

Build Your Own Chatbot

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Amazon Web Services

Docker Captain
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Author
Runner
Lifelong learner



STAR WARS CHATBOT

Tell me a Yoda quote

Developer challenges

Automated Speech
Recognition

Scalability

Business Logic

Dialog Manager

Authentication

Availability

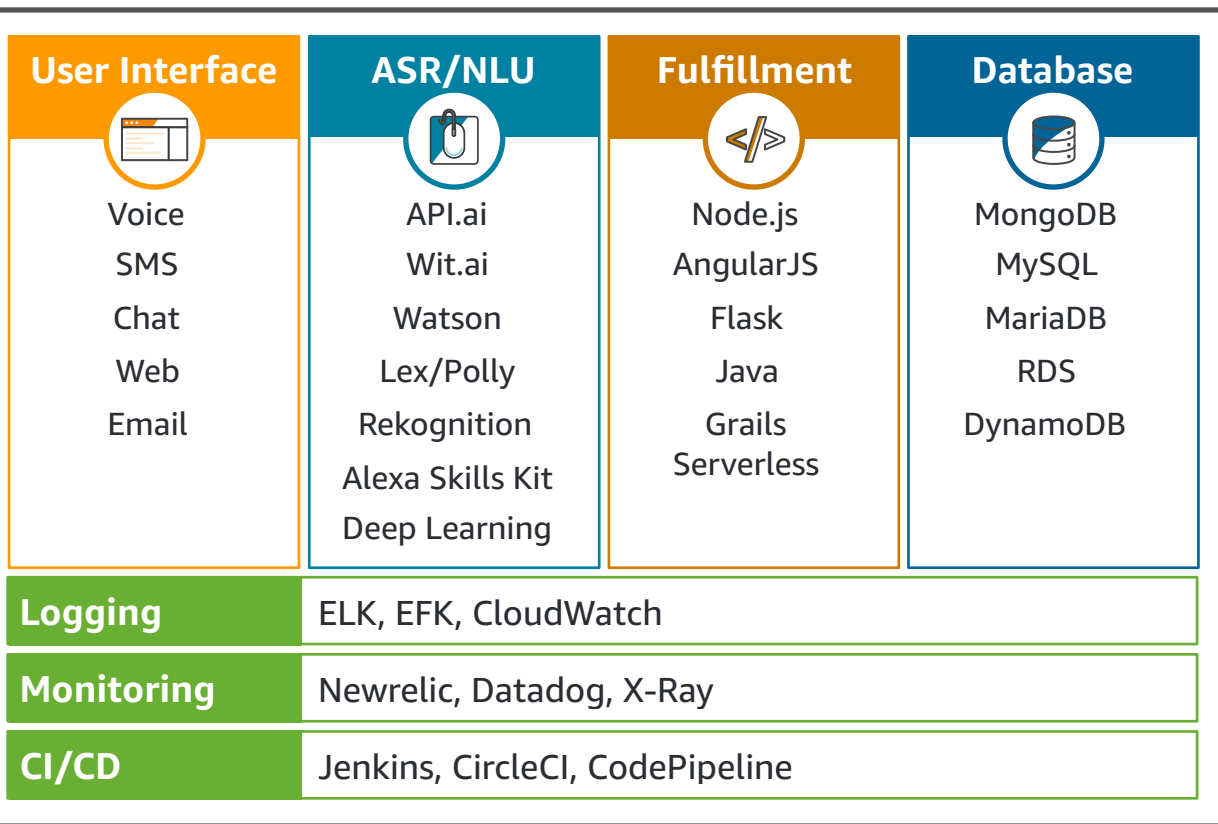
Testing

Natural Language
Understanding

Mobile

Disparate Systems

CHATBOT Components



BookHotel

Intents

A particular goal that the user wants to achieve

Utterances

Spoken or typed phrases that invoke your intent

Slots

Data the user must provide to fulfill the intent

Prompts

Questions that ask the user to input data

Fulfillment

The business logic required to fulfill the user's intent

I'd like to book a hotel.

Sure, which city?

New York City

What date do you check in?

...



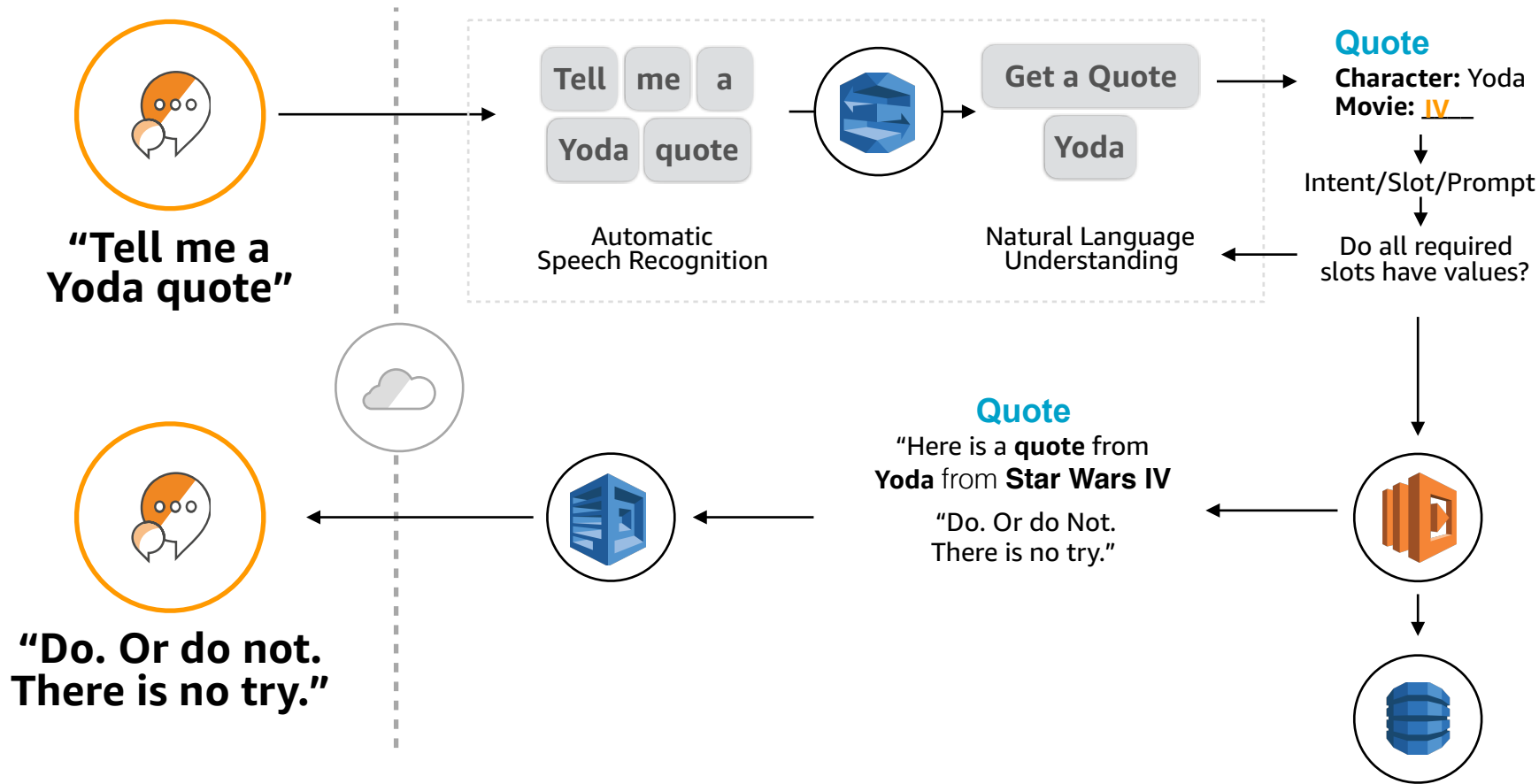
November 30th.



