Electronics and Computer Science

Faculty of Engineering and Physical Sciences

University of Southampton Malaysia

COMP3207

CLOUD APPLICATION DEVELOPMENT

Task 1: Proposal of Cloud-Based Application - CloudTalk

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1. Clarity of the Application Proposal

Application Name: CloudTalk

Description: CloudTalk is a cloud-based real-time messaging application. This application enables people to quickly form and start group chats, easily join public chat rooms, and send messages in real-time. The application uses Google Cloud Platform (GCP) and related cloud technologies to ensure **scalability, security, and high feasibility**.

Difference from other chat platforms:

1. **Quickly create group chats**: Unlike traditional chat applications, CloudTalk allows users to quickly form and disband chat rooms, which is suitable for temporary discussions or collaboration.
2. **Public chat group function**: Unlike traditional chat applications, CloudTalk allows group admin to set groups to be public. This setting allows users to join groups by searching group IDs or names without the need for group admin approval. This makes it easier for like-minded people to group and communicate.

Intended Users:

1. **Individuals** who need a secure and private chat platform or to find like-minded people.
2. **Organizations** that need team communication for a specific short-term task.
3. **Educators** who want to improve teacher-student interaction or provide online topic discussions.

Real-World Use Cases:

1. **Freelancers and clients:** Freelancers create chat rooms to discuss project content and details with clients, communicate project progress and status in real time, and close the chat after the project is completed.
2. **Students and teachers:** Teachers create chat rooms to discuss specific topics with students, and close and save the chat room after the discussion. Teachers can also create chat rooms to communicate with students and parents about their academic performance at school
3. **Online service providers and customers:** Companies that provide online services (e.g., e-learning, e-commerce) create chat rooms to interact with customers track feedback, and close the chat room after the service is completed.
4. **Event organizers:** Event organizers create chat rooms to coordinate with participants and close them after the event.
5. **Game players:** The team leader creates chat rooms to communicate with team members in real-time during the gameplay and closes them after the game session is over.

Purpose of the Application:

CloudTalk was developed to give users a reliable, secure, and real-time messaging platform. In addition, we also want to provide users with a platform where they can quickly form and disband groups, and easily join public groups to find like-minded people.

Future development direction (Not Included in This Coursework):

1. **AI-powered chatbots**: The chatbot can automatically answer user questions and provide customer support.
2. **Voice and video calls:** This is a common feature of a chat application, but it will not be one of the features at this stage due to time constraints. However, it can be implemented in the future to improve user experience.
3. **End-to-end encryption:** This may also be implemented in the future to enhance the application's security.

2. Specificity of Requirements

Tables 1 and 2 list most of the requirements that users may have for CloudTalk. However, this coursework is unlikely to implement all requirements. It will be developed according to the priority and feasibility indicated in the tables, and the remaining features will be developed in the future.

Functional Requirements

Table 1 shows the functional requirements for CloudTalk, along with their descriptions and priorities.

	Requirement	Description	Priority
1	User Authentication & Authorization	Users can register, log in, and log out securely.	High
2	Real-Time Messaging	Users can send and receive messages in real-time.	High
3	Chat Rooms & Private Chats	Users can create and disband chat rooms easily, join group by searching group names or group ID, and one-on-one direct messaging.	High
4	Message Storage & History	User can retrieve previous messages.	High
5	Group admin authority	Group admin has the authority to change the group name, add and remove users.	High
6	File Sharing	Users can send images, videos, and documents	Medium
7	Push Notifications	Users can receive instant notifications of new messages.	Medium
8	User Status & Presence	Displays whether a user is online, offline, or typing.	Medium
9	Search & Filtering	Users can search for messages, chat rooms, and users.	Medium
10	Message Reactions	Users can react to messages with emojis or send emojis.	Low
11	User settings	Users can open and close notifications, edit username.	Low

Table 1: Functional Requirements of CloudTalk

Non-functional Requirements

Table 2 shows the non-functional requirements for CloudTalk, along with their descriptions and priorities.

	Requirement	Description	Priority
1	Scalability	Ensure that the application doesn’t become stuck when users demand grows. (High priority but challenging due to cost constraints)	High
2	Security	Provide secure authentication and encryption	High
3	Performance	Guarantee short message delivery times and low latency	High
4	Reliability	Minimize the probability of application crashes	Medium
5	Maintainability	Ensure the code is understandable and documentation is clear for easy updates and debugging in the future.	Medium
6	Usability	Provides a simple and user-friendly user interface.	Low
7	Accessibility	Make the application accessible to users with disabilities	Low

Table 2: Non-functional Requirements of CloudTalk

User stories

Table 3 shows 19 user stories for CloudTalk, along with their descriptions.

