Build Your Own Chatbot

Arun Gupta @arungupta

Amazon Web Services

aws

Docker Captain
Java Champion
JavaOne Rock Star (4 years)

STAR WARS CHATBOT

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Tell me a Yoda quote

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Developer challenges

Automated Speech Recognition

Scalability

Business Logic

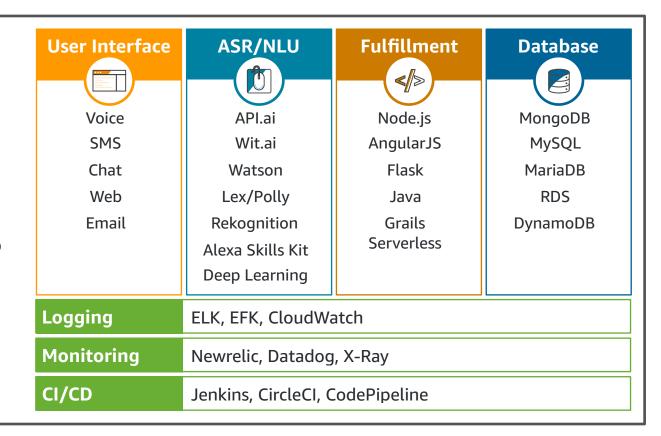Dialog Manager

Authentication

Availability

Testing

Natural Language Understanding

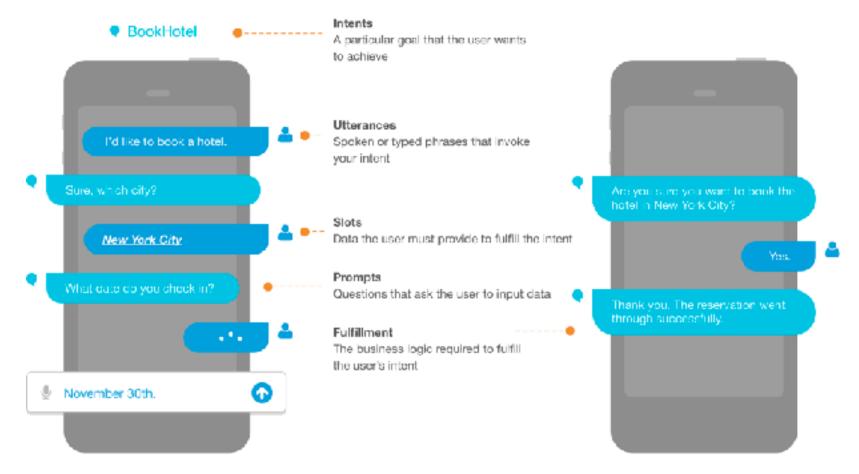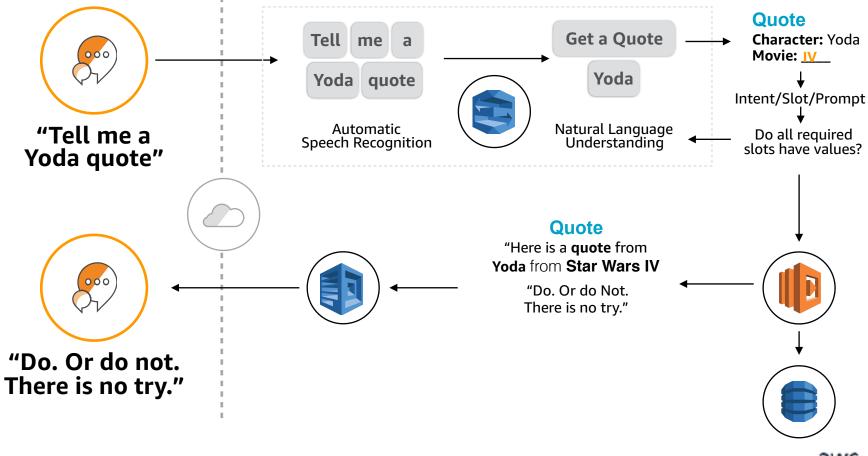Mobile

Disparate Systems

CHATBOT
Components

User Interface	ASR/NLU	Fulfillment	Database
Voice	API.ai	Node.js	MongoDB
SMS	Wit.ai	AngularJS	MySQL
Chat	Watson	Flask	MariaDB
Web	Lex/Polly	Java	RDS
Email	Rekognition	Grails	DynamoDB
	Alexa Skills Kit	Serverless	
	Deep Learning		

Logging	ELK, EFK, CloudWatch
Monitoring	Newrelic, Datadog, X-Ray
CI/CD	Jenkins, CircleCI, CodePipeline

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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

BookHotel

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.