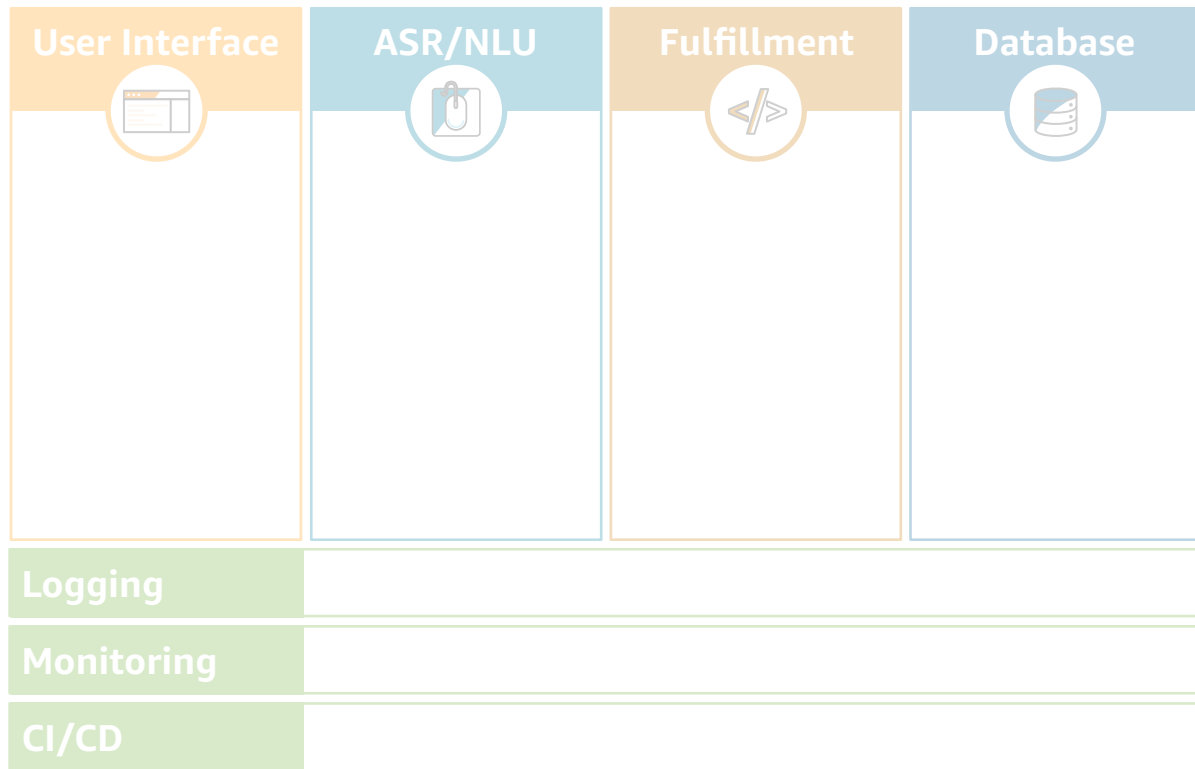
Are you sure you want to book the hotel in New York City?

Yes.

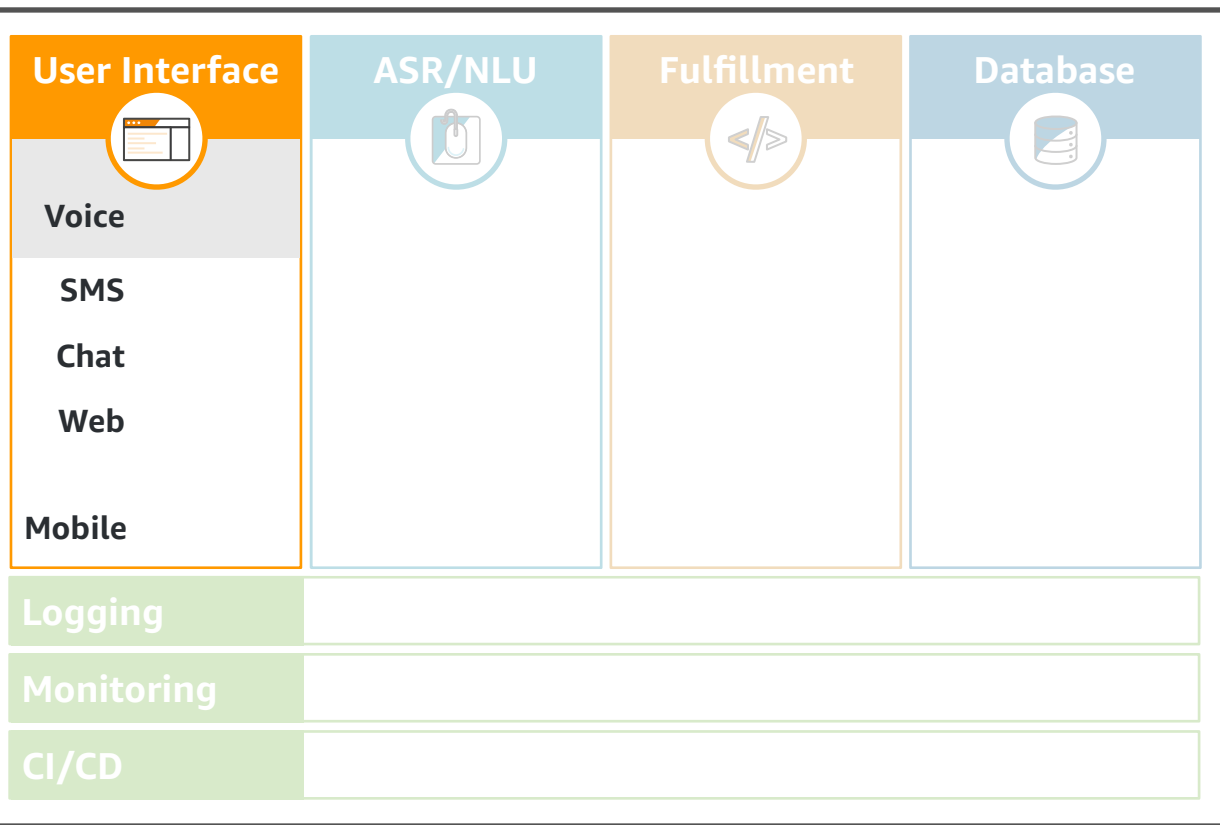
Thank you. The reservation went through successfully.



