

Open Banking Hybrid Cloud Architecture

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Abstract : Individual Banks and the Banking System as a whole make a home for a large chunk of its client data and various forms of possible interactions and transactions that are carried by the end-users of the bank. Due to security purposes, this data presently is being given very limited access to the users and staling out in the Banking Databases. There is a need to design a system for making this information publically available for upcoming SMEs and individuals those can benefit from the potentially existing demographic trends keeping a check of the possibly emerging regulatory threats.

We plan on building a system called **Open Hybrid Multi Cloud System** which would have the following features:-

- Making the information being withheld by the Banking organizations, publically available for upcoming SMEs and individuals those can benefit from the potentially existing demographic trends.
- Assumptions:
 1. All the security threats have been taken into consideration and resolved.
 2. Considering banks as virtual entities with no real life existence.
 3. We have customer consent access to their transactional data.

Keywords: Bank , data, API, cloud , open banking.

I. INTRODUCTION

Open banking is also known as "open bank data." Open banking is a banking practice that provides third-party financial service providers open access to consumer banking, transaction, and other financial data from banks and non-bank financial institutions through the use of application programming interfaces (APIs). Open banking will allow the networking of accounts and data across institutions for use by consumers, financial institutions, and third-party service providers. Open banking is becoming a major source of innovation that is poised to reshape the banking industry.

Under open banking, banks allow access and control of customers personal and financial data to third-party service providers, which are typically tech startups and online financial service vendors. Customers are normally required to grant some kind of consent to let the bank allow such access, such as checking a box on a terms-of-service screen in an online app. Third-party providers APIs can then use the customer's shared data (and data about the customer's financial counterparties). Uses might include comparing the customer's accounts and transaction history to a range of financial service options,

aggregating data across participating financial institutions and customers to create marketing profiles, or making new transactions and account changes on the customer's behalf.

Through the use of networked accounts, open banking could help lenders get a more accurate picture of a consumer's financial situation and risk level in order to offer more profitable loan terms. It could also help consumers get a more accurate picture of their own finances before taking on debt. An open banking app for customers who want to buy a home could automatically calculate what customers can afford based on all the information in their accounts, perhaps providing a more reliable picture than mortgage lending guidelines currently provide.

The paper is organized as follows:

In Section 1, the introduction of the paper is provided along with the structure, important terms, objectives and overall description. In Section 2 we discuss related work. In Section 3 we have the complete information about the technology and stack that have been used to demonstrate end to end automated invoicing. Section 4

tells us about the methodology and the process description. Section 5 tells us about the future scope and concludes the paper with acknowledgement and references.

Objectives

This project aims to address some of the problems in current systems by providing a user friendly interface to see the trends in different demographic regions.

Front-End Development Objectives:

- Brainstorm and design freehand.
- Design dynamic XD Designs.
- Build a clean user-interface.
- Build a neat user-experience.
- Develop easy to use and understandable front-end.
- Achieve the goal of “right information at the right time”.

Backend Development Objectives:

- Develop a scalable project.
- Developing a fully-testable codebase
- Testing APIs
- Automating Tests and continuous build/integration.
- Automating strict request validations.
- Deliver RESTful API Endpoints

II. RELATED WORK

1) Banking on open hybrid multicloud, Published By Anthony Lipp, Global Head of Strategy for Banking and Financial Markets and IBM Industry Academy member Originally published 01 December 2020

Open hybrid multicloud is a foundational environment enabling effective digital transformation that integrates traditional computing platforms with private, public, and managed cloud services. In essence, a hybrid cloud becomes a virtual computing environment that aligns workloads and interfaces with the most appropriate computing platform. All these services need to be

managed as though they were designed to behave as a single unified environment.

2) Know all about Account Aggregator Network- a financial data-sharing system , Posted On: 10 SEP 2021 8:00AM by PIB Delhi , (Release ID: 1753713)

An Account Aggregator (AA) is a type of RBI regulated entity (with an NBFC-AA license) that helps an individual securely and digitally access and share information from one financial institution they have an account with to any other regulated financial institution in the AA network. **Data cannot be shared without the consent of the individual.** There will be many Account Aggregators an individual can choose between. Account Aggregator replaces the long terms and conditions form of ‘blank cheque’ acceptance with a granular, step by step permission and control for each use of your data.

3) Cloud Usage in the Financial Services Sector, Release Date: 02/21/2020

This survey analyzes the level of adoption of cloud solutions and requirements from financial institutions’ perspectives. The study analyzed the cloud usage of financial institutions across three main areas of interest: security concerns, regulatory requirements, and governance aspects.

This survey was created and completed by members of the Financial Services Stakeholders Platform, a CSA working group whose main objective is to identify and share the challenges, risks and best practices for the development, deployment and management of secure cloud services in the financial services industry.