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"Tell me a
Yoda quote"

Tell me a

Yoda quote

Automatic
Speech Recognition

Get a Quote

Yoda

Natural Language
Understanding

Quote
Character: Yoda
Movie: IV

Intent/Slot/Prompt

Do all required
slots have values?

Quote
"Here is a **quote** from
Yoda from **Star Wars IV**

"Do. Or do Not.
There is no try."

"Do. Or do not.
There is no try."

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CHATBOT
Architecture

User Interface	ASR/NLU	Fulfillment	Database

Logging	
Monitoring	
CI/CD	

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CHATBOT
Architecture

User Interface	ASR/NLU	Fulfillment	Database
Voice			
SMS			
Chat			
Web			
Mobile			

Logging	
Monitoring	
CI/CD	

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CHATBOT
Architecture

User Interface	ASR/NLU	Fulfillment	Database
Voice			
SMS			
Chat			
Web			
Mobile			

Logging
Monitoring
CI/CD

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CHATBOT
Architecture

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CHATBOT
Architecture

User Interface	ASR/NLU	Fulfillment	Database

Voice
SMS
Chat
Web
Mobile

Logging

Monitoring

CI/CD

aws

CHATBOT
Architecture

CHATBOT
Architecture

User Interface	ASR/NLU	Fulfillment	Database
Voice			
SMS			
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Mobile			

Logging
Monitoring
CI/CD

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CHATBOT
Architecture

CHATBOT
Architecture

User Interface	ASR/NLU	Fulfillment	Database

Voice

SMS

Chat

Web

Mobile

Logging

Monitoring

CI/CD

aws

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)

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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

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JSON
Document

```json
{
  "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"
}
```

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Amazon Lex

Service for building conversational interfaces using voice and text

Provides
Automatic Speech Recognition (ASR): speech → text
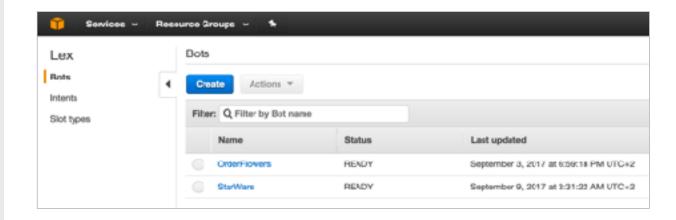Natural Language Understanding (NLU): text →intent

Powered by the same deep learning technologies as Alexa

http://aws.amazon.com/lex

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Build a
Lex Bot

aws

Multi-turn Conversations

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

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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 #)

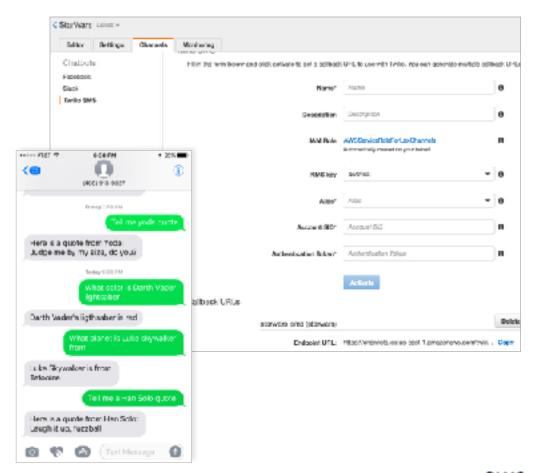Set Callback URL in Messaging of Twilio SMS endpoint

When message comes in

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

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**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

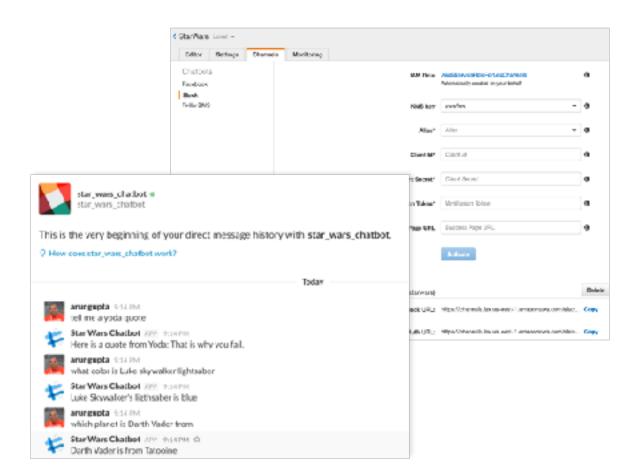Postback: Lex bot's endpoint that listens to Slack events

OAuth: Lex bot's handshake with Slack

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

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Lex
and Slack
INTEGRATION

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Lex and Facebook
INTEGRATION