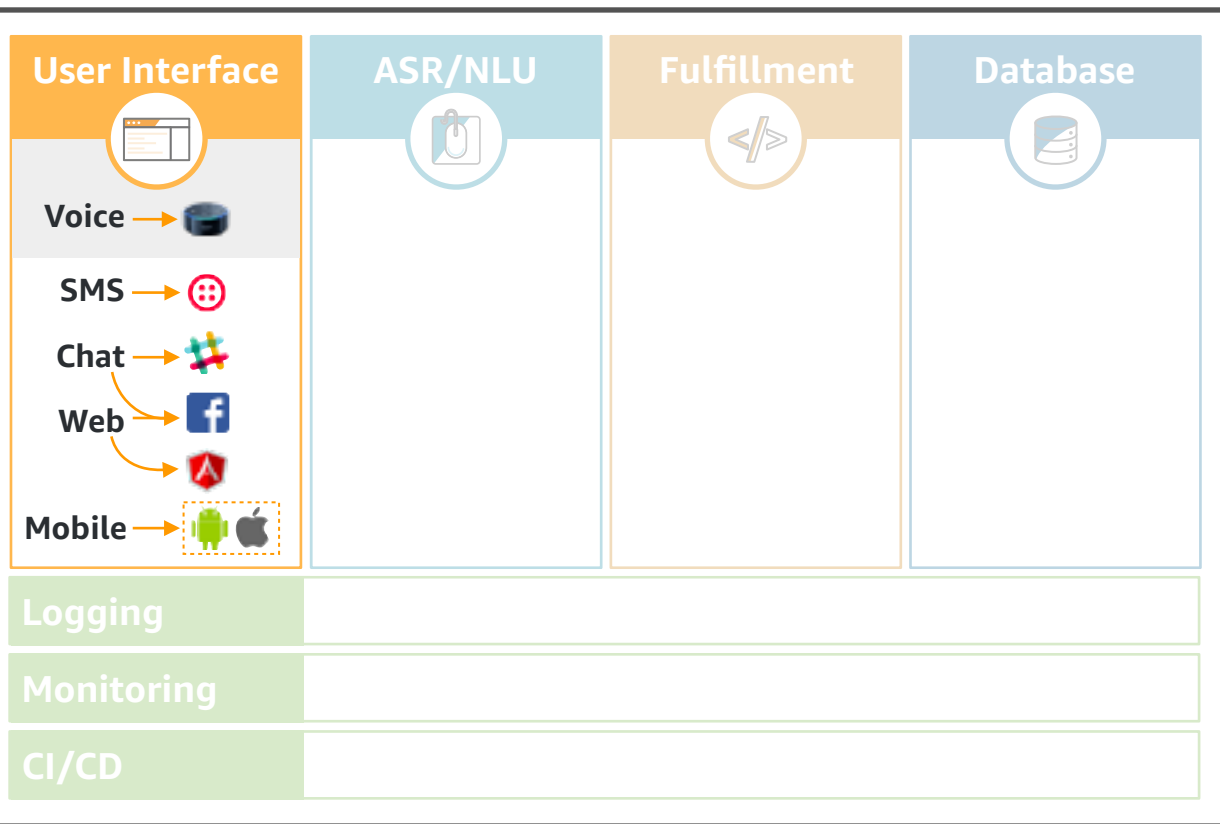
CHATBOX Architecture



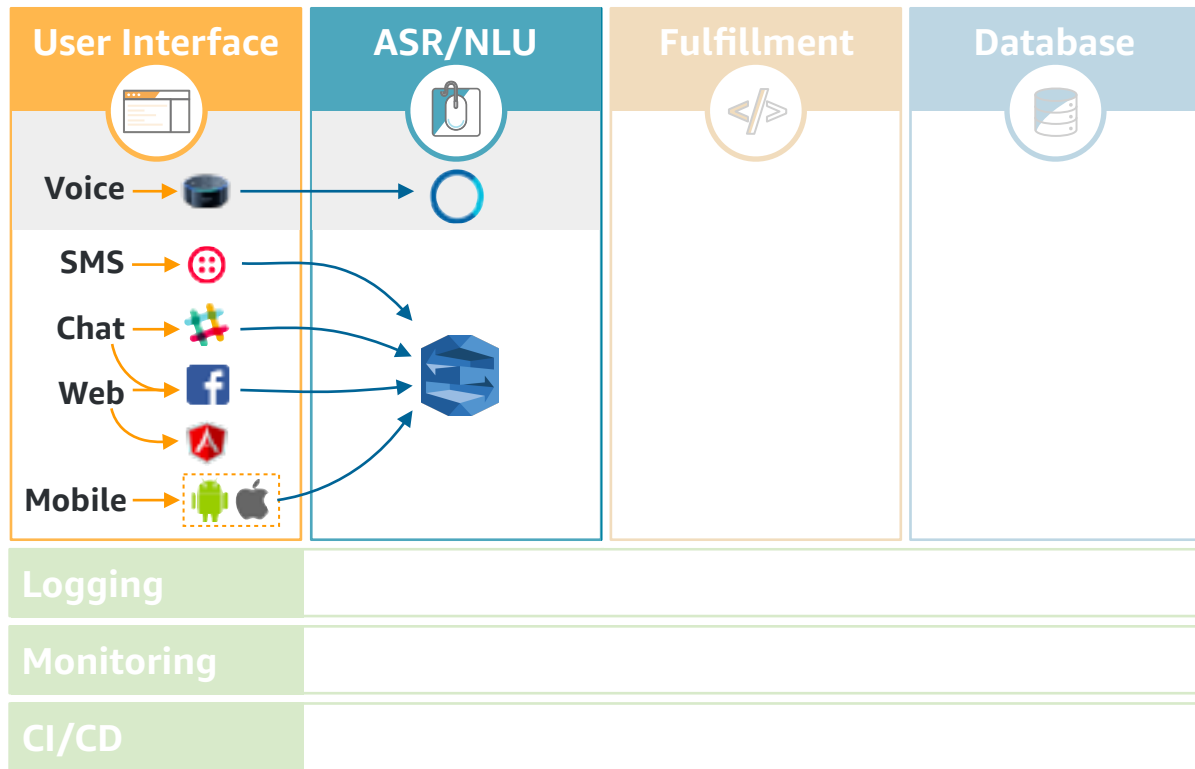
CHATBOX Architecture



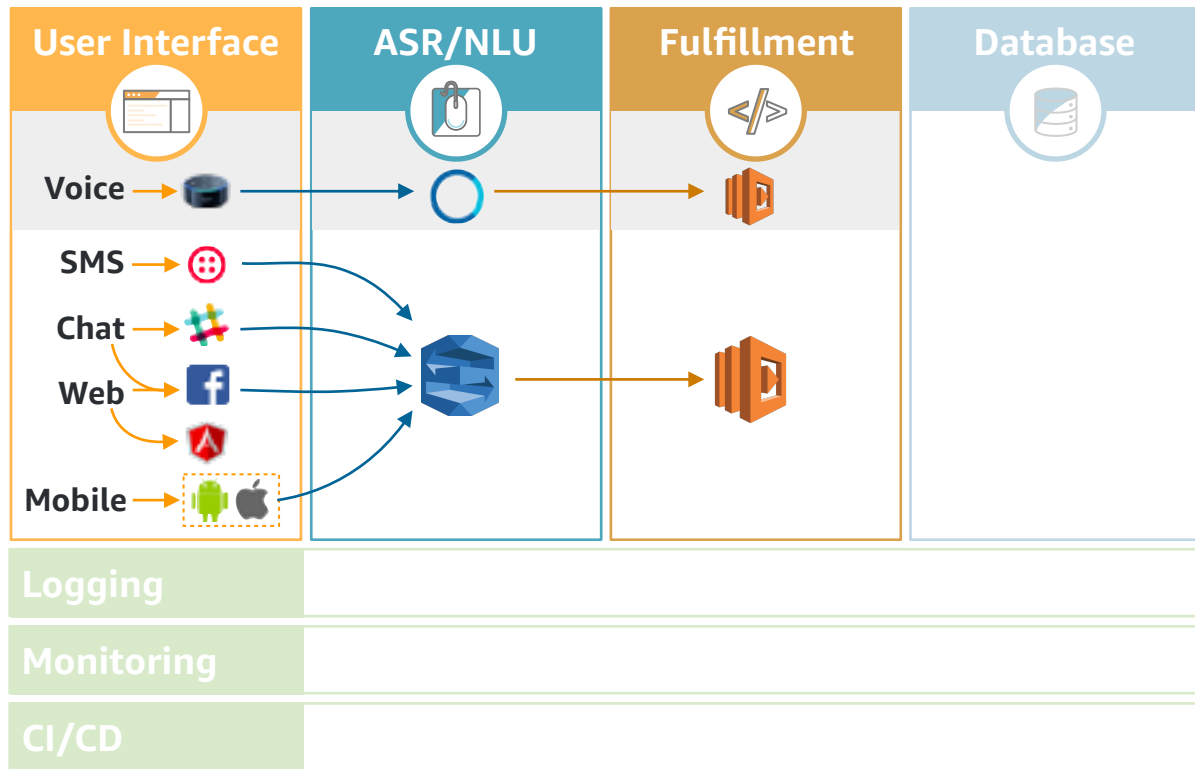
CHATBOX Architecture



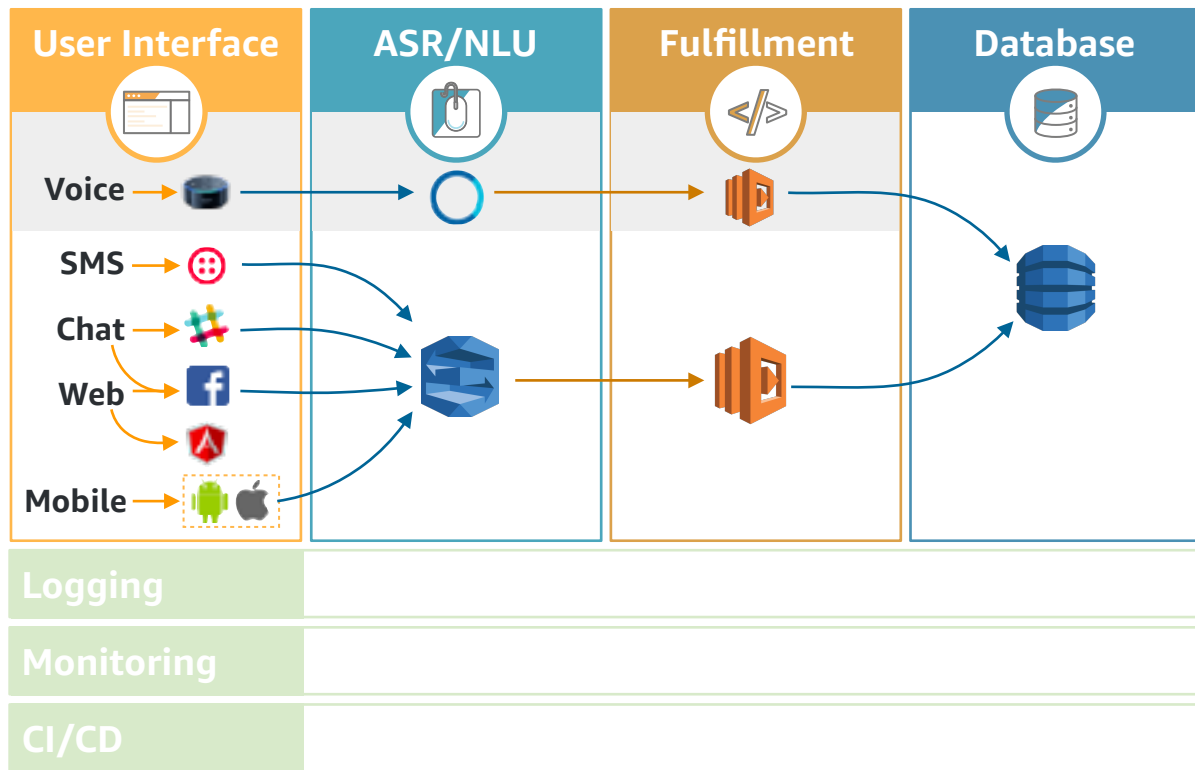
CHATBOX Architecture



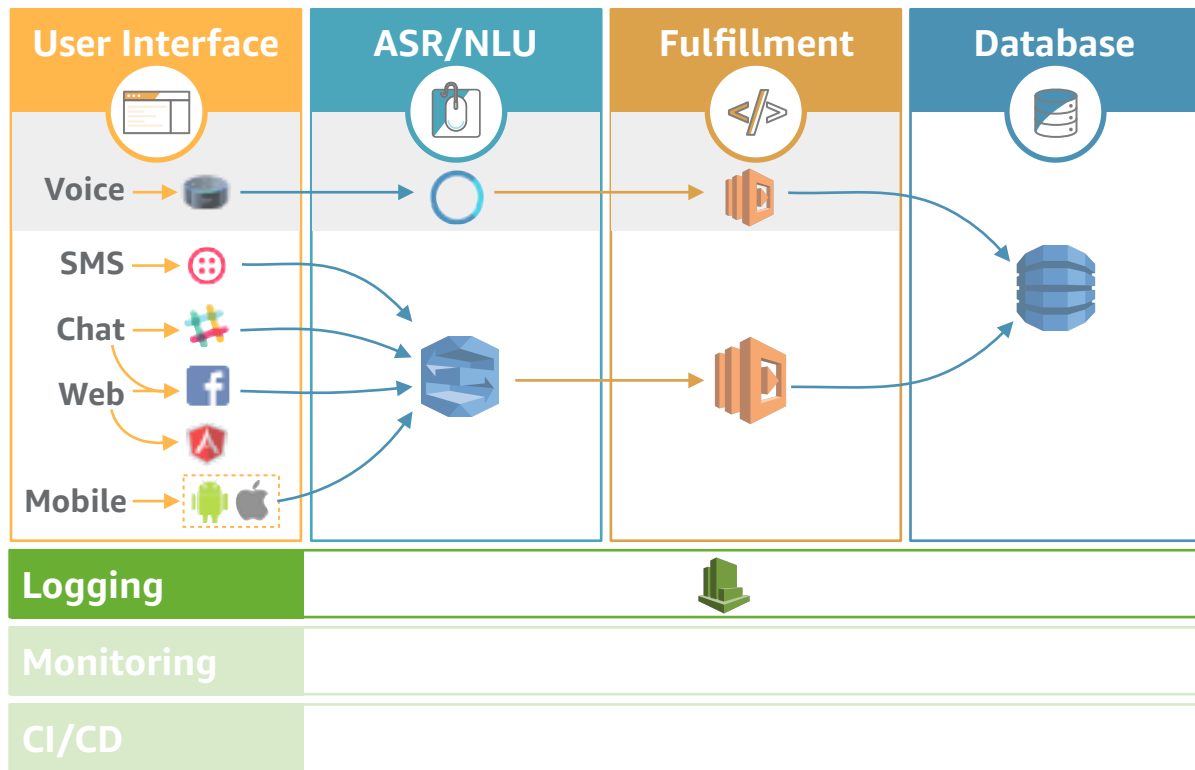
CHATBOX Architecture



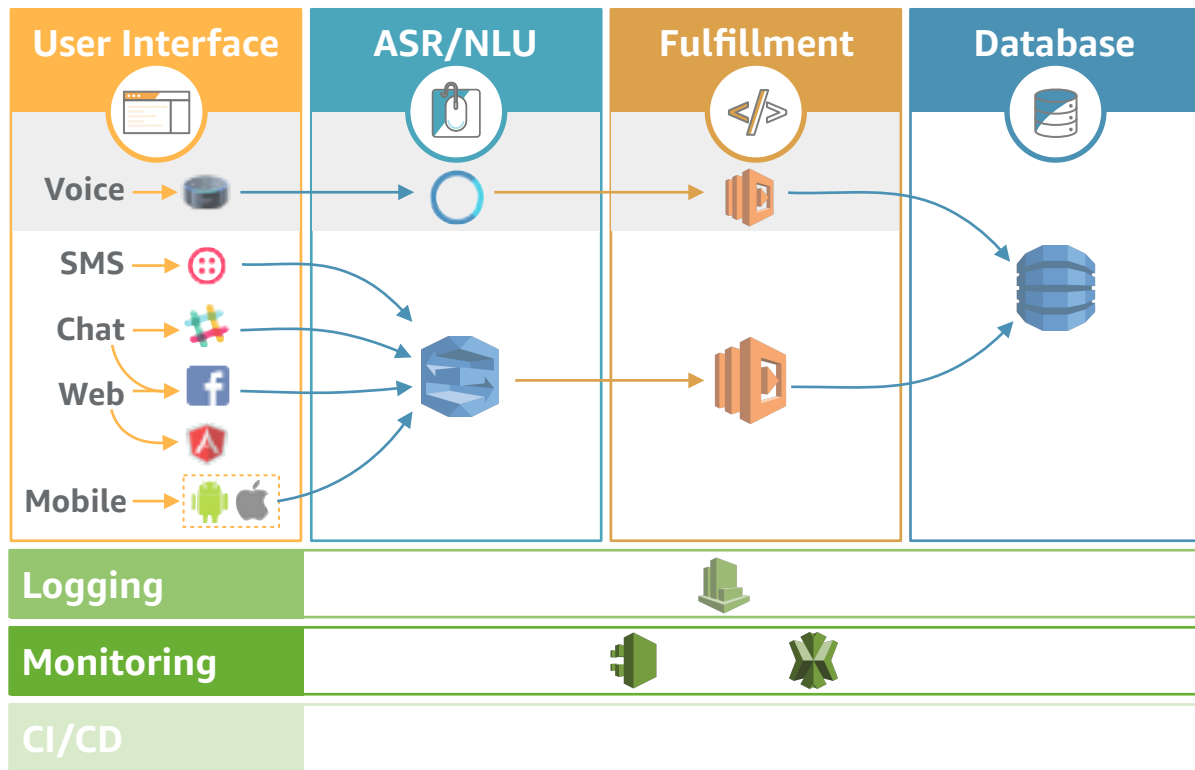
CHATBOX Architecture



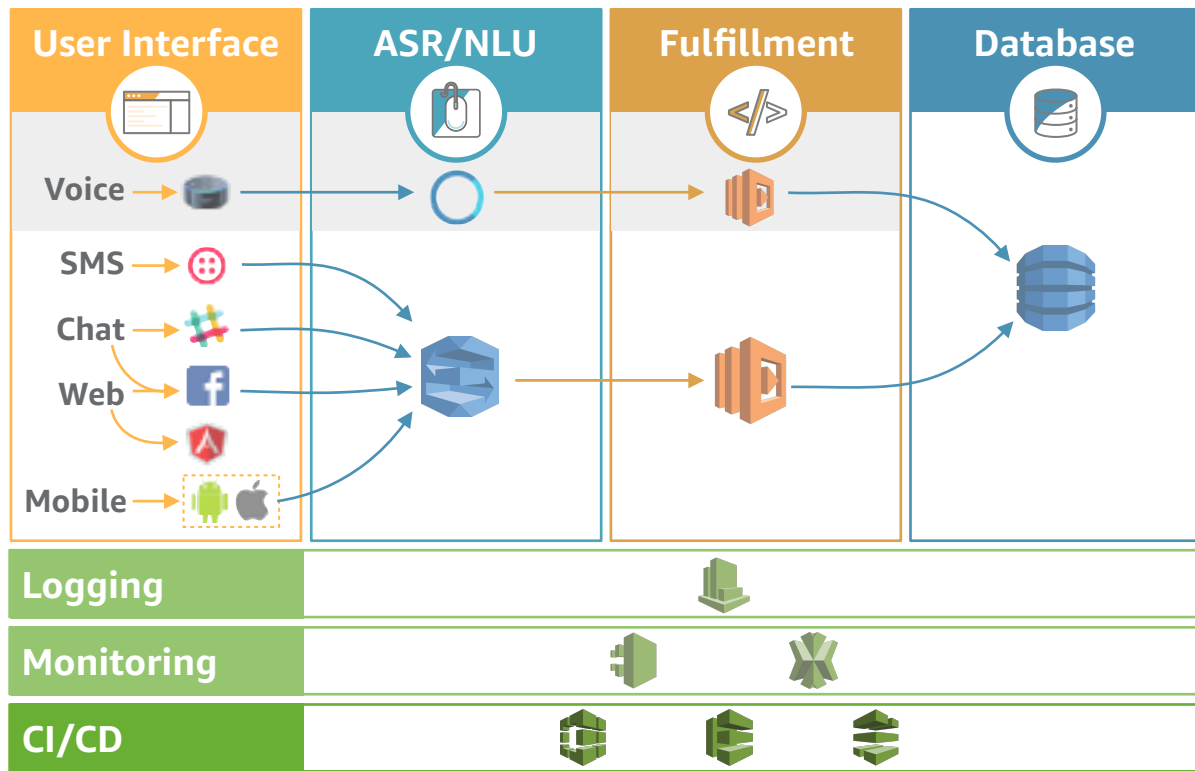
CHATBOX Architecture



CHATBOX Architecture



CHATBOX Architecture



BYOC Build Your Own Chatbot



Build a Lex bot

Voice User Interface (VUI)

Define intent, utterances,
slot types, slots, prompts

Write Lambda function
for business logic
(intent → database)

Prepare database, setup indexes

