Computer Engineering Department

Assistance Chatbot for Android Developers

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Introduction

Background: Android is the most popular operating system for the smartphone. Google announced that there are 2 billion monthly active devices which are running android. These facts encourage the companies and android developers to build innovative and useful apps on the platform to reach broader user base.

Problem: Current web-based search engines and developer forums require android developers to search with specific and simple keywords rather than in a full question format. This restricts developers to express their queries as they like. Also these platforms don't maintain context between the subsequent searches.

Solution: We aim to crawl existing Android developer forums and use the dataset to train models using machine learning tools. The goal is to provide the best possible solution to android questions where a chatbot can also maintain context and provide seamless experience.

System Architecture

The design implementation of the chatbot is a cloud-based platform that receives the Android related questions in the textual or voice format from the end user and finds out the most similar match of the question from the database.

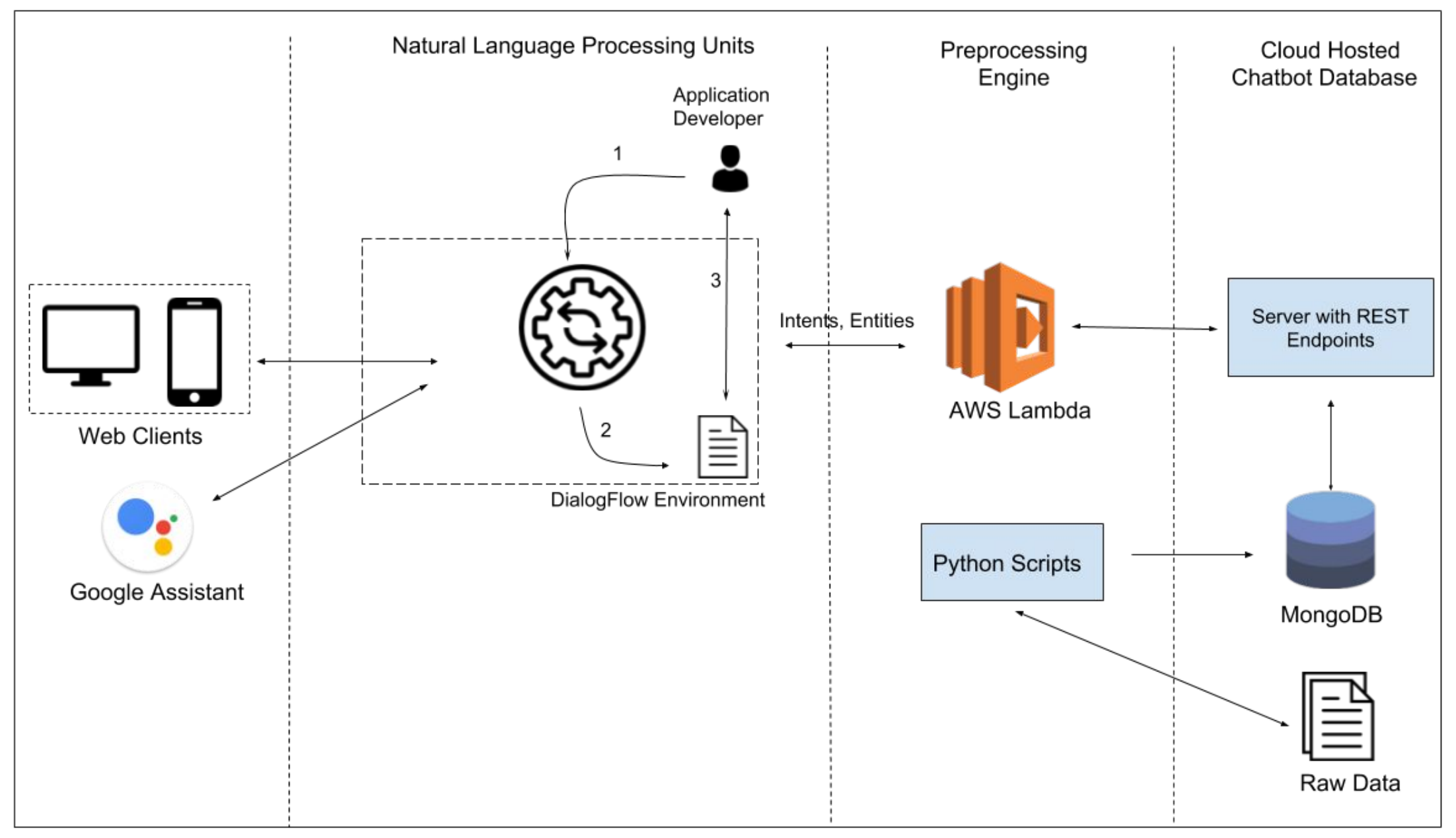


Fig. 1 Project Architecture

The answer of the question is searched through the available dataset and answer is provided in either text or voice format based on the client from which the request has been made. The entire service stack is hosted on the Amazon Web Service cloud.

Implementation

Frontend Client

For any chatbot application, a web application is a necessary component so that user can access the chatbot across any standard browser on different OS. We have the web application developed in NodeJS using Express framework. NodeJS is a JavaScript framework helps to build an application with a dynamic user interface.