Create a Facebook application

Specify application credentials in Lex bot
Gives Callback URL

Setup webhooks for Facebook application
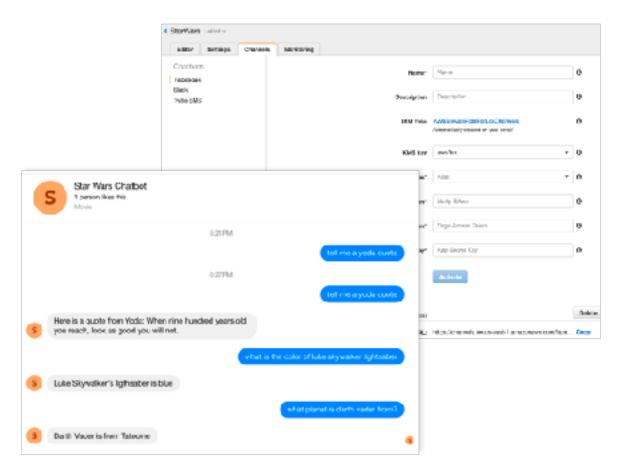
Specify Callback URL and enable subscription

Optionally, publish the application
(for public consumption)

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

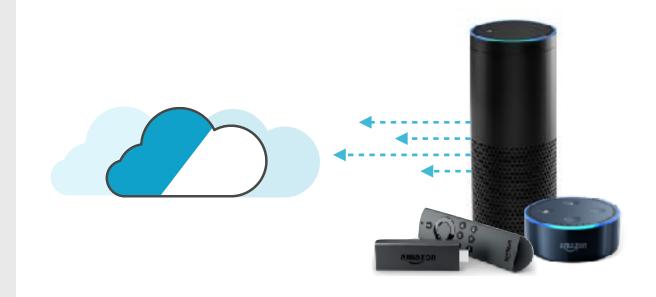# Lex and Facebook
INTEGRATION

Web Application

Text here

aws

Mobile

Text here

aws

amazon alexa

What is Alexa

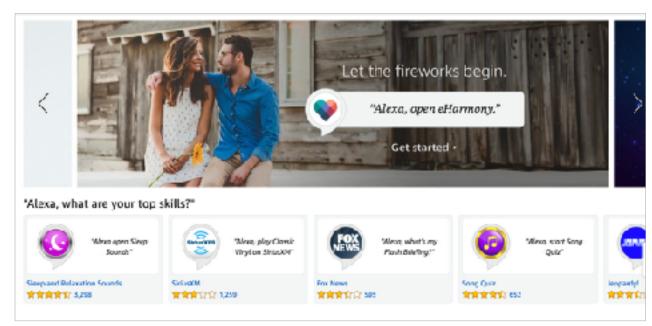play music, read the news and more

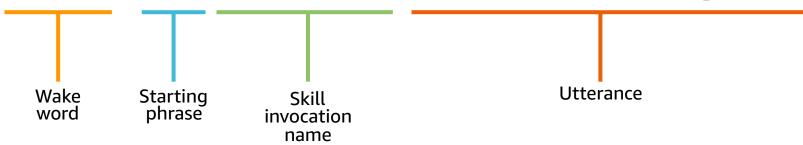**Echo** is an **always-on always-connected hands-free device** that connects to Alexa

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Alexa
Has Skills

amazon.com/skills

Alexa, ask Star Wars tell me a Yoda quote

Wake
word

Starting
phrase

Skill
invocation
name

Utterance

aws

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
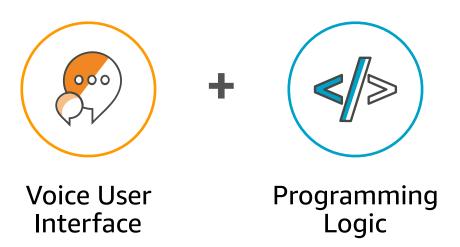
5b Customer sees a graphical representation in the companion app

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

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Two Sides of an Alexa Skill

Voice User Interface

+

Programming Logic

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Two Sides of an Alexa Skill

Voice User Interface

developer.amazon.com

+

Programming Logic

aws.amazon.com

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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 of web service on any cloud provider

Beta Test your Skill

Submit your Skill for **Certification**

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Alexa
Skills Kit

```xml
<dependency>
    <groupId>com.amazon.alexa</groupId>
    <artifactId>alexa-skills-kit</artifactId>
    <version>1.4.0</version>
    <scope>compile</scope>
</dependency>
```

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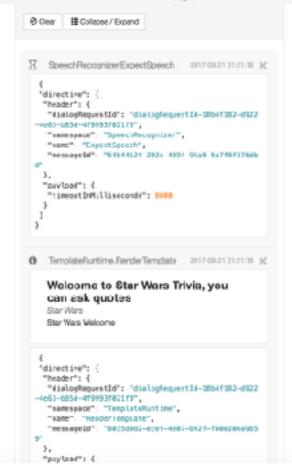Log Out   Resources   Help   Language EN-US ▾   Console ON