Integrate with Twilio/SMS,
Slack, Facebook, Web, mobile



Build an Alexa skill (optional)

Export Lex bot
configuration

Write Lambda function
for business logic
(intent → database)



DynamoDB

Fast, fully-managed NoSQL database service

Both key/value and document

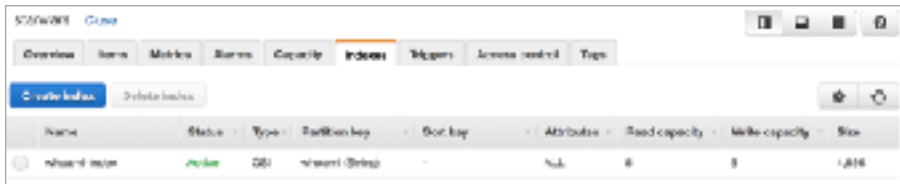
Capable of handling any amount of data

Durable and highly available

All SSD storage

Simple and cost effective

JSON Document



Name	Status	Type	Path	Policy	Attributes	Size
root	Active	Policy	root	root		1,000

```
{
  "dead": true,
  "force-sensitive": true,
  "force-side": "light",
  "id": 1,
  "lightsaber": "green",
  "planet": "Dagobah",
  "quotes": [
    "When nine hundred years old you reach, look as good you will not.",
