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Final Project
CodeSync

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PART 0

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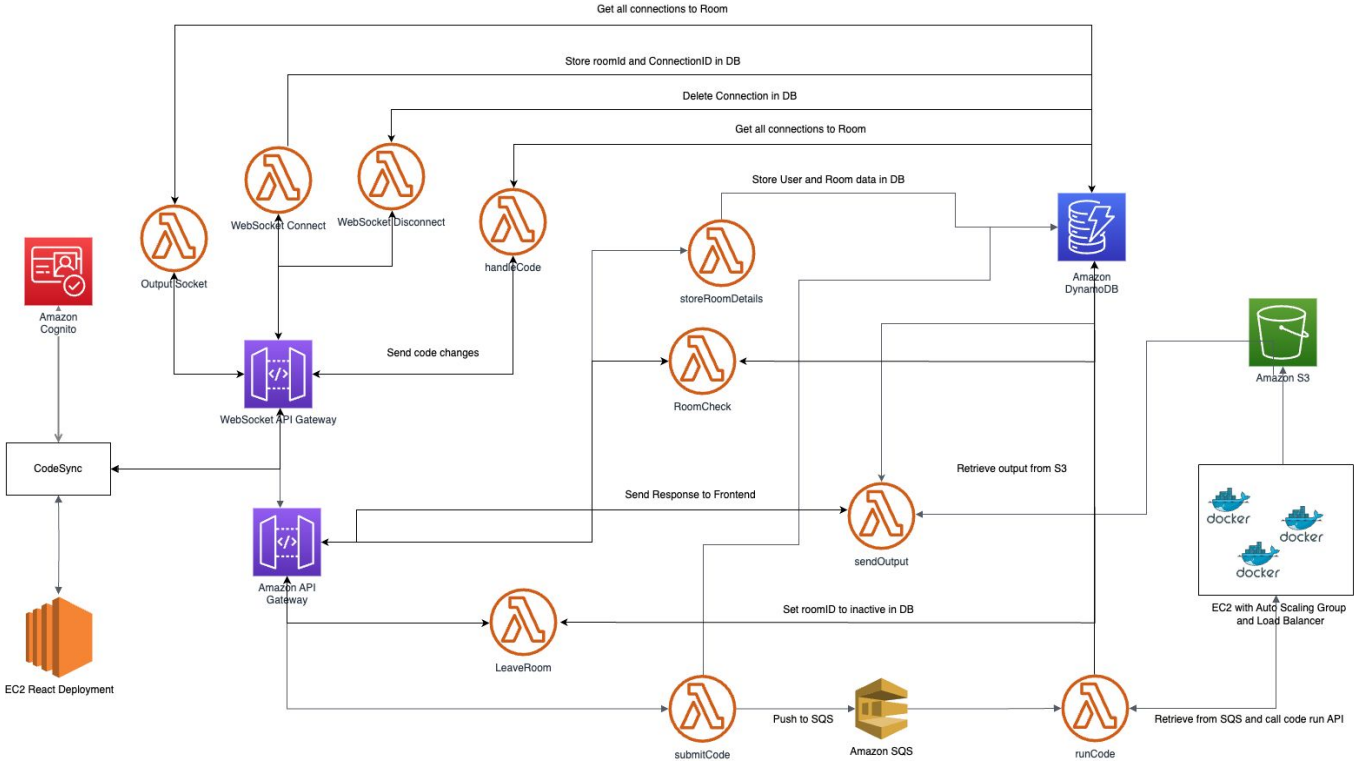
About Codesync

Codesync is a cutting-edge **live coding platform** designed to facilitate real-time collaboration and coding among developers. Users can create rooms where they can code together, with live updates and synchronization enabled through WebSockets.

