, load their game



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