



HACK-O-HIRE

CYBERPUNKS (PICT)

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IDEA PHASE SUBMISSION

DIGITAL BOX

CONTENTS:

- 1) SYSTEM DESIGN**
- 2) DATABASE DESIGN**
- 3) FUNCTIONALITY**
- 4) ANALYTICS**

INTRODUCTION

OBJECTIVE:

A unified system will be created to capture and centralize customer complaints and inquiries from various channels. This system will use document storage databases, relational databases (RDBMS), and DynamoDB for efficient data handling. While complaints from phone calls, emails, and SMS will be supported, the main emphasis will be on promoting the company's customer support app. This platform-agnostic approach will enable swift access to data and thorough analytics for enhanced customer service.

FEATURES:

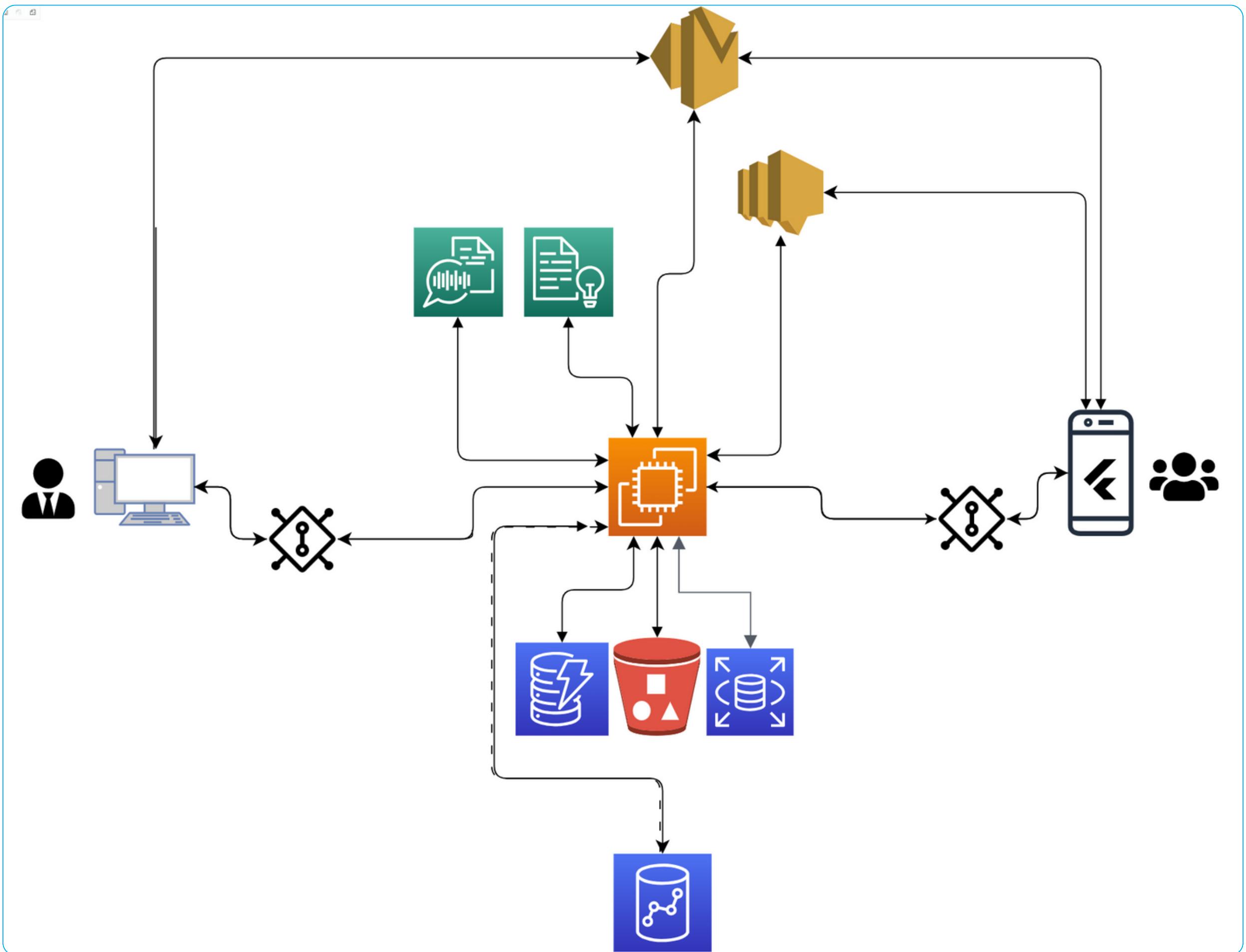
- Multi-channel Platform Independent Complaint Intake
- Two-way Communication
- Secure Document Management
- Centralized Data Storage
- Data Security and Privacy
- Analytics, Reporting And complaint priority using AI
- Audit Logs