Key Features:

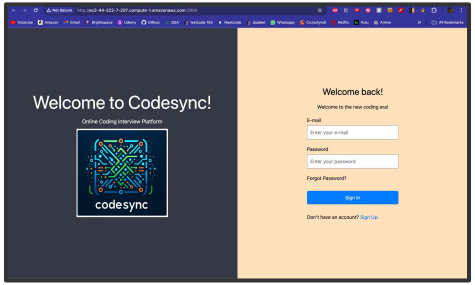
- **Real-time Collaboration:** Seamless live coding sessions where multiple users can code together in real-time. WebSockets (AWS WebSocket API) ensure that all participants in a room see the same code simultaneously, providing an interactive and synchronized coding experience.
- **Secure Code Execution:** Codesandbox isolated environments are used to run code inputted by users. This ensures that code is executed securely and independently, preventing interference and maintaining the integrity of the coding environment.
- **Scalable Infrastructure:** Built on a robust microservice architecture leveraging AWS services for backend and frontend deployment, ensuring high availability and performance.
- **Secure and Efficient:** Utilizes AWS Cognito for user authentication, DynamoDB for data storage, and EC2 instances for frontend deployment.

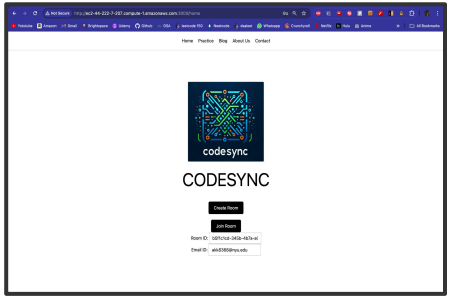
Architecture Diagram



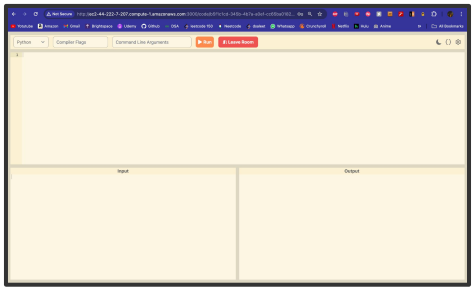
Frontend and AWS Cognito

- The frontend of Codesync is built with **React**, providing a dynamic and interactive user interface. Deployed on **AWS EC2**, it ensures scalability and reliability, allowing the platform to handle increasing user demand. Key features include an intuitive user interface for easy navigation and real-time collaboration using WebSockets, which ensures instant code updates across all participants.





- For user authentication, **AWS Cognito** is utilized to provide secure sign-up, login, and user management. It supports scalable user pools and offers multi-factor authentication for enhanced security. AWS Cognito also integrates seamlessly with other AWS services, ensuring both security and efficiency in managing user identities and access.



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Web Sockets Integration in Rooms

- **User Joins Room:**
  - WebSocket connection established using `CollaborativeIDEWebSocket` method `$connect`
  - Enables real-time collaboration and synchronization
- **Code Updates:**
  - `Updatecode` method broadcasts changes to all connected users
- **User Leaves Room:**
  - `LeaveRoomAPI` triggers `leaveRoom` Lambda function
  - Checks if user is the room owner
  - Closes room session and terminates all WebSocket connections if the user is the owner

How Room Logic is being stored and handled

APIs:

- **Create Room:** The Python Code Processing API triggers the `createRoom` method, which invokes the `store-roomDetails` Lambda function. This function records details in the DynamoDB `Room-details` table, including room ID, creation time, user ID, and active status.
- **Join Room:** When a user wants to join a room, the "`RoomCheck`" API's `check-room` method verifies if the room exists in the `Room-details` table and if it is active. If the checks pass, the user is connected to the room associated with that room ID.

DynamoDB Tables:

- Room-details: Stores information about each room, such as room ID, creation time, user ID, and active status.

Submitted Code Backend Flow

- When user submits a code, the code script is stored in an **S3 bucket** and a signal is sent to **SQS** with **room_id** as the key
- '**code-execution-status**' table is updated in db as "**Pending**"
- **run-code** function polls the SQS queue, calls the code run API and stores the output in an S3 bucket
- 'code-execution-status' table is updated in db as "**Completed**"
- Once the execution status is updated, **send-output** function fetches the output from S3 and sends it to the frontend

Code Run API

- Deployed as a **Flask API** running in a docker container
- **Isolated Sandbox Environment** to ensure security
- User can set code execution timeout
- User can define custom requirements/libraries to include in the code environment
- Configured with an **Auto Scaling Group** and an **Application Load Balancer** for scalability

THANK YOU

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