4) Multi Cloud Security Written by Madhukeshwar Bhat, Director, Chapter Development, CSA Bangalore, and Rob Aragao, Chief Security Strategist, CyberRes Blog Article Published: 02/17/2022

Multi-cloud approaches come with several benefits; though there are challenges as well. In order to realize the intended benefits, several challenges need to be addressed. The idea of cloud computing isn’t new. Perhaps, it took several decades for cloud computing to become a commercial phenomenon. Today, cloud has become an integral part of enterprise business strategy. Research firm Gartner predicts that 85% of organizations will embrace a cloud-first principle by 2025 and estimates that over 95% of new digital workloads will be deployed on cloud-native platforms, up from 30% in 2021.

III. TECHNOLOGIES USED

Numerous technologies have been used to develop this end to end system.

NodeJS

Node.js is an open-source, cross-platform JavaScript runtime environment that executes JavaScript code outside of a browser. Node.js lets developers use JavaScript to write command line tools and for server-side scripting—running scripts server-side to produce dynamic web page content before the page is sent to the user's web browser. Consequently, Node.js represents a "JavaScript everywhere" paradigm, unifying web application development around a single programming language, rather than different languages for server side and client side scripts. Node.js distributed development project, governed by the Node.js Foundation, is facilitated by the Linux Foundation's Collaborative Projects program. Corporate users of Node.js software include GoDaddy, Groupon, IBM, LinkedIn, Microsoft, Netflix, PayPal, Rakuten, SAP, Voxer, Walmart, and Yahoo!

MongoDB

MongoDB is an open source database management system (DBMS) that uses a document-oriented database model which supports various forms of data. It is one of numerous nonrelational database technologies which arose in the mid-2000s under the NoSQL banner for use in big data applications and other processing jobs involving data that doesn't fit well in a rigid relational model. Instead of using tables and rows as in relational databases, the MongoDB architecture is made up of collections and documents.

React

React (also known as React.js or ReactJS) is a JavaScript library for building user interfaces. It is maintained by Facebook and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications, as it's optimal only for its intended use of being the quickest method to fetch rapidly changing data that needs to be recorded. However, fetching data is only the beginning of what happens on a web page, which is why complex React applications usually require the use of additional libraries for state management, routing, and interaction with an API. React was created by Jordan Walke, a

software engineer at Facebook. He was influenced by XHP, an HTML component framework for PHP. It was first deployed on Facebook's newsfeed in 2011 and later on Instagram.com in 2012. It was open-sourced at JSConf US in May 2013. React Native, which enables native Android, iOS, and UWP development with React, was announced at Facebook's React.js Conf in February 2015 and opensourced in March 2015. On April 18, 2017, Facebook announced React Fiber, a new core algorithm of React framework library for building user interfaces. React Fiber was to become the foundation of any future improvements and feature development of the React framework. On April 19, 2017, React 360 V1.0.0 was released to the public. This allowed developers with experience using React to jump into VR development.

ExpressJs

Express.js, or simply Express, is a back end web application framework for Node.js, released as free and open-source software under the MIT License. It is designed for building web applications and APIs. It has been called the de facto standard server framework for Node.js.

Mongo Atlas

Database-as-a-Service (DBaaS) is a service that allows you to set up, deploy, and scale a database without worrying about on-premise physical hardware, software updates, and the details of configuring for performance. With DBaaS, a cloud provider does all that for you—and gets you up and running right away.

MongoDB Atlas is a fully-managed cloud database that handles all the complexity of deploying, managing, and healing your deployments on the cloud service provider of your choice (AWS, Azure, and GCP). MongoDB Atlas is the best way to deploy, run, and scale MongoDB in the cloud. With Atlas, you'll have a MongoDB database running with just a few clicks, and in just a few minutes.

JWT

JWT, or JSON Web Token, is an open standard used to share security information between two parties — a client and a server. Each JWT contains encoded JSON objects, including a set of claims. JWTs are signed using a cryptographic algorithm to ensure that the claims cannot be altered after the token is issued. JWTs differ from other web tokens in that they contain a set of claims. Claims are used to transmit information between two parties. What

these claims are depends on the use case at hand. For example, a claim may assert who issued the token, how long it is valid for, or what permissions the client has been granted.

Redux

Redux is a pattern and library for managing and updating application state, using events called "actions". It serves as a centralized store for state that needs to be used across your entire application, with rules ensuring that the state can only be updated in a predictable fashion. Redux helps you manage "global" state - state that is needed across many parts of your application.

The patterns and tools provided by Redux make it easier to understand when, where, why, and how the state in your application is being updated, and how your application logic will behave when those changes occur. Redux guides you towards writing code that is predictable and testable, which helps give you confidence that your application will work as expected.