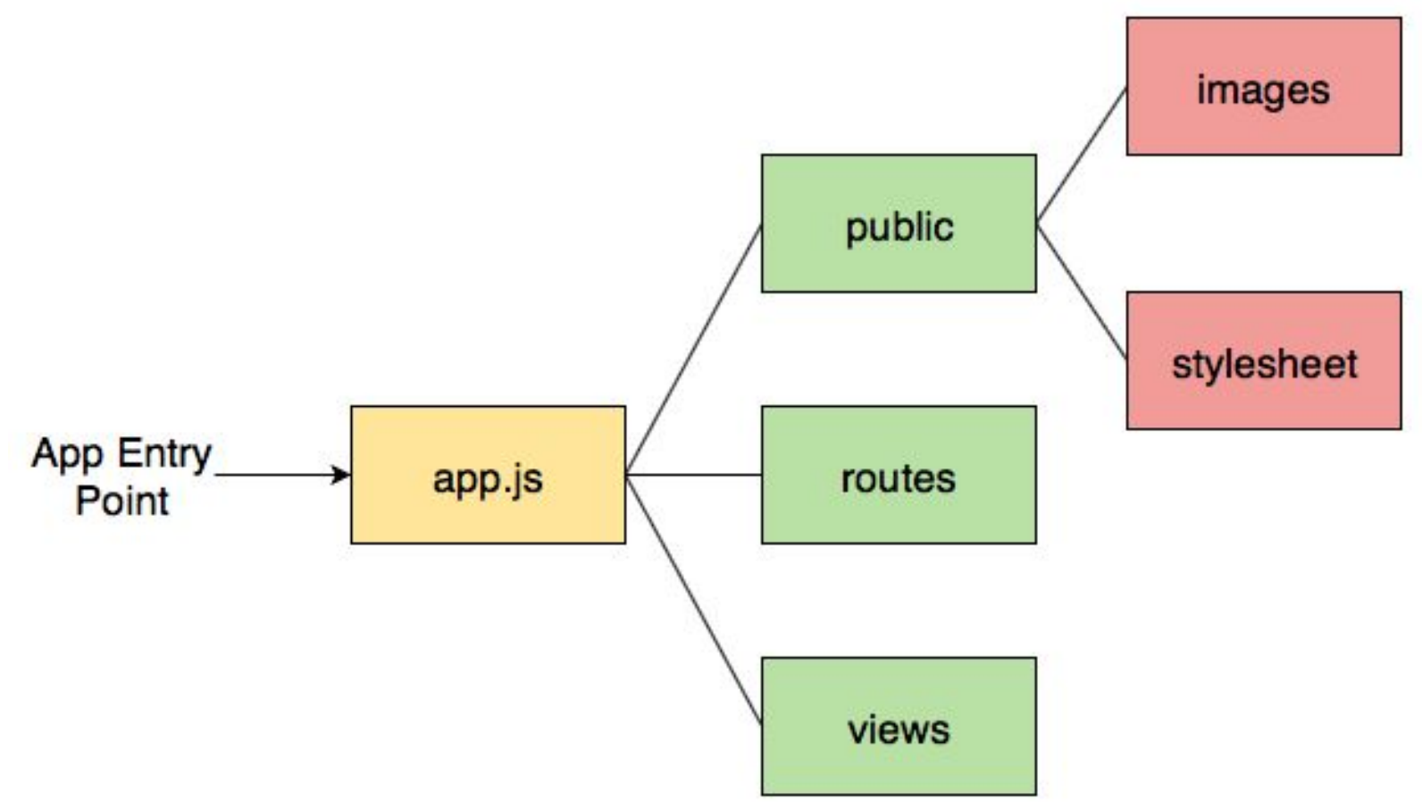


Fig. 2 NodeJS Frontend Application

Web client also accepts the input in the audio format. Google Cloud's speech-to-text service has been integrated and speech is converted into text in real-time.

DialogFlow

DialogFlow is the Natural Language Processing and understanding (NLP) framework provided Google. It serves as the main component of the project. DialogFlow helps to detect the intent from the text provided by the end user. It also extracts the entities from the text provided. DialogFlow provides the better accuracy for the NLP as compared to a new NLP processor built from the scratch.

Intent Type	Training Phrases
Package	● How to use java.xml.parsers package? ● Give the details of java.xml.parsers package.
UI Element	● Give me the sample image of GlassActionBar ● What is the UI element of GlassActionBar?
Diagnostic Code	● What is the diagnostic code for LCD? ● Tell me the code for camera

Table. 1 Sample Intents and Training Phrases

AWS Lambda

The DialogFlow fetches the intent and entity from the asked question and passes it to the AWS Lambda webhook api which is further delegated to backend restful api. The Lambda is responsible to execute business logic based on the incoming intent and entities from DialogFlow. This Lambda api is developed on NodeJS 8.10 platform. Here, the core of the application logic is executed. It is responsible to create a formatted http request URL to invoke the GET request of backend restful api.