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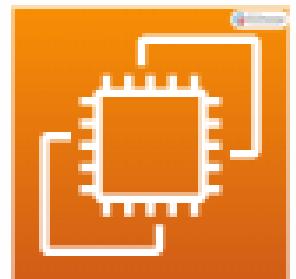
SYSTEM DESIGN



SYSTEM DESIGN FOR DIGITAL BOX

SYSTEM DESIGN ELABORATION

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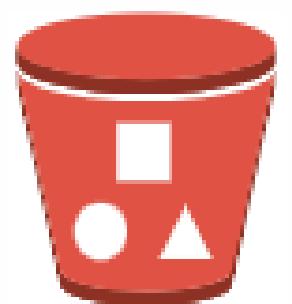
AWS EC2 (ELASTIC COMPUTE CLOUD)

We will deploy the backend server application on EC2 instances node js+express js instance to handle API requests, manage data, and orchestrate interactions between clients and representatives. EC2 provides scalable compute capacity to effectively handle varying loads



AWS RDS (RELATIONAL DATABASE SERVICE)

We will host the Postgre SQL database on RDS to store structured data such as customer information, complaint details, and audit trails. RDS offers managed database services with automated backups, scaling, and maintenance, reducing operational overhead.



AMAZON S3 (SIMPLE STORAGE SERVICE)

S3 will store attachments and files associated with complaints, such as images, documents, and recordings. It offers durable object storage with high availability and scalability, suitable for storing large volumes of multimedia content.



AMAZON DYNAMO DB

DynamoDB will store interaction history data, metadata, and other unstructured or semi-structured data that requires flexibility and scalability. Its NoSQL database model allows for fast and efficient storage and retrieval of diverse data types, ideal for dynamic interaction records.

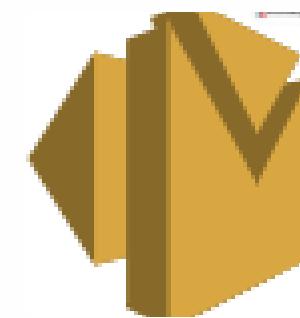
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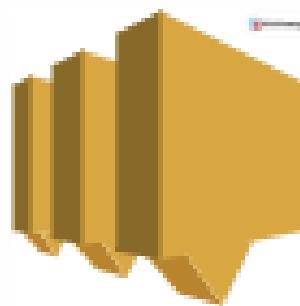
AMAZON REDSHIFT

Redshift will serve as the data warehouse for analytics, aggregating and analyzing complaint data, and customer feedback. It provides a scalable and cost-effective solution for processing and analyzing large datasets, enabling insights and decision-making. Once the complaint is resolved it will be consumed by redshift in denormalized form.



AMAZON SIMPLE EMAIL SERVICE (SES)

SES will handle outgoing email notifications and communications between the digital box system and customers or representatives. It provides a reliable and scalable email-sending service with features such as email validation, delivery tracking, and bounce management.



AMAZON SNS (SIMPLE NOTIFICATION SERVICE)

SNS will send push notifications to clients and representatives, informing them about new messages, updates, or resolved complaints. It provides a scalable and reliable messaging service, ensuring timely delivery of notifications across various channels.