Rest Api

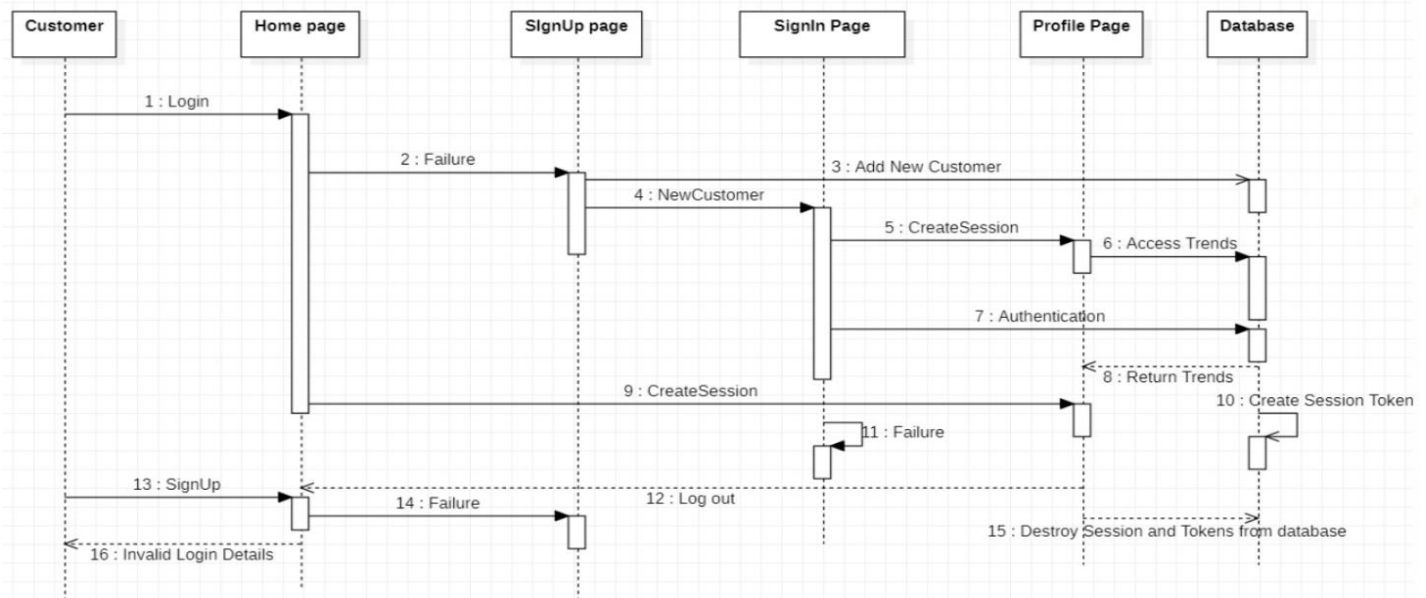
An API is a set of definitions and protocols for building and integrating application software. It's sometimes referred to as a contract between an information provider and an information user—establishing the content required from the consumer (the call) and the content required by the producer (the response). REST is a set of architectural constraints, not a protocol or a standard. API developers can implement REST in a variety of ways.

When a client request is made via a RESTful API, it transfers a representation of the state of the resource to the requester or endpoint. This information, or representation, is delivered in one of several formats via HTTP: JSON (Javascript Object Notation), HTML, XLT, Python, PHP, or plain text. JSON is the most generally popular file format to use because, despite its name, it's language-agnostic, as well as readable by both humans and machines.