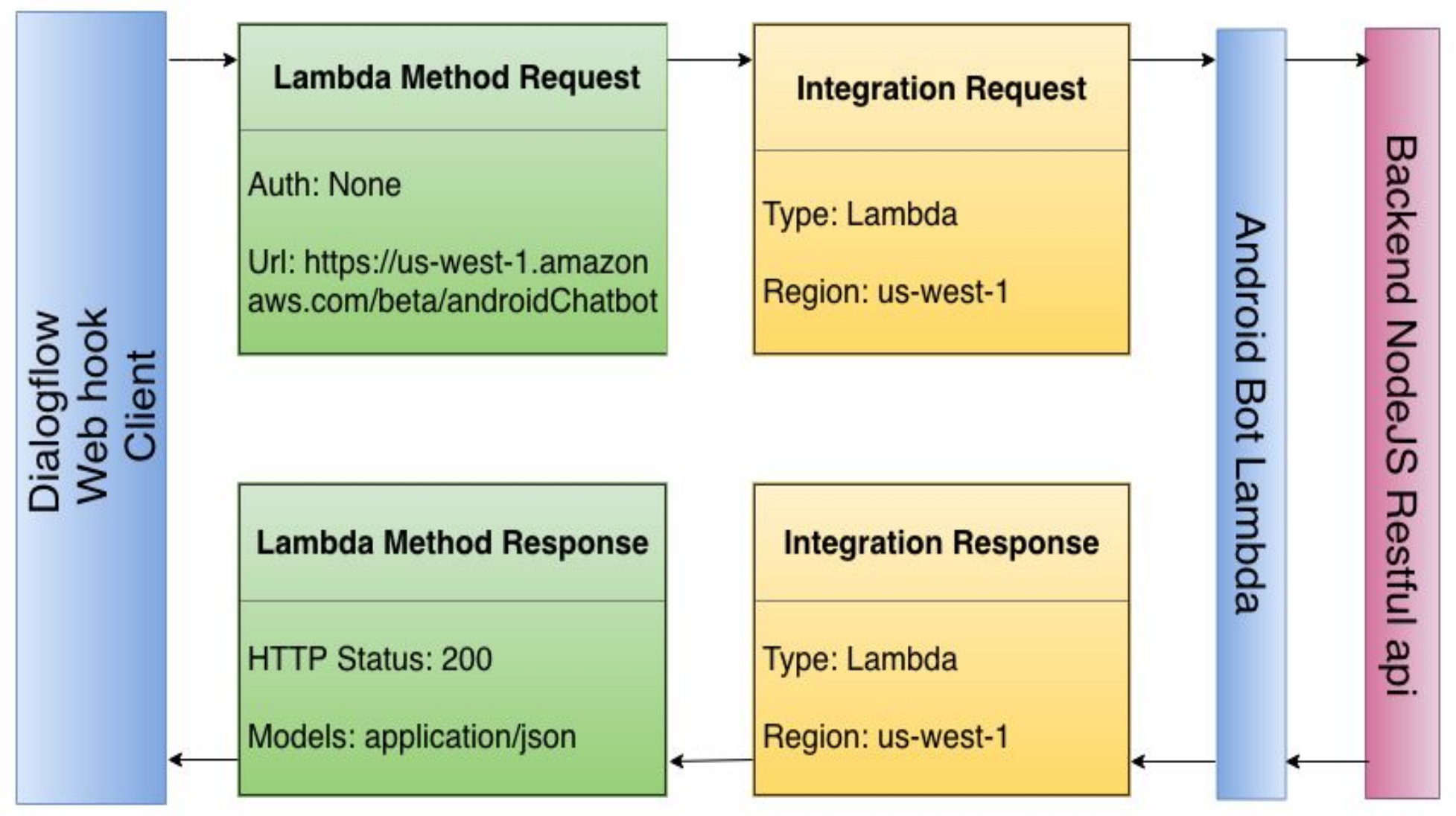


Fig. 3 AWS Lambda Interaction Diagram

The backend api is invoked with intent, entities passed as parameters in request and lambda receives the response from backend api based on them. The lambda sends back the response in a user readable format to DialogFlow.

Backend API & Data Processing

The last part is the data in various formats like csv, xml. The data is gathered using some crawlers, from public forums, official Android websites, knowledge markets and many more. The data processing, structuring, cleaning is done through the scripts and that inserts data in MongoDB database. The rest endpoints are created and returns proper answers from the database to AWS Lambda. For Some components deep learning neural network with Tensorflow, TFLearn is also used to find the answer.

