

Build Your Own Chatbot

Arun Gupta @arungupta

Amazon Web Services

Docker Captain
Java Champion
JavaOne Rock Star (4 years)
NetBeans Dream Team
Silicon Valley JUG Leader
Author
Runner
Lifelong learner



STAR WARS CHATBOT

Tell me a Yoda quote

Developer challenges

Automated Speech
Recognition

Scalability

Business Logic

Dialog Manager

Authentication

Availability

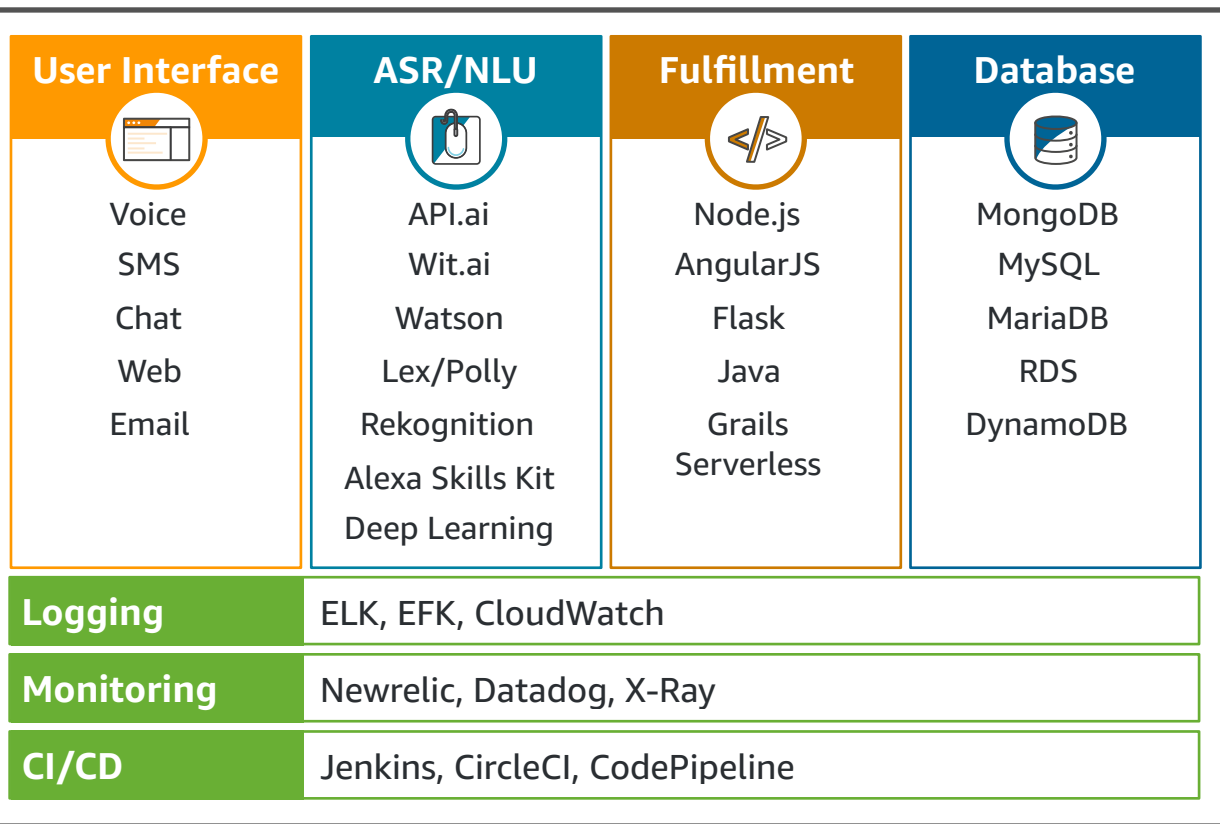
Testing

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.