    "Truly wonderful, the mind of a child is",
    "A Jedi uses the Force for knowledge and defense, never for attack",
    "That is why you fail.",
    "Adventure. Excitement. A Jedi craves not these things.",
    "Judge me by my size, do you?",
    "Fear is the path to the dark side",
    "Wars not make one great",
    "Do, or do not. There is no try",
    "Size matters not",
    "The dark side clouds everything",
    "Impossible to see the future is",
    "Clear your mind must be",
    "Much to learn you still have ... my old padawan"
  ],
  "weapon": "lightsaber",
  "whoami": "Yoda"
}
```



Amazon Lex

Service for building conversational interfaces using voice and text

Provides

Automatic Speech Recognition (ASR): speech → text

Natural Language Understanding (NLU): text → intent

Powered by the same deep learning technologies as Alexa

<http://aws.amazon.com/lex>



Build a Lex Bot

Services ~ Resource Groups ~

Lex

- Bots
- Intents
- Slot types

Bots

Create Actions

Filter:

	Name	Status	Last updated
<input type="radio"/>	OrderFlowers	READY	September 3, 2017 at 6:59:18 PM UTC+2
<input type="radio"/>	StarWars	READY	September 9, 2017 at 1:31:23 AM UTC+2

Multi-turn Conversations

Default session timeout is **5 mins**,
can be up to **24 hours**



Lex and Twilio

SMS INTEGRATION

Twilio: Build software that communicates with everyone in the world

Create a Twilio SMS endpoint

Specify Twilio credentials in Lex bot

Create a Twilio SMS endpoint (phone #)