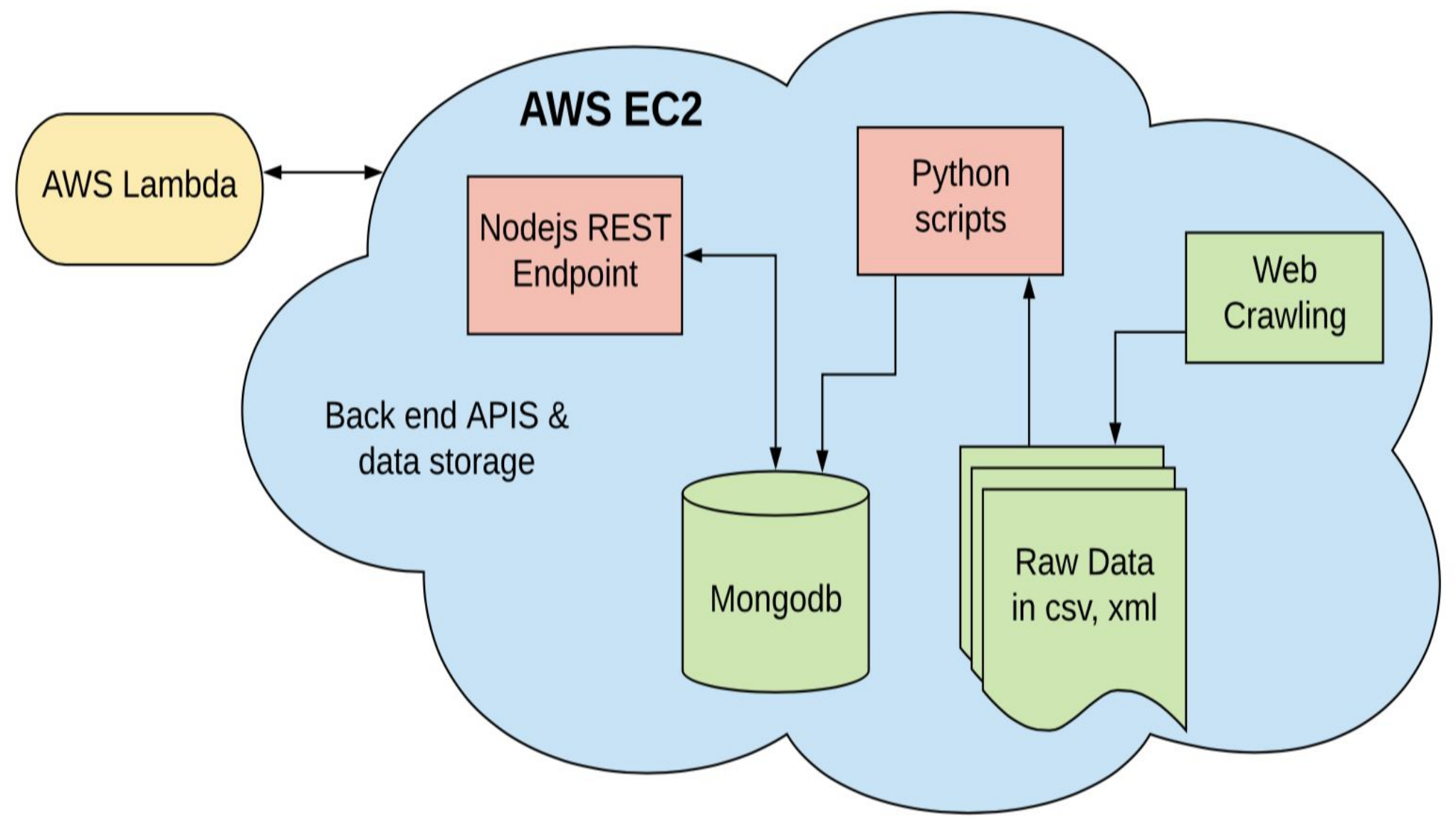