AMAZON TRANSCRIBE

Transcribe will convert audio recordings of customer interactions (e.g., phone calls) into text transcripts. It will enable automatic transcription of interactions, making them searchable and analyzable, and enhancing accessibility for analysis and auditing purposes.

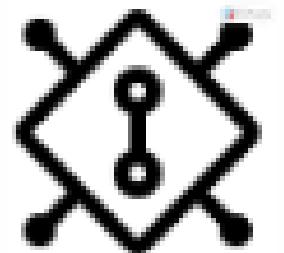
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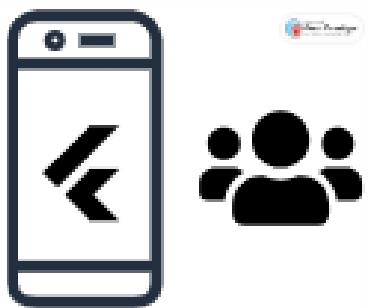
AMAZON COMPREHEND

Comprehend will perform natural language processing (NLP) tasks such as sentiment analysis, topic modeling, and language detection on textual data. It will extract insights from customer feedback, interaction notes, and complaint descriptions.



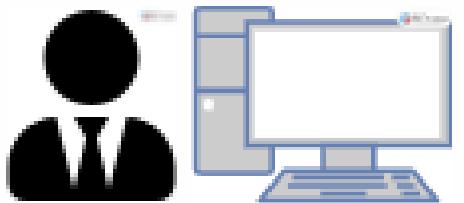
API GATEWAY

API Gateway will expose RESTful APIs for clients and representatives to interact with the backend services securely. It will handle request routing, authentication, and rate limiting, ensuring controlled access to backend resources.



FLUTTER ON CLIENT SIDE

We will use Flutter for cross-platform mobile app development, allowing clients to access the digital box functionality on both iOS and Android devices. Flutter provides a rich set of UI components and tools for building intuitive and responsive mobile applications. Flutter allows faster development and faster shipping of updates to the market with changing needs.