User stories	**Description**
As a user, I want to register and log in securely so that only I can access my chats.	User Authentication & Authorization
As a user, I want to send and receive messages in real-time so that I can communicate instantly.	Real-Time Messaging
As a group admin, I want to add and remove users so that I can control the environment in the group.	Group admin authority
As a user, I want to create and join chat rooms easily so that I can participate in group discussions.	Chat Rooms feature
As a user, I want to see previous messages so that I can recall what	Message Storage &

happened in the past.	History
As a user, I want to share files in chat so that I can send images, videos, and documents.	File Sharing
As a user, I want to receive notifications when I get a message so that I don't miss important messages or updates.	Push Notifications
As a user, I want to see if someone is online or typing so that I know if I should expect a message.	User Status & Presence
As a user, I want to search chat rooms by typing chat room names so that I can quickly find the room.	Search & Filtering
As a user, I want to react to specific messages with emojis so that I can express my emotions quickly.	Message Reactions
As a user, I want to modify my settings so that I can have a better experience with this application.	User settings
As a developer, I want the application can handle many users so that performance will be retained when user demand grows.	Scalability
As a user, I want my messages and personal data to not have the risk of a data breach so that I do not need to worry about privacy.	Security
As a user, I want the messages to be delivered and received instantly so that I can talk with my friends smoothly.	Performance
As a user, I want the application to be stable and not always crash so that I can rely on this application.	Reliability
As a developer, I want understandable code and clear documentation so that I can easily maintain and update the application.	Maintainability
As a user, I want the interface to be simple and user-friendly so that I can navigate the application easily.	Usability
As a user with disabilities, I want accessibility features so that I can use the application without limitations.	Accessibility

Table 3: User stories of CloudTalk

Use cases

Table 4 shows the use cases for the three roles in CloudTalk.

Role	Use Case
Regular User (e.g., Team Member, Customer, Student, Game player)	• Register, log in, and log out securely. • Send and receive real-time messages. • Create or join chat rooms. • Retrieve message history. • Send and receive files (images, videos, documents). • Receive notifications. • Edit or delete their messages.
Moderator (e.g., Community Moderator, Customer Support Representative, Teacher)	• All use cases a regular user has • Add or remove users from a chat group. • Delete messages. • Pin important messages.
Group Admin (e.g., Project Manager, Event Organizer, Business Owner)	• All use cases a moderator has • Manage chat rooms (create, edit, delete) • Change group settings (name, privacy, etc.).

Table 4: Use cases of CloudTalk

3. Feasibility and Technology Stack

Cloud Platform: **Google Cloud Platform (GCP)**

- GCP was chosen because of its high scalability, high performance, high security, high cost-effectiveness, and support for real-time messaging.

Technology Stack

Table 5 presents the selection of appropriate technologies (e.g., containers, microservices, databases) that support CloudTalk's requirements, along with their justifications.

Component	Technology	Justification
Frontend	Nuxt.js (Vue.js)	Faster than Vue, SEO-friendly, and supports a combination of client and server-side rendering for a smooth user experience. (Kurtzman, 2022)
Backend	Node.js	Fast delivery, easy scalability, quick to adapt, and easy to learn(Team, 2024)
Authentication	Firebase Authentication	Provides backend services, easy-to-use SDKs, and leverages industry standards like OAuth 2.0 and OpenID Connect. (Firebase, 2024c)
Database	Firebase Realtime Database (original: Firebase Firestore and WebSockets)	Scalable NoSQL database with real-time sync for chat messages. (Firebase, 2024a)
Hosting	Firebase Hosting	Fast, secure, CDN-backed hosting. (Firebase, 2024d)
Storage and file sharing	Cloud Storage for Firebase	Powerful, simple, and cost-effective. Firebase SDKs for Cloud Storage increase the security for file uploads and downloads. (Firebase, 2024b)
Monitoring	Google Cloud Monitoring and Logging	Provides real-time performance insights and error tracking. (Cloud, 2024)
Serverless/ FaaS	Google Function (original: Google Kubernetes Engine)	Serverless function deployment that scales automatically based on demand. Ideal for event-driven workloads(F. Cloud, 2025).
Push Notifications	Firebase Cloud Messaging (FCM) (original: not planned)	Enable background push notifications to users when the browser is inactive, or the app is closed

Table 5: Technology stack of CloudTalk

Feasibility considerations for technology selection:
Scalability: Firebase allows autoscaling to handle increased traffic.
Security: Firebase Authentication provides secure login methods with MFA.
Performance: Firebase Realtime Database ensure low-latency, real-time communication.
Cost-Effectiveness: Pay-as-you-go pricing model reduced the cost used in this application

4. Justification of Cloud Platform

The reason I use **Google Cloud Platform (GCP)** includes:

1. **Real-Time Messaging Support**: Firebase Realtime Database (which is a product of GCP) supports real-time data storage, which is critical for chat applications to ensure that messages are delivered with low latency. (Firebase, 2025a)
2. **Scalability & Performance**: Google Cloud Functions (GCF) provides an event-driven, serverless execution environment that automatically scales based on user demand, making it ideal for handling fluctuating workloads without server management. GCP also performs well in hosting and file sharing by utilising Firebase Hosting and Cloud Storage.(G. Cloud, 2025)
3. **Security**: GCP provides built-in IAM policies, Key Management Service (KMS), and Firebase Authentication to ensure that your applications have secure access controls.. (Rampersad, 2025)
4. **Cost Effectiveness & Free Tier Benefits**: It offers a free tier with Firebase services and a pay-as-you-go pricing model, making it budget-friendly for this coursework.(Firebase, 2025b)

5. Conclusion

CloudTalk is a secure, low-latency, real-time cloud chat application. This application focuses on chat room features, including quick group formation and joining public groups. It uses Google Cloud Platform (GCP) as a cloud platform, Firebase Realtime Database for real-time data storage, and Cloud Functions for backend logic, providing a serverless and scalable infrastructure that simplifies deployment and maintenance. The advantages of GCP greatly improve the security and reliability of this application.

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