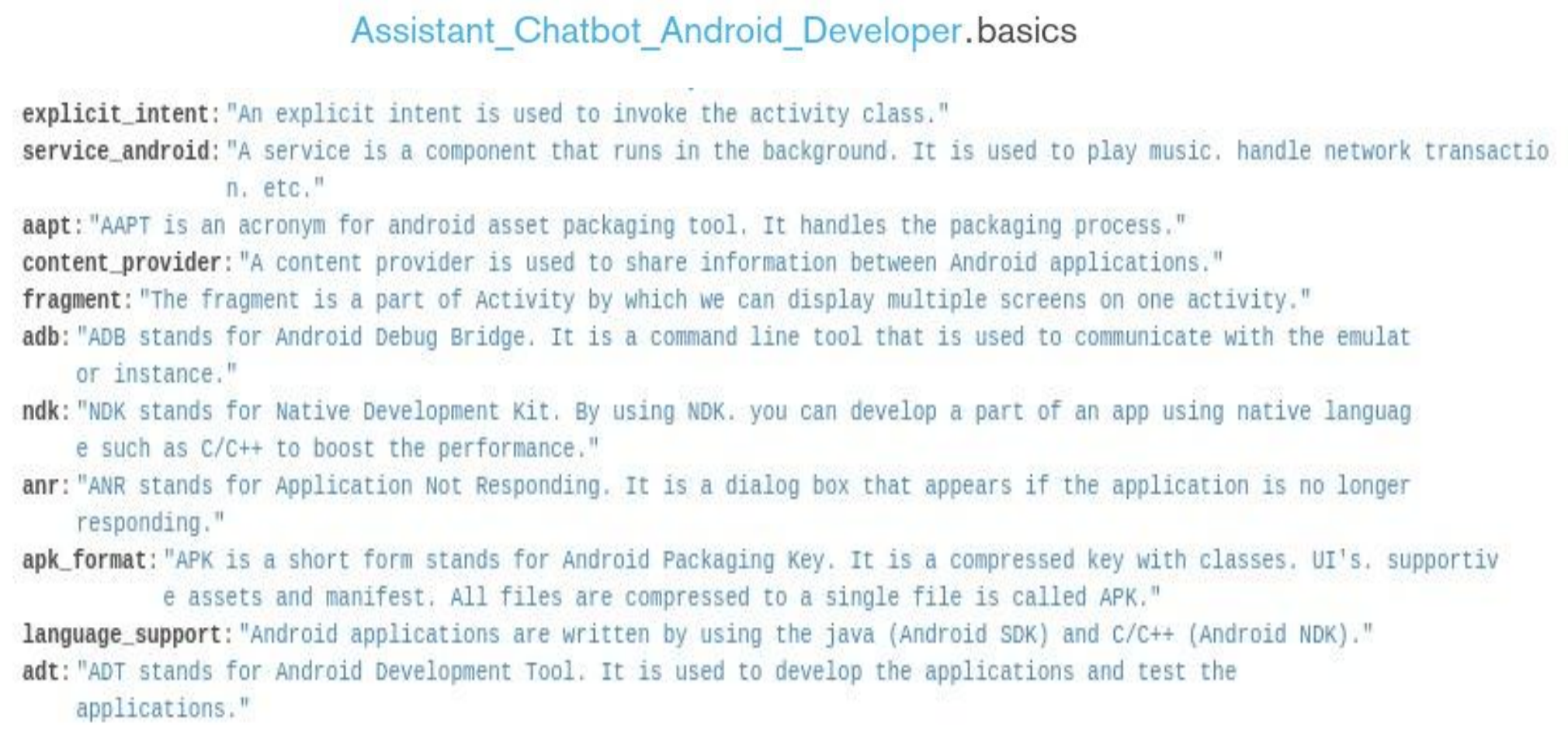