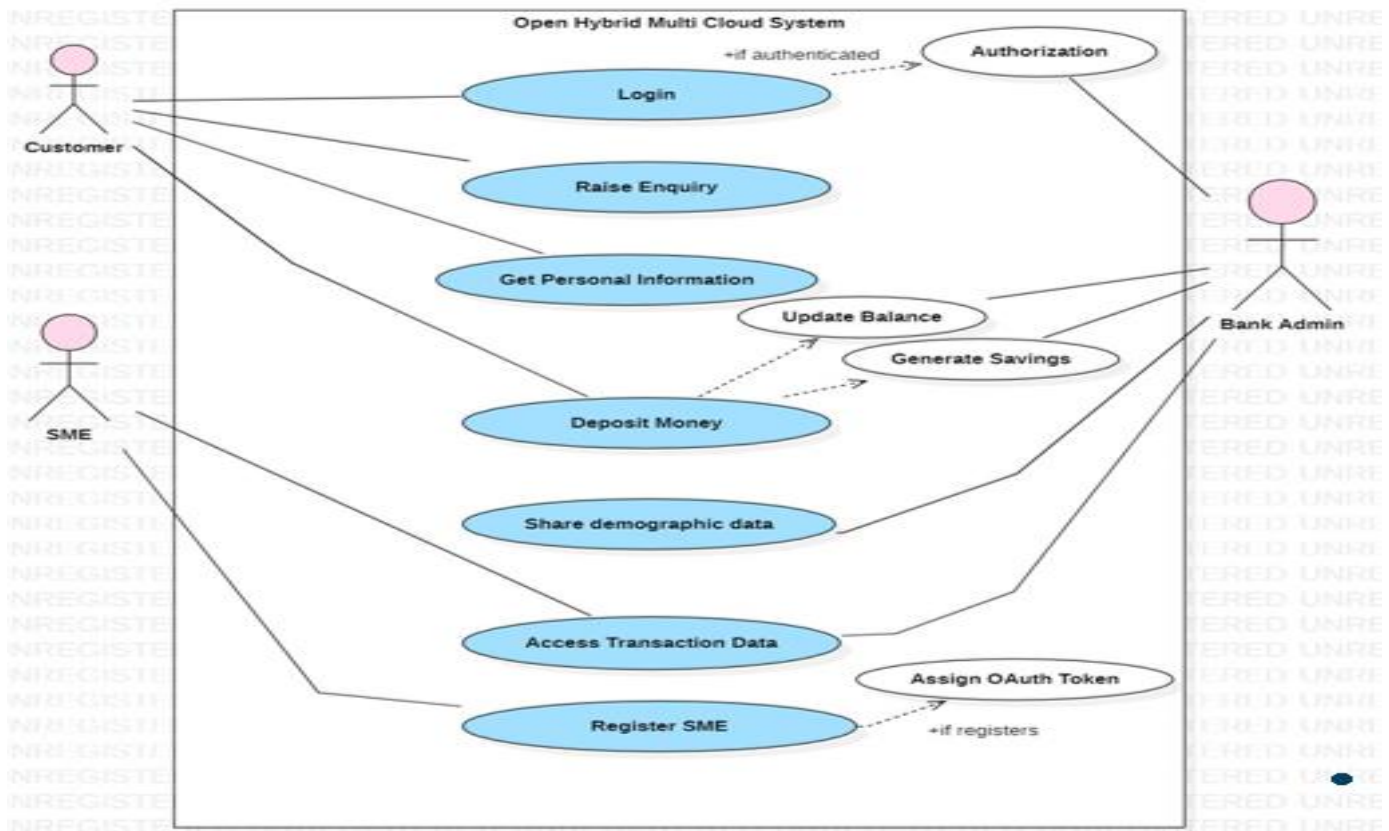
V. METHODOLOGY

It works on the principle of Hybrid mutlicloud system which revolves around the following terminologies:-

1. Private cloud: Each and every bank that comes in compliance to give access to their client database needs to shift, to a private cloud environment within secured, and fully owned technical frameworks. The banks will be asked to share the customer data based on certain fields, this data will ensures that the customer's private data remains intact.
2. Public cloud: Through an enhanced public cloud, tailored for financial services, that is interoperable with private cloud systems.
3. Hybrid Cloud: The Hybrid Cloud service integrate all the services needed as though they were designed to behave as a single unified environment.
4. End users and SME: Redefining customer engagement in the context of user ecosystems. SME get to monitor the market trends and help them in making suitable changes to their business model.



Sequence Diagram



VI. CONCLUSION

We build a system called **Open Hybrid Multi Cloud System** which makes the information being withheld by the Banking organizations, publically available for upcoming SMEs and individuals those can benefit from the potentially existing demographic trends.

The data representation using graphs allows the ease in observing the trends throughout the region and thus have various advantages:

- Easier for startups and businesses to access demographic data.
- One stop solution to get information on demand.
- Reduces the amount of unused data in banking systems.

VII. FUTURE WORK

With a data revolution upon us, tomorrow's leaders must embrace the value and benefits of open banking today. Countries around the world are at different stages of adoption, some relying heavily on regulation and others being led by the markets. We believe the industry does not need to wait for this regulation and we encourage banks and other institutions to proactively enable access to wider data sets.

Open banking has unleashed a wave of innovation and we expect to see continued rapid growth as more markets uncover the best ways to capitalize on open banking access or enhance its capabilities. As the data and regulatory foundations for open banking are being built around the world, the network effects of data, financial institutions, fintech companies and consumers will continue to provide massive benefits to businesses and consumers alike.

As a feature for advanced functionality in the future consumers would be able to opt into a range of services, such as better loan matching or debt reduction advice, to help them do more with their money.

An open hybrid multi cloud environment can help banks boost the performance of other exponential technologies such as AI, Robotics, IOT, 5G etc.

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