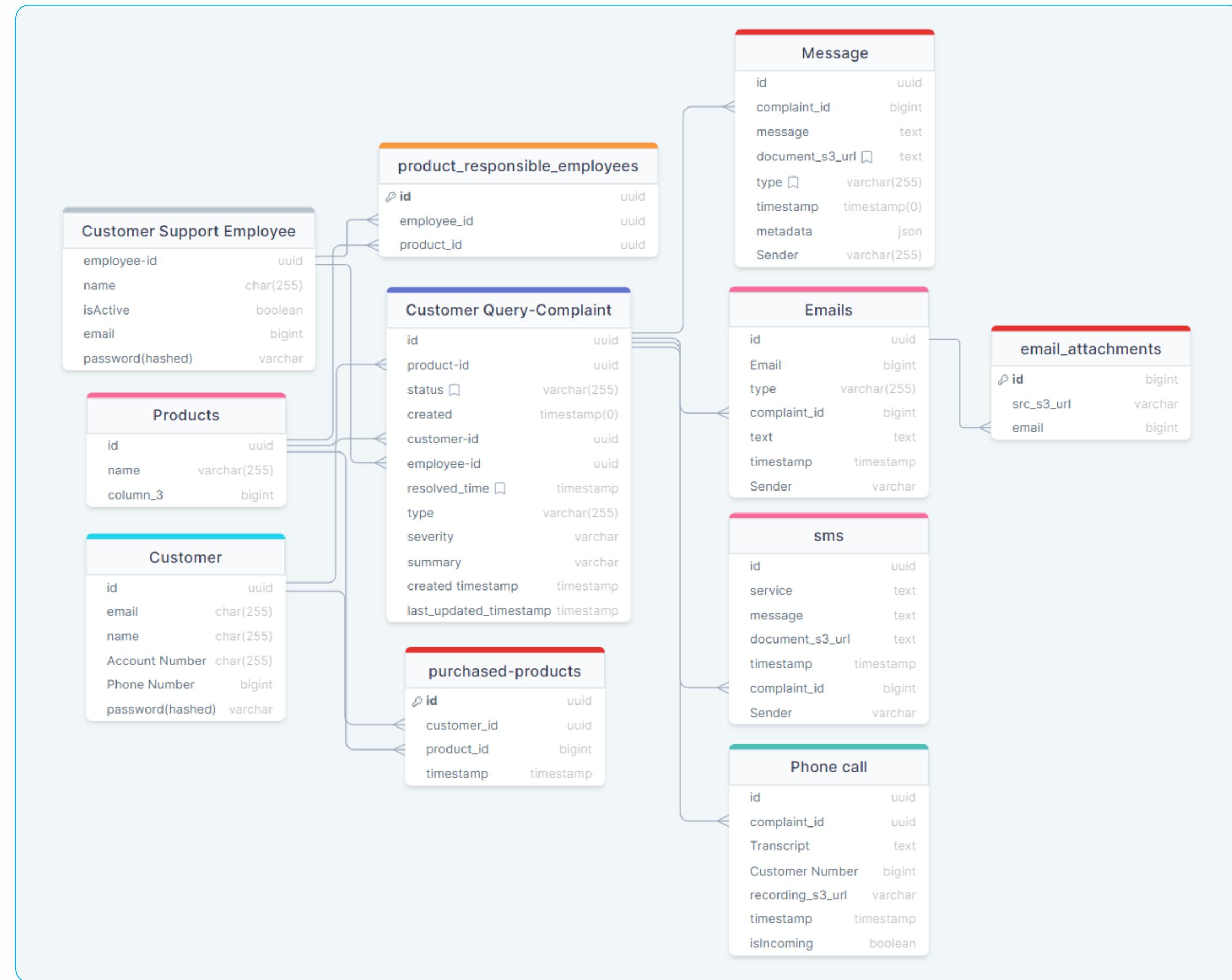
REPRESENTATIVE SIDE

Representatives can access the system via web or desktop apps using our API Gateway, facilitating secure communication with backend services through RESTful APIs, system will automatically assign the complaints to responsible representatives from the active queue

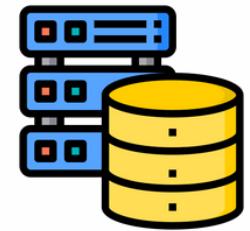


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2 | DATABASE DESIGN



DB-SCHEMA FOR RELATIONAL DATABASE



COMPLAINT -QUERY CENTRIC DATABASE

CHALLENGE:

Disjointed communication across email, phone, and SMS makes it difficult to track complaint history and resolve issues efficiently.

SOLUTION:

A centralized database with a core "Complaint-Query" table.

HOW IT WORKS:

Complaint-Query acts as a central hub for all customer complaints.

It links to individual "Messages", "Email", "SMS", and "Phone calls Transcript" entries, capturing each communication exchange between customer and employee within the complaint interaction.

This creates a complete record of the complaint history, regardless of the initial communication channel (email, phone, SMS, or in-app chat).

BENEFITS:

Unified View: Track the entire complaint journey in one place.

Faster Resolution: Easier access to historical details for efficient problem-solving.

Flexibility: Handles both simple and complex complaints with multiple messages or product concerns.

Next: We'll explore the specific tables and their relationships in the schema

MAJOR TABLES



COMPLAINT-QUERY TABLE

Table To Store one complaint instance between a customer and customer-support-employee

Status: whether it is resolved(default = pending)

Message-id: One(complaint)-to-many(messages)

Summary: obtained from AWS comprehend



MESSAGE TABLE

The objective of this table is to store all the in-app messages

Message: store the Text field

URL: Attachment URL(default = null)

Metadata: Appropriate metadata in JSON regarding URL (default=NULL)



ALTERNATE COMMUNICATION TABLES

Includes sms's, phonecall(transcripts) , email table. an instance of a complaint on these platforms will redirect customers to the chatting platform, generating a complaint instance

Phone calls/SMSs/emails associated with the complaint will be one-to-many in the complaint-query table instance.



