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Building Chatbot Using Amazon Lex and Integrating with A Chat Application

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Abstract

Engaging in hotel room reservations has remained a hassle even though there are few applications which provide their own services. This study aims at building a voice chatbot device that can be used for hotel reservation using Amazon Lex Service with Facebook Messenger as the communication platform. The chatbot is built by leveraging on Amazon Web Services (AWS) in the form of a service called Amazon Lex for configuring the bot with utterances and responses and Lambda Functions to validate the responses while carrying out the operations by using Facebook Messenger service. The lambda function runs a script that collects input in the form of plain text or by using voice recognition using the microphone connected to it, which is sent to the Amazon Lex to be processed using various services provided by Amazon Web Services. Then the chatbot sends back a suitable response to the user through the speaker connected to the device or in the form of plain text.

sequence of actions to complete its primary functions when it comes to complex tasks. The simplest type of chatbot is the scripted chatbot. Discussions with such chatbots can only take predetermined sequences. At each progression of the conversation, the user should select from the limited choices provided to reach the next stage of the conversation. Chatbots offer several significant advantages. The first advantage is that the chatbot

This bot is also integrated with a Facebook page and can be implemented in the real-world applications as well. The admin of the page has access to entire messages that are received through the chatbot and can do the appropriate arrangements as required.

Introduction

Amazon Lex service is an area of Amazon Web Services (AWS) that focuses on the activities performed by smart machines, that is, they mimic human activities and reactions. Some of the activities performed through lex service include speech recognition, learning, planning and problem-solving. A chatbot is a smart device, which is designed with the specific purpose of meeting its user's requests. Chatbots understand exactly what the request entails by inferring different information, such as focusing on certain keywords, from the conversation between the bot and each individual user. It requires planning and completion of a task before the chatbot can move onto its next task. It needs to identify the
is available 24/7 to offer service. Another advantage is that the customer waiting time is eliminated, so that customers can receive service at their own convenience.

Methodology

A flowchart is designed that shows the process flow of the entire project.

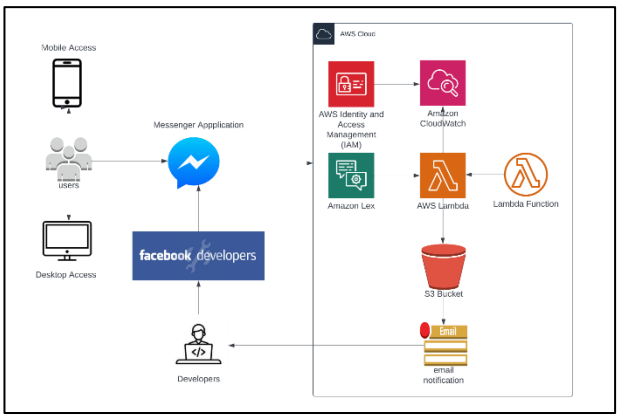

Figure 1

The Architecture Diagram of the Project

There will be multiple users who can access their social media platform account ie, Facebook via mobile as well as desktop, the messenger chat application is also available for the users to communicate via text, images and stickers with their Facebook friends.

The developer of the chatbot gets access to the Facebook developers account and integrates that hotel booking chatbot that was built on amazon web services (AWS) with messenger application. The process of booking the hotel reservation can be done by creating a new Facebook page for that respective hotel.

The details entered in the chatbot can be view in the admin console of the page and the entire log data gets reflected in the amazon cloud watch as well as S3 buckets. In the backend, whenever users interact with the chatbot a Lambda function gets invoked to process the user requirements.