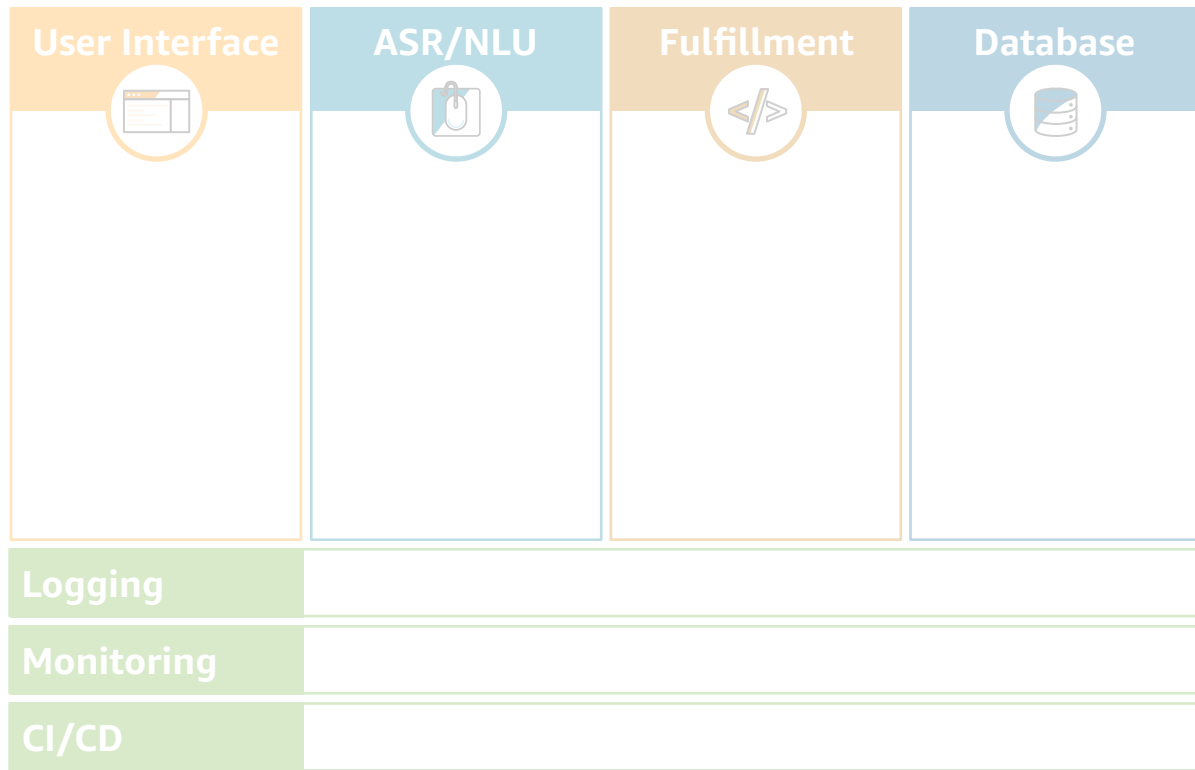


Are you sure you want to book the hotel in New York City?

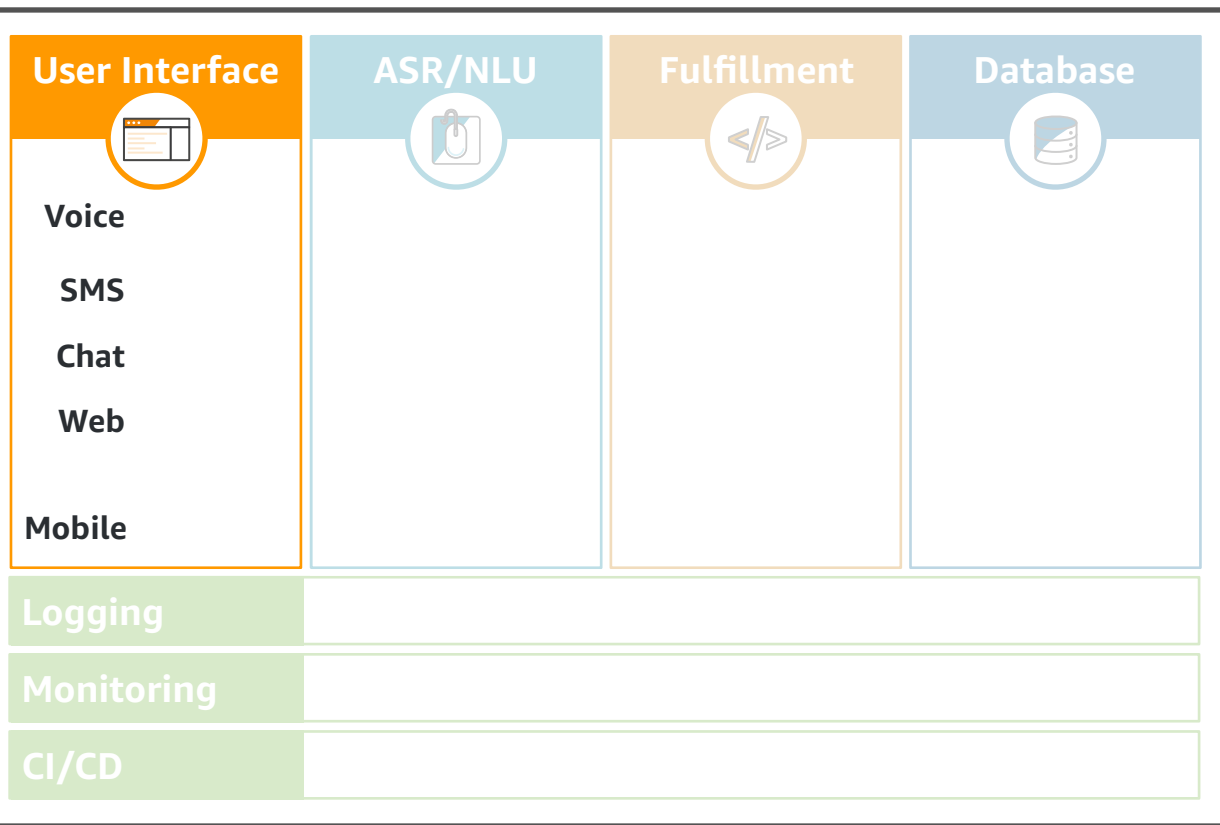
Yes.

Thank you. The reservation went through successfully.