HYBRID DATABASE STRATEGY FOR HIGH READ THROUGHPUT

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CHALLENGE:

- In a relational database (PostgreSQL), retrieving all details for a single resolved complaint can be slow.
- Related data like phone calls, emails, and SMS may be scattered across tables, requiring complex nested queries that impact performance.
- Retrieving all details for a single complaint from a relational DB is not ideal.

SOLUTION:

DynamoDB for Resolved Complaints:

- Leverage DynamoDB, a NoSQL key-value store, to store all data for a resolved complaint in a single JSON document.
- This document includes core details, foreign keys, and denormalized fields
- Each complaint document can contain arrays of related data like phone call transcripts, SMS, and emails.

EXAMPLE DYNAMO DB DOCUMENT STRUCTURE (COMPLAINT):

```
{  
  "complaintTicketId": {  
    "complaintId": "CT123456",  
    "customerId": "C789"  
  },  
  "customerInformation": {  
    "name": "John Doe",  
    "contactInformation": {...},  
    "accountId": "A123456"  
  },  
  "complaintDetails": {...},  
  "interactionHistory": [  
    {...},  
    {...},  
    {...},  
    {...}  
  ],  
  "additionalMetadata": {  
    "location": "City X",  
    "customerFeedback": "",  
    "tagsLabels": [...]  
  },  
  "auditTrail": {...}  
}
```



DOCUMENT HANDLING WITH AWS-S3

BENEFITS:

SCALABILITY:

Effortlessly scale storage capacity up or down based on your needs. S3 can handle massive datasets efficiently.

DURABILITY:

S3 boasts exceptional durability, designed for 99.999999999% (11 nines) of data durability, minimizing data loss risks.

COST-EFFECTIVENESS:

S3 utilizes a pay-as-you-go pricing model. You only pay for the storage you use and the requests you make.

SECURITY:

Implement robust security measures with features like:

IAM (Identity and Access Management): Control who can access your S3 buckets and what actions they can perform.

ENCRYPTION:

Encrypt data at rest (within S3) and in transit for enhanced protection.

BUCKET POLICIES:

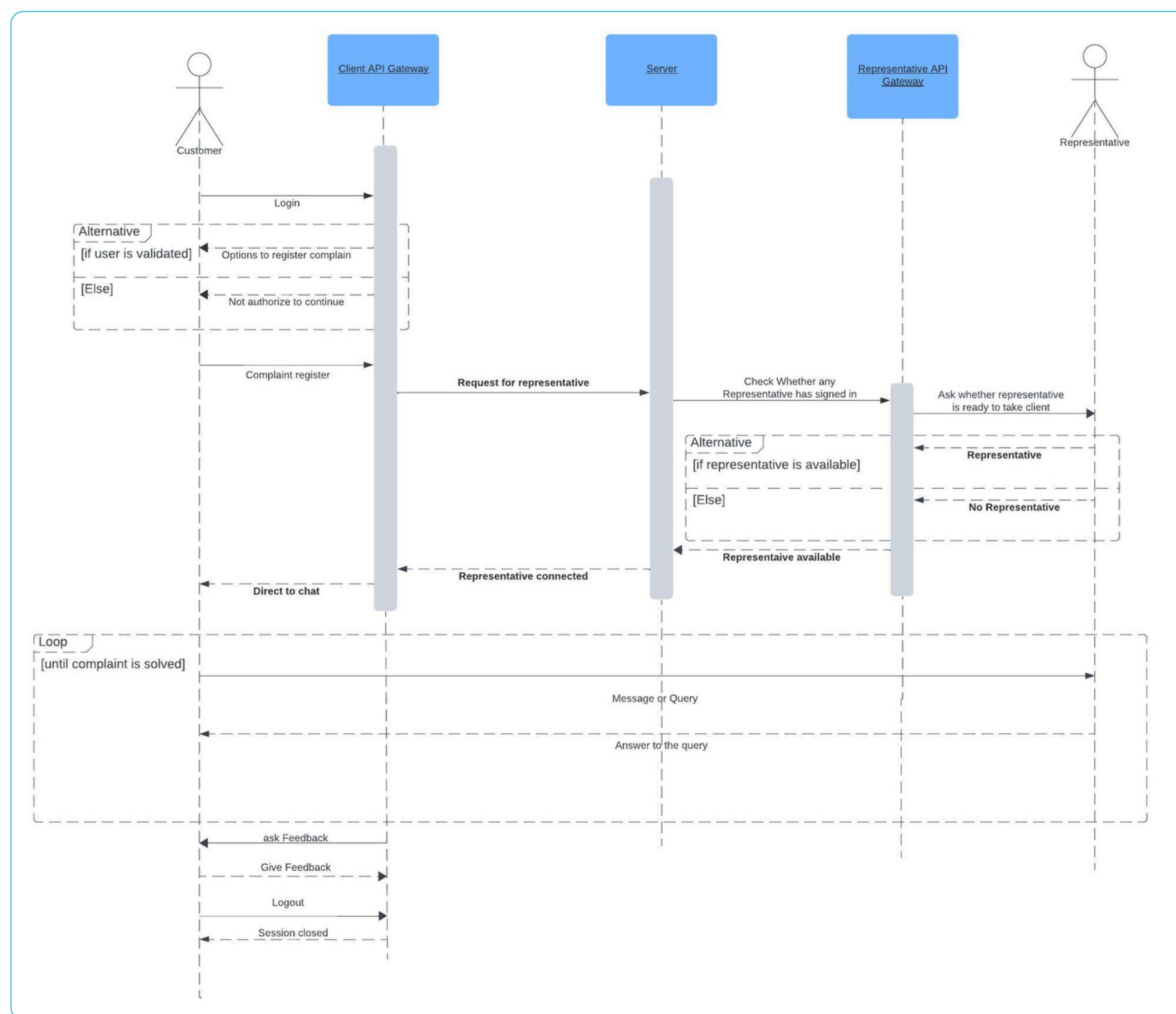
Define policies to specify authorized users and actions for each bucket.



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FUNCTIONALITY



SEQUENCE DIAGRAM

SEQUENCE DIAGRAM ELABORATION

The system utilizes an API gateway for authentication and managing active representatives and customers. It begins with customer login authentication. Upon successful validation of credentials, customers gain access to register complaints.

After the customer registers a complaint, the system verifies if any representatives are logged in. If a representative is available, the system prompts them to confirm readiness to assist a client. Subsequently, the customer is directed to a chat session with the representative. Conversely, if no representatives are available, the system notifies the customer accordingly.

The chat session persists in a loop until the complaint is resolved. Within this session, the customer can send messages, queries, and associated files or documents to the representative. Similarly, the representative can provide responses and assistance. Once the complaint is resolved, the representative can conclude the session and mark the complaint as solved.

Once the complaint is resolved, the system prompts the customer for feedback. The customer can then provide feedback or choose to log out of the system.



ADDITIONAL FUNCTIONALITIES

The system enables customers to register complaints through alternative channels, including email or phone.

Representatives have access to customer history and associated documents, along with comprehensive details of the complaint, including previous representatives, query status, and other relevant information.

The system will generate reports on customer complaints, facilitating analysis for management. These reports aid in identifying areas for improvement in the complaint-handling process. Additionally, they enable adjustments to staffing levels based on peak complaint periods.

Ensure representatives are adhering to complaint and communication protocols. If not, a mail would be sent to the representative regarding the issue. This is to ensure customer satisfaction. And it ensures that problems are addressed according to its severity.