Overview of Technologies and Services

1. **Cloud Computing :** Cloud computing is the on-demand delivery of compute power, database, storage, applications, and other IT resources through a cloud services platform via the Internet with pay-as-you-go pricing. With cloud computing, users don't need to make large upfront investments in hardware and spend a lot of time on the heavy lifting of managing that hardware. Instead, users can provision exactly the right type and size of computing resources they need to power your newest bright idea or operate their IT department.
2. **Amazon Lex:** Amazon Lex service support both voice and text and can be deployed across mobile and messaging platforms. Amazon Lex enables any developer to build conversational chatbots quickly. With Amazon Lex, no deep learning expertise is necessary—to create a bot, users can just specify the basic conversation flow in the Amazon Lex console. Amazon Lex manages the dialogue and dynamically adjusts the responses in the conversation. Using the console, you can build, test, and publish your text or voice chatbot.
3. **IAM:** Identity and Access Management (IAM) provides fine-grained access control across all of AWS. With IAM, one can specify who can access which services and resources, and under which conditions. With IAM policies, users can manage permissions to their workforce and systems to ensure least-privilege permissions. IAM is an AWS service that is offered at no additional charge. IAM helps protect against security incidents by allowing administrators to automate numerous user account related tasks.
4. **CloudWatch:** Amazon CloudWatch is a monitoring and management service that provides data and actionable insights for AWS, hybrid, and on-premises applications and infrastructure resources. One can collect and

access all your performance and operational data in the form of logs and metrics from a single platform rather than monitoring them in silos (server, network, or database). CloudWatch enables users to monitor the complete stack (applications, infrastructure, and services) and use alarms, logs, and events data to take automated actions and reduce mean time to resolution (MTTR). This frees up important resources and allows you to focus on building applications and business value.

5. **AWS Lambda: AWS** Lambda is a serverless compute service that runs your code in response to events and automatically manages the underlying compute resources for you. These events may include changes in state or an update, such as a user placing an item in a shopping cart on an ecommerce website. You can use AWS Lambda to extend other AWS services with custom logic, or create your own backend services that operate at AWS scale, performance, and security.
6. **AWS Lambda Function:** AWS Lambda function helps developers to focus on core product and business logic instead of managing operating system (OS) access control, OS patching, right-sizing, provisioning, scaling, etc. Users can run Python code in AWS Lambda. Lambda provides runtimes for Python that code to process events. The code runs in an environment that includes the SDK for Python (Boto3), with credentials from an AWS Identity and Access Management role that one can manage.
7. **S3 Bucket:** Amazon Simple Storage Service (Amazon S3) is an object storage service that offers industry-leading scalability, data availability, security, and performance. Customers of all sizes and industries can use Amazon S3 to store and protect any amount of data for a range of use cases, such as data lakes, websites, mobile applications, backup and restore, archive, enterprise applications, IoT devices, and big data analytics.
8. **SNS Service:** SNS stands for Simple Notification Service. It is a web service which makes it easy to set up, operate, and send a notification from the cloud. It provides developers with the highly scalable, cost-effective, and flexible capability to publish messages from an application and sends them to other applications.

Implementation

The building phase of a chatbot can be done using the predefined templates that are already pre-defined by amazon web services (AWS) or can also be developed from scratch. The languages supported in the building of a chatbot are python and NodeJS with various versions that can be selected on the developer's preference. Once the code has been developed then it is tested in the lambda interface.

After the code development cross platform integration must be done between AWS Lex console and the messenger application using the Facebook developer's console. The private keys and the secret codes must be validated for the successful integration. Here is a brief description of the testing process. Stress-testing a CPU means running it at maximum capacity for a sustained period of time to evaluate its stability. Stress testing software uses a variety of techniques to push your CPU to 100% capacity for an hour or more, then analyzes its performance. CPU stress tests are also known as CPU load tests.

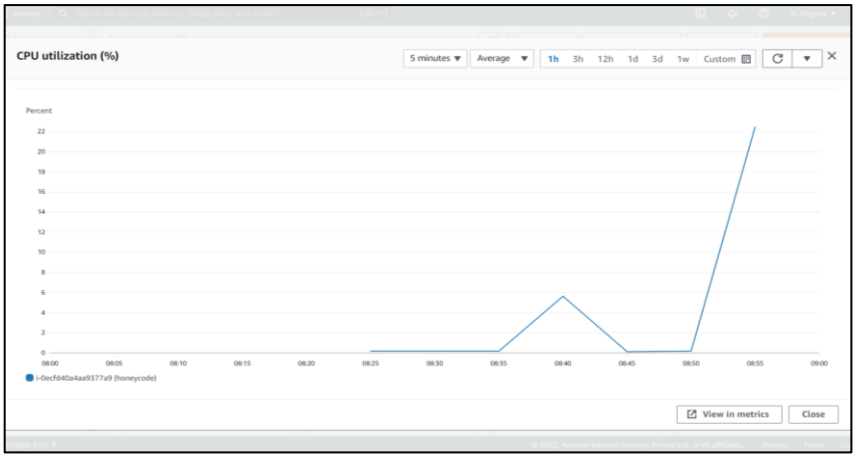

Figure 2 The Stress Testing raph.