Fig. 4 Backend API and Data Processing

Data Persistence Layer

As MongoDB is used for faster reads, the data is stored in the form of collections as intents and document as an object. A document object is formed of key-value pairs with many entities and its answers. So, in the chatbot scenario, document key is a keyword that user wants answer of and value is the answer of that specific fields in different form. The data format consistency has been maintained for all types of collections. This way whenever Lambda requests api to find the answer, it fetches the answer using required keys in constant time.



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Assistant_Chatbot_Android_Developer.basics

explicit_intent:"An explicit intent is used to invoke the activity class."
service_android:"A service is a component that runs in the background. It is used to play music. handle network transactio
                n. etc."
aapt:"AAPT is an acronym for android asset packaging tool. It handles the packaging process."
content_provider:"A content provider is used to share information between Android applications."
fragment:"The fragment is a part of Activity by which we can display multiple screens on one activity."
adb:"ADB stands for Android Debug Bridge. It is a command line tool that is used to communicate with the emulat
    or instance."
ndk:"NDK stands for Native Development Kit. By using NDK. you can develop a part of an app using native languag
    e such as C/C++ to boost the performance."
anr:"ANR stands for Application Not Responding. It is a dialog box that appears if the application is no longer
    responding."
apk_format:"APK is a short form stands for Android Packaging Key. It is a compressed key with classes. UI's. supportiv
           e assets and manifest. All files are compressed to a single file is called APK."
language_support:"Android applications are written by using the java (Android SDK) and C/C++ (Android NDK)."
adt:"ADT stands for Android Development Tool. It is used to develop the applications and test the
    applications."
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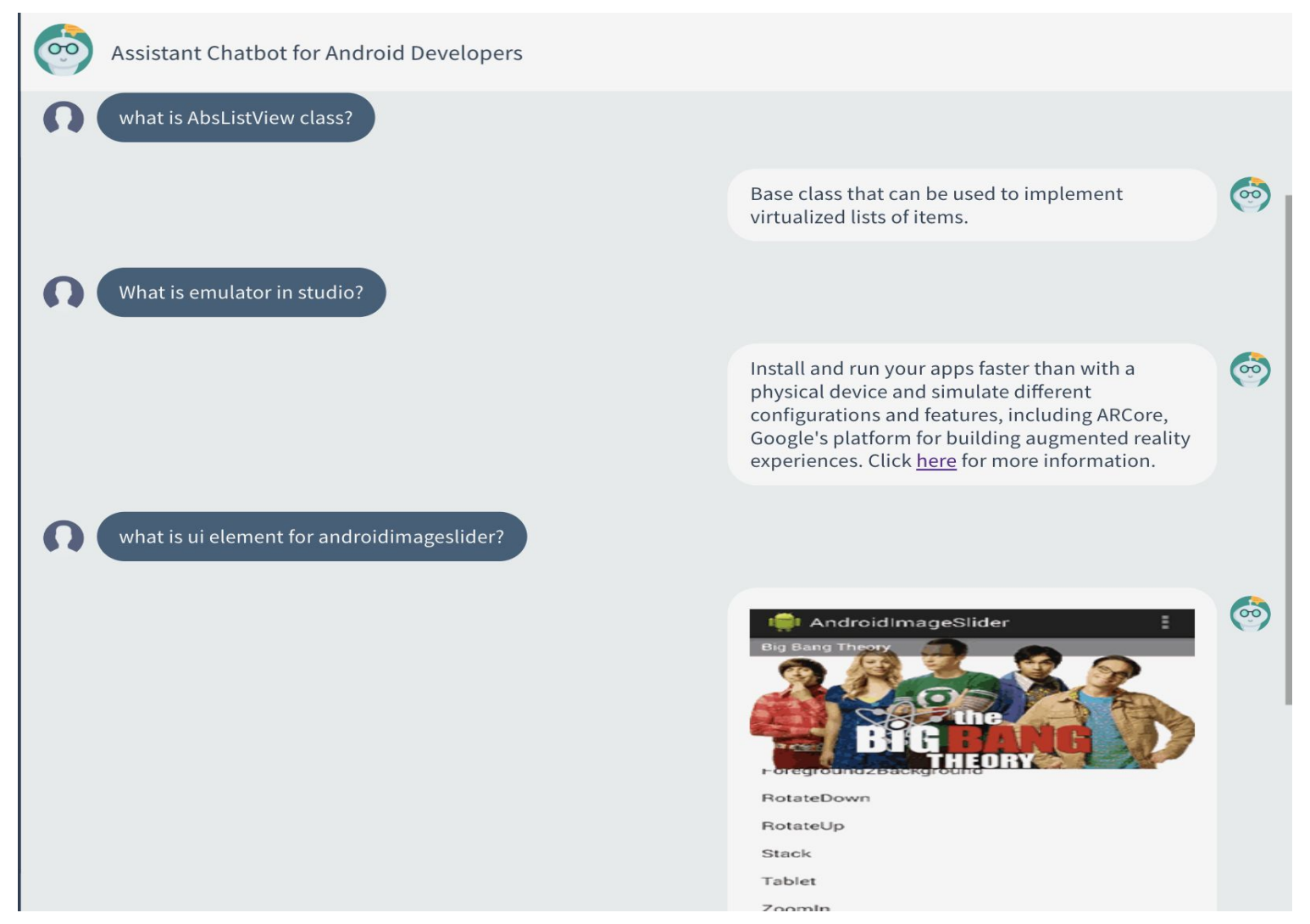
Fig. 5 Database Design

Results

At the end of the project, we were able to deliver the chatbot on two different platforms. Both the web client and Google assistant takes the input query in text and voice formats and and provides output in text and voice formats.