MOBILE APPLICATION

OBJECTIVE:

Our design of The Digital Box mobile app aims to streamline customer communication, complaints handling, and document management across various digital channels while prioritizing data privacy and enhancing overall customer satisfaction.

KEY FEATURES:

- **TWO-WAY INTERACTIVE CAPABILITIES:**
Enables seamless Centralized two-way communication between customers and customer service representatives for addressing complaints and queries.
(including SMS, email, and in-app notifications, into a unified inbox.)
- **ACCESS TO STORED CUSTOMER COMMUNICATIONS:**
Provides secure access to stored customer communications, including queries, complaints, and resolutions, facilitating efficient management and resolution.
- **SECURE DOCUMENT UPLOAD/DOWNLOAD:**
Facilitates secure upload and download of documents at the customer level, ensuring data privacy and confidentiality.



MOBILE APPLICATION

DESIGN CONSIDERATIONS:

- Supports multiple digital channels (e.g., SMS, in-app notifications, email) for communication and document exchange.
- Ensures consistent storage of logs for each communication channel.
- Showcases all documents, communications, complaints, and resolutions exchanged with customers.
- Maintains audit logs of each customer communication for transparency and accountability.

BENEFITS:

- Enhances customer experience and satisfaction by providing a comprehensive view of customer interactions and documents.
- Simplifies communication across products and services, leading to improved complaints handling and resolution.
- Streamlines document management processes, facilitating ease of access and retrieval.



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ANAYLTICS



CENTRALIZED COMPLAINT DATA ANALYSIS WITH REDSHIFT

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CHALLENGE:

Gaining actionable insights from siloed customer complaint data across channels (email, phone, SMS, in-app chat).

SOLUTION:

A centralized data warehouse built on Amazon Redshift(for resolved complaints).

BENEFITS:

- Scalable storage for large datasets of resolved complaints.
- This Data can be consumed by QlikView MI TO GENERATE COMPREHENSIVE REPORTS
- Optimized query performance for efficient analysis.

CORE CONCEPT: DENORMALIZED COMPLAINT-QUERY TABLE

- Stores key complaint details (customer ID, status, type, product).
- Maintains foreign keys for relationships with other tables (Customer, Employee, Product).
- Denormalized fields (optional): strategically include frequently accessed data from related tables (e.g., message summaries, phone call transcripts).



UNLOCKING INSIGHTS WITH AWS COMPREHEND

CHALLENGE:

Extracting meaning and trends from unstructured complaint text.

SOLUTION:

Leverage AWS Comprehend, a powerful Natural Language Processing (NLP) service.

CAPABILITIES:

- Entity Recognition: Identify key entities like products, and issue types.
- Sentiment Analysis: Gauge customer satisfaction from complaint text.
- Key Phrase Extraction: Understand recurring themes and topics.
- (Optional) Custom Entities: Train AWS Comprehend for specific product terminology.

ANALYSIS WORKFLOW:

- Extract complaint text from Redshift (message content field).
- Send text to Comprehend for analysis (e.g., entity recognition, sentiment).
- Store analysis results back in Redshift (e.g., identified entities, sentiment scores).

BENEFITS:

- Identify product issues and trends.
- Understand customer concerns and preferences.
- Improve customer service and product offerings.

CONCLUSION

- Our design of The Digital Box mobile app represents a significant advancement in customer communication and document management. By providing a seamless and intuitive user experience, the app empowers users to efficiently handle customer interactions, complaints, and document exchanges across various digital channels.
- With a focus on security and privacy, the Digital Box app ensures that sensitive data is protected through robust encryption and authentication mechanisms. This commitment to security instills trust and confidence among users, reinforcing the app's value proposition.
- In summary, the Digital Box solution employs ETL (Extract, Transform, Load) techniques to seamlessly integrate diverse data sources. By prioritizing support for phone calls, emails, SMS, and our customer support app, we ensure swift data access and robust analytics. This unified approach revolutionizes complaint management, driving enhanced customer service and satisfaction.