Set Callback URL in Messaging
of Twilio SMS endpoint

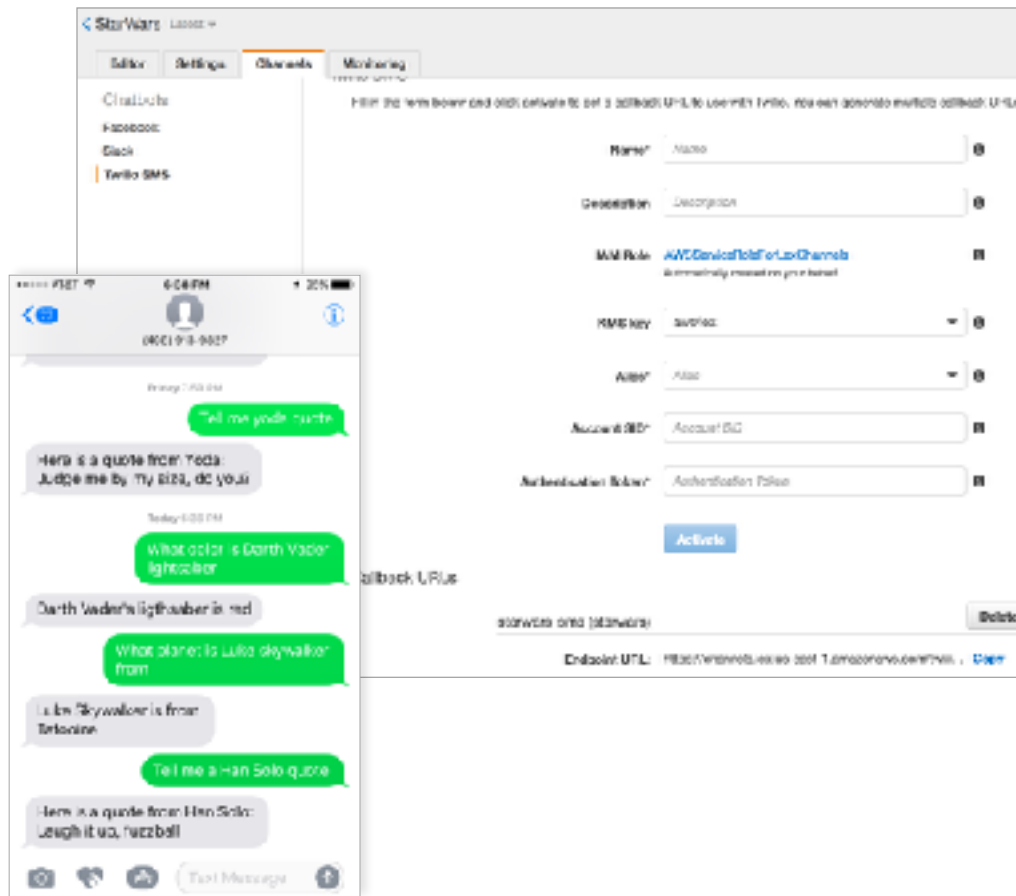
When message comes in

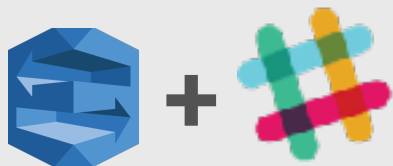
<https://docs.aws.amazon.com/lex/latest/dg/twilio-bot-association.html>



Lex and Twilio

SMS INTEGRATION





Lex and Slack

INTEGRATION

Create a Slack application: api.slack.com

Add a Bot to the application

Always online

Enable interactive messages

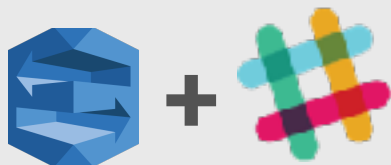
Specify Slack credentials in Lex bot

Specify URLs in Slack application

Postback: Lex bot's endpoint that listens to Slack events

OAuth: Lex bot's handshake with Slack

<https://docs.aws.amazon.com/lex/latest/dg/slack-bot-association.html>



Lex and Slack INTEGRATION

The screenshot displays the Slack interface for a chatbot named 'star_wars_chatbot'. The chat history shows a conversation where the user 'arungspta' asks for a Yoda quote, and the chatbot responds with 'Here is a quote from Yoda: That is why you fail.' The user then asks for Luke Skywalker's lightsaber color, and the chatbot responds 'Luke Skywalker's lightsaber is blue.' Finally, the user asks which planet Darth Vader is from, and the chatbot responds 'Darth Vader is from Tatooine.'

The settings panel on the right shows various configuration options for the chatbot, including:

- MM Flow: [AddSkillToSkillSet-C16E7A7608](#)
- MM ID:
- MM ID:
- Client ID:
- Secret:
- Token:
- URL:

The 'Add Skill' button is visible at the bottom of the settings panel.



Lex and Facebook

INTEGRATION

Create a Facebook application

Specify application credentials in Lex bot

Gives Callback URL

Setup webhooks for Facebook application

Specify Callback URL and enable subscription

Optionally, publish the application
(for public consumption)

<http://docs.aws.amazon.com/lex/latest/dg/fb-bot-association.html>



Lex and Facebook

INTEGRATION

The screenshot displays the Amazon Lex console interface. On the right, the 'Star Wars' chatbot configuration is visible, including fields for Name, Description, IAM Role, and SNS Topic. On the left, a preview window shows the chatbot's interaction with a user. The chatbot's name is 'Star Wars Chatbot' and it has 1 person who likes this. The chat history shows the following messages:

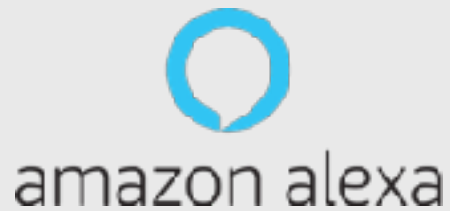
- User: "tell me a yoda quote"
- Star Wars Chatbot: "Here is a quote from Yoda: When nine hundred years old you reach, look as good as you will not."
- User: "what is the color of luke skywalker's lightsaber"
- Star Wars Chatbot: "Luke Skywalker's lightsaber is blue"
- User: "what planet is darth vader from?"
- Star Wars Chatbot: "Darth Vader is from Tatooine"

Web Application

Text here

Mobile

Text here



What is Alexa



Alexa is a **cloud-based service** that can answer questions, play music, read the news and more



Echo is an **always-on always-connected hands-free device** that connects to Alexa



Alexa Has Skills

amazon.com/skills

Let the fireworks begin.

"Alexa, open eHarmony."

Get started

Alexa, what are your top skills?

Skill Icon	Voice Command	Skill Name	Rating
	"Alexa open Sleep Sounds"	Sleepand Relaxation Sounds	★★★★☆ 5,255
	"Alexa, play Siri's M on Spotify"	Siri's M	★★★★☆ 1,259
	"Alexa, what's my Flash Briefing?"	Fox News	★★★★☆ 582
	"Alexa, start Song Quiz"	Song Quiz	★★★★☆ 652
		longplay!	★★★★☆ 527

Alexa, ask Star Wars tell me a Yoda quote

Wake
word

Starting
phrase

Skill
invocation
name

Utterance

Customer

Alexa

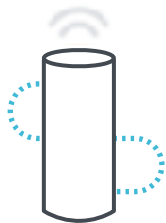
Your Alexa Skill



1 Customer asks a question or gives a command

2 Alexa identifies your skill's name, analyzes and understands the customer's request, then sends your service a structured representation of the user's request

3 Your service processes the request and returns a text and graphical response



5a Customer hears the response from Alexa's voice

4a Alexa converts the returned text to speech and streams it to the device



5b Customer sees a graphical representation in the companion app

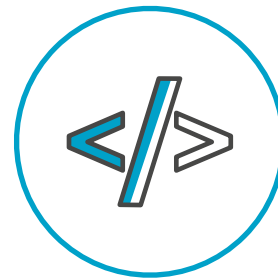
4b Your graphical representation (if any) is rendered in the companion app

Two Sides of an Alexa Skill



Voice User
Interface

+



Programming
Logic

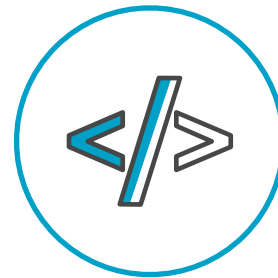
Two Sides of an Alexa Skill



Voice User
Interface

developer.amazon.com

+



Programming
Logic

aws.amazon.com



Build an Alexa Skill

Design a **Voice User Interface**

Setup the Skill in the Developer Portal

Can be done using ASK CLI or REST API

Use the Voice Design to **Build Your Interaction Model**

Intents, sample utterances, and the dialog model

Write and Test the Code for your Skill

AWS Lambda or web service on any cloud provider

Beta Test your Skill

Submit your Skill for **Certification**





Alexa Skills Kit

```
<dependency>  
  <groupId>com.amazon.alex</groupId>  
  <artifactId>alex</artifactId>  
  <version>1.4.0</version>  
  <scope>compile</scope>  
</dependency>
```

echosim.io provided by Quinix Media. Special thanks to Sam Mathis for his Alexa in the browser [project](#).