Results and Discussions

Initially, the chatbot successfully provided the right output in about less number of cases. However, as the training data improved with continuous interaction with the chatbot, this accuracy has improved to a greater extent. For queries unrelated to the intents described in the chatbot, a generalized response is generated, and such questions were logged to be checked later and included to the datasets. The Amazon S3 connected to the chatbot have successfully monitored the traffic to various sections of the chatbot by matching capabilities of Amazon Lex with your own business logic to zero in on your user's intent. Developers and creators can also use the confidence score threshold while testing during bot development, to determine if changes to the sample utterances for intents have the desired effect. These improvements enable you to design more effective conversation flows.

capturing the general purpose of the user. This information can further be used to analyze the kind of people visiting the site and their purpose. Although people aren't always

precise in their wording when they interact with a bot, we still want to provide them with a natural user experience. With natural language understanding improvements and confidence scores now available on Amazon Lex, one can have additional information available to design a more intelligent conversation. Developers can couple the machine learning-based intent

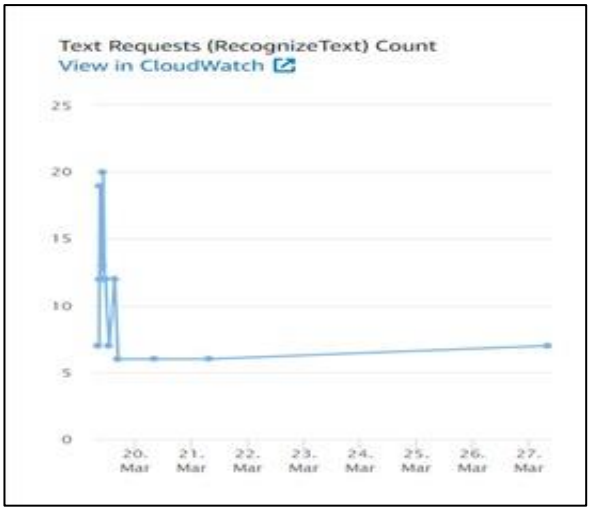

Figure 3

The number of text requests with respect to the dates.

In Figure 3 The x-axis represents the date.

The y-axis on the graph represents the number of text requests.

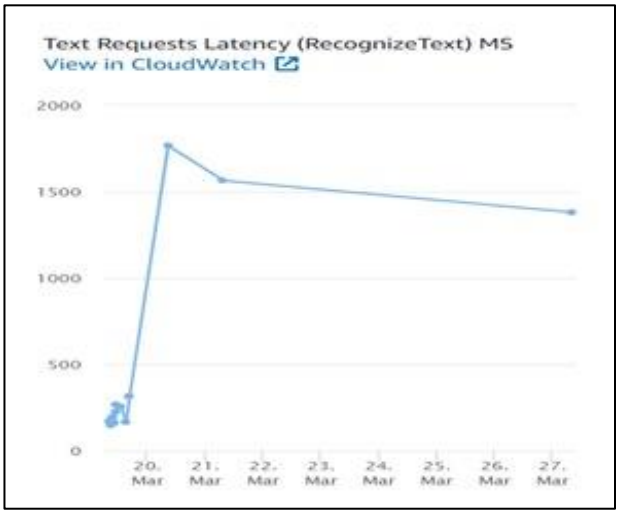

Figure 4

The time latency of text requests with respect to the dates.

In Figure 4 The x-axis represents the date.

The y-axis on the graph represents the latency (in milli seconds) of text requests.