Echosim.io provided by iQuarius Media. Special thanks to Sam Machin 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.
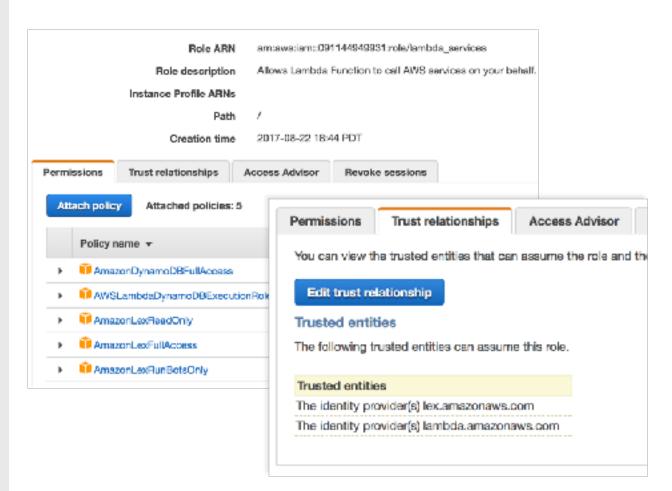
Expect Speech

⊘ Clear   ☰ Collapse / Expand

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

{
 "directive": {
  "header": {
   "dialogRequestId": "dialogRequestId-18b4f182-d922-4e63-b854-4f9993f011f9",
   "namespace": "SpeechRecognizer",
   "name": "ExpectSpeech",
   "messageId": "64b44124-2924-4891-06a5-6a7f8f176db"
  },
  "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-18b4f182-d922-4e63-b854-4f9993f011f9",
   "namespace": "TemplateRuntime",
   "name": "RenderTemplate",
   "messageId": "6e15ded1-e1e1-4e81-bn2f-f60e20ea965"
  },
 },
 "payload": {

echosim.io

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Security

LOGGING

Amazon CloudWatch

Monitoring service for AWS cloud resources and applications

Visibility into resource utilization and operational performance with Metrics and Logs

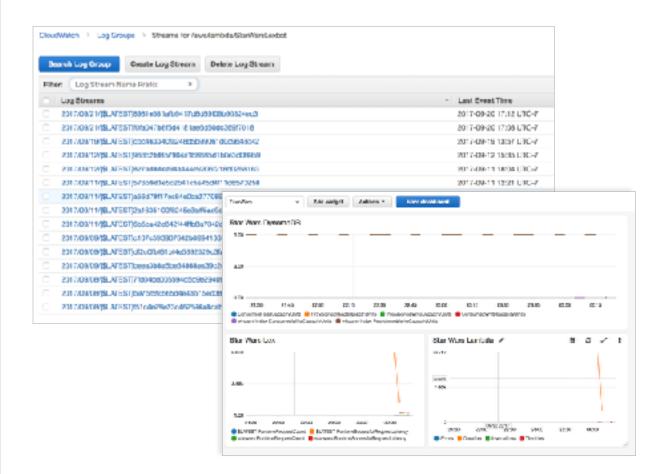Set alarm thresholds to send notifications or trigger Auto Scaling

Log aggregation, monitoring and troubleshooting with CloudWatch Logs

Support for Custom Metrics

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LOGGING
Amazon CloudWatch

aws

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

aws

ANALYZE & DEBUG

AWS X-Ray

Add a snapshot of X-Ray dump

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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
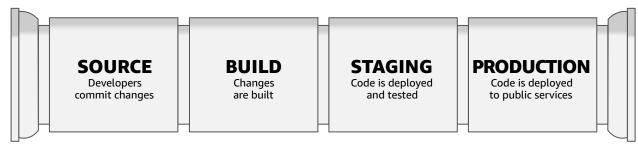
Deployment Pipeline

ON AWS

AWS CodePipeline

Automated continuous integration and continuous delivery release workflow

SOURCE	BUILD	STAGING	PRODUCTION
Developers commit changes	Changes are built	Code is deployed and tested	Code is deployed to public services

Pull source code from

AWS CodeCommit

Amazon S3

GitHub

Build with

AWS CodeBuild

Jenkins

Solano Cl

TeamCity

Test with

Apica

BlazeMeter

Ghost Inspector

HPE StormRunner Load

Runscope

Deploy with

AWS CodeDeploy

AWS Elastic Beanstak

AWS OpsWorks Stacks

AWS CloudFormation

Xebia Labs

aws

Maven
Plugin

```xml
<groupId>com.github.seanroy</groupId>
<artifactId>lambda-maven-plugin</artifactId>
<version>2.2.?</version>
```

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References

Amazon Lex
aws.amazon.com/lex

Developer Portal
developer.amazon.com

Slides & code
github.com/arun-gupta/chatbot