Alexa Skill Testing Tool

Click and **hold** the microphone button or hold down the space bar on your keyboard to activate the microphone.

Expected Speech



Clear

Collapse / Expand

SpeechRecognizer.ExpectSpeech 2017-09-21 11:21:18

```
{
  "directive": {},
  "header": {
    "dialogRequestId": "dialogRequestId-10b1f102-d922-4e60-b854-4f9993f011f9",
    "namespace": "SpeechRecognizer",
    "name": "ExpectSpeech",
    "messageId": "64b44121-2924-4901-05a5-847f0f1766b"
  },
  "payload": {
    "timeoutInMilliseconds": 8000
  }
}
```

TemplateRuntime.RenderTemplate 2017-09-21 11:21:18

Welcome to Star Wars Trivia, you can ask quotes

Star Wars
Star Wars Welcome

```
{
  "directive": {},
  "header": {
    "dialogRequestId": "dialogRequestId-10b1f102-d922-4e60-b854-4f9993f011f9",
    "namespace": "TemplateRuntime",
    "name": "RenderTemplate",
    "messageId": "0015d9d1-ec01-4e01-b21f-f0e020ea905"
  },
  "payload": {
```

echosim.io



Security

Role ARN `arn:aws:iam::091144849831:role/lambda_services`

Role description Allows Lambda Function to call AWS services on your behalf.

Instance Profile ARNs

Path /

Creation time 2017-08-22 18:44 PDT

Permissions Trust relationships Access Advisor Revoke sessions

[Attach policy](#) Attached policies: 5

Policy name
▶ AmazonDynamoDBFullAccess
▶ AWSLambdaDynamoDBExecutionRole
▶ AmazonLexReadOnly
▶ AmazonLexFullAccess
▶ AmazonLexRunBotsOnly

Permissions **Trust relationships** Access Advisor

You can view the trusted entities that can assume the role and the

[Edit trust relationship](#)

Trusted entities

The following trusted entities can assume this role.

Trusted entities

The identity provider(s) `lex.amazonaws.com`

The identity provider(s) `lambda.amazonaws.com`



LOGGING

Amazon CloudWatch

Monitoring service for AWS cloud resources and applications

Visibility into resource utilization and operational performance with Metrics and Logs

Set alarm thresholds to send notifications or trigger Auto Scaling

Log aggregation, monitoring and troubleshooting with CloudWatch Logs

Support for Custom Metrics



LOGGING Amazon CloudWatch



**ANALYZE
& DEBUG**

**AWS
X-Ray**

AWS X-Ray provides an end-to-end view of requests

Combines the data gathered from each service into singular units called traces

View the service map to see trace data such as latencies, HTTP statuses



**ANALYZE
& DEBUG
AWS
X-Ray**

Add a snapshot of X-Ray dump

Deployment Pipeline



AWS CodeBuild

Managed build service that compiles source code, runs tests and create packages



AWS CodeDeploy

Automates deployment of packages to EC2 instances, rolling updates and health checks



AWS CodePipeline

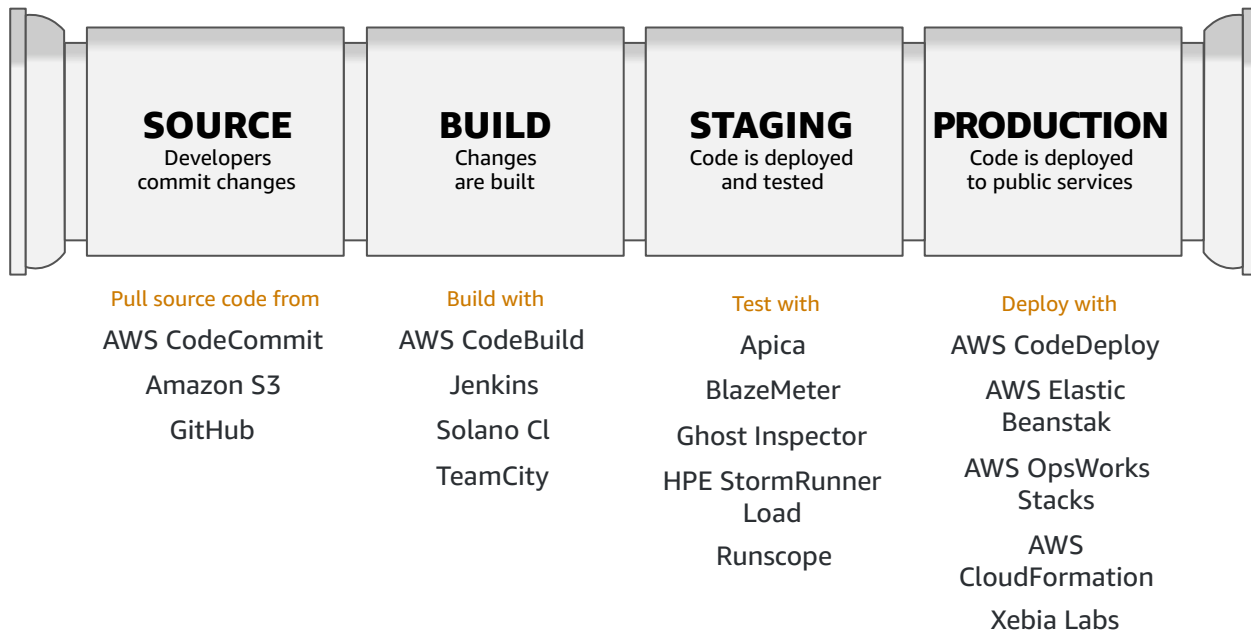
CI/CD service that builds, tests and deploy applications, visual workflow, integrate using custom plugins

Deployment Pipeline

ON AWS

AWS CodePipeline

Automated continuous integration and continuous delivery release workflow



Maven Plugin

```
<groupId>com.github.seanroy</groupId>  
<artifactId>lambda-maven-plugin</artifactId>  
<version>2.2.2</version>
```




References

Amazon Lex

aws.amazon.com/lex

Developer Portal

developer.amazon.com

Slides & code

github.com/arun-gupta/chatbot