Conclusion and Future Scope

These type of chatbots reduces human intervention during the online hotel booking processes and also once published these bots can be active online 24 / 7. Since the integration has been done by using Facebook messenger the entire underlying infrastructure of the Facebook page will be maintained by Meta team and the entire cloud resource will be maintained by the AWS cloud account administrator. Hence, the hotel department and their admin team can mainly focus on reaching their target audience without worrying about the underlying infrastructure to main. The future of chatbots is that businesses will automate simple payments and allow users to pay directly over live chat through Facebook Messenger app. The instant process makes the customer happy and improves customer satisfaction. MasterCard has also launched a chatbot, especially for customer payments. These capabilities of the bots to answer queries related to account balance, assist customers to set payment alerts and collect final payments from customers. The use of Artificial Intelligence (AI) and Natural Language Processing (NLP) helps to analyze voluminous user-generated data to identify trending topics and understand your user behavior. It also helps to streamline the processes to work in an effective manner.

References

[1] Overview of AWS Services
https://d1.awsstatic.com/whitepapers/aws-overview.pdf?did=wp_card&trk=wp_card

[2] Why prefer AWS over On-Premise Hosting https://www.fingent.com/blog/why-prefer-aws-over-on-premise-hosting

[3] Advantages and drawback of on-premise https://www.xperience-group.com/blog/cloud-vs-on-premise-software/

[4] M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. Katz, A. Konwinski,G. Lee, D. Patterson, A. Rabkin, I. Stoica, et al. A view of cloud computing. Communications of the ACM, 53(4):50–58, 2010.

[5] I. Bermudez, S. Traverso, M. Mellia, and M. Munafo. Large scale observation and analysis of Amazon AWS traffic. (October), 2012.

[6] I. Bermudez, S. Traverso, M. Mellia, and M. Munafo. Exploring the cloud from passive measurements: The Amazon AWS case. 2013 Proceedings IEEE INFOCOM, pages 230–234, 2013.

[7] K. He, A. Fisher, L. Wang, A. Gember, A. Akella, and T. Ristenpart. Next stop, the cloud: Understanding modern web service deployment in ec2 and azure. In Proceedings of the 2013 Conference on Internet Measurement Conference, IMC'13, pages177–190, New York, NY, USA, 2013. ACM.

[8] A. Li, X. Yang, S. Kandula, and M. Zhang. Cloudcmp: Comparing public cloud providers. In Proceedings of the 10th ACM SIGCOMM Conference on Internet Measurement, IMC '10, pages 1–14, New York, NY, USA, 2010. ACM.

[9] G. B. Satrya, P. T. Daely and S. Y. Shin, " Android forensics analysis: Private chat on social messenger, "in Eighth International Conference on Ubiquitous and Future Networks 2016 (ICUFN 2O16), TU Wien, Vienna, Austria, Aug 2016.

[10] Bogdan Ionescu, Cristian Gadea and Bogdan Solomon, "A chat-centric collaborative environment for web-based real-time collaboration," in IEEE10th Jubilee International Symposium on Applied Computational Intelligence and Informatics (SACI), Timsoara, Romania, Aug 2015.

[11] B. Nardi, S. Whittaker, and E. Bradner, "Interaction and Outeraction: Instant Messaging in Action," in Proc. of the 3rd CSCW Conference. ACM, 2000, pp. 79–88.

[12] A. Xu, Z. Liu, Y. Guo, V. Sinha, and R. Akkiraju, "A new Chatbot for Customer Service on Social Media," in Proc. of the 35th CHI Conference. ACM, 2017, pp. 3506–3510.

[13] A. Kerlyl, P. Hall, and S. Bull, "Bringing Chatbots into Education: Towards Natural Language Negotiation of Open Learner Models," in Applications and Innovations in Intelligent Systems XIV. Springer, 2007, pp. 179–192

[14] A. M. Rahman, A. A. Mamun and A. Islam, "Programming challenges of chatbot: Current and future prospective," 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC), 2017, pp. 75-78, doi: 10.1109/R10-HTC.2017.8288910

[15] G. Daniel, J. Cabot, L. Deruelle and M. Derras, "Xatkit: A Multimodal Low-Code Chatbot Development Framework," in IEEE Access, vol. 8, pp. 15332-15346, 2020, doi: 10.1109/ACCESS.2020.2966919.