Users can ask about variety of basic Android questions along with Android API information. Chatbot also responds with sample images of UI components.

Web client is supported on all the popular web browsers. As web browser is rich in media, it can take input in text and voice format and always provide output in text format. It can show different data like hyperlinks, images, etc. Such answers are supported only on the web client.



Assistant Chatbot for Android Developers

what is AbsListView class?

Base class that can be used to implement virtualized lists of items.

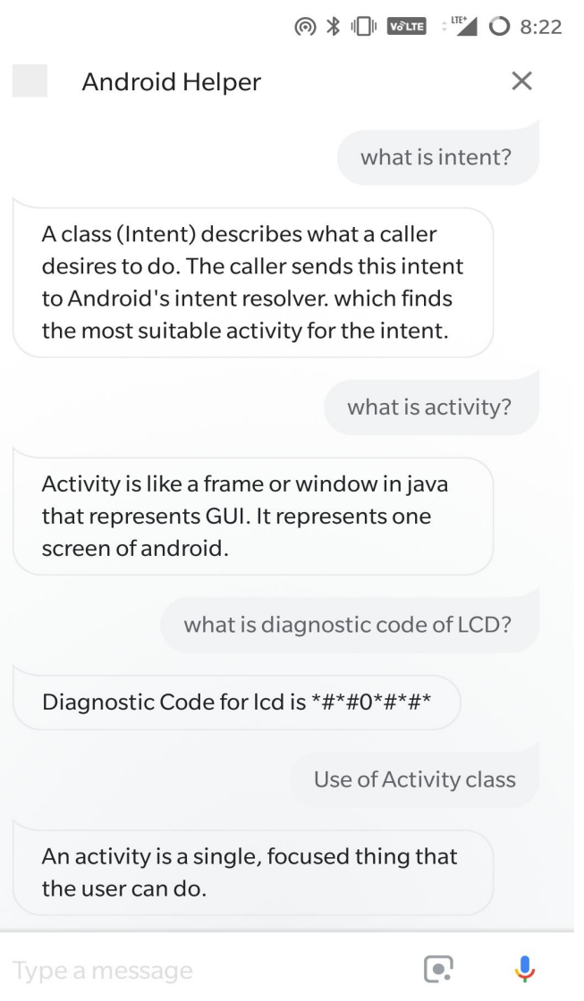
What is emulator in studio?

Install and run your apps faster than with a physical device and simulate different configurations and features, including ARCore, Google's platform for building augmented reality experiences. Click here for more information.

what is ui element for androidimageslider?

Fig 6. Web Client

Google voice assistant enables the end user to ask questions via Google devices like Google Home, Google Home mini and Google Assistant app. User can ask questions via voice or type in Google Assistant app and it will return the answer in audio format. We have tried to keep the answer in limited length so that it can be used over the voice as well.



8:22

Android Helper

what is intent?

A class (Intent) describes what a caller desires to do. The caller sends this intent to Android's intent resolver. which finds the most suitable activity for the intent.

what is activity?

Activity is like a frame or window in java that represents GUI. It represents one screen of android.

what is diagnostic code of LCD?

Diagnostic Code for lcd is *#*#0*#*#*

Use of Activity class

An activity is a single, focused thing that the user can do.

Fig 7. Google Voice Assistant

Summary

The goal of the project was achieved and we developed a smart chatbot which handles variety of queries related to Android that also maintains the context between conversations. Considering the broadness of the project and technologies, we learned and expertised the technologies like DialogFlow, AWS , NodeJS, and MongoDB. The learning curve will be helpful for our growth and professional development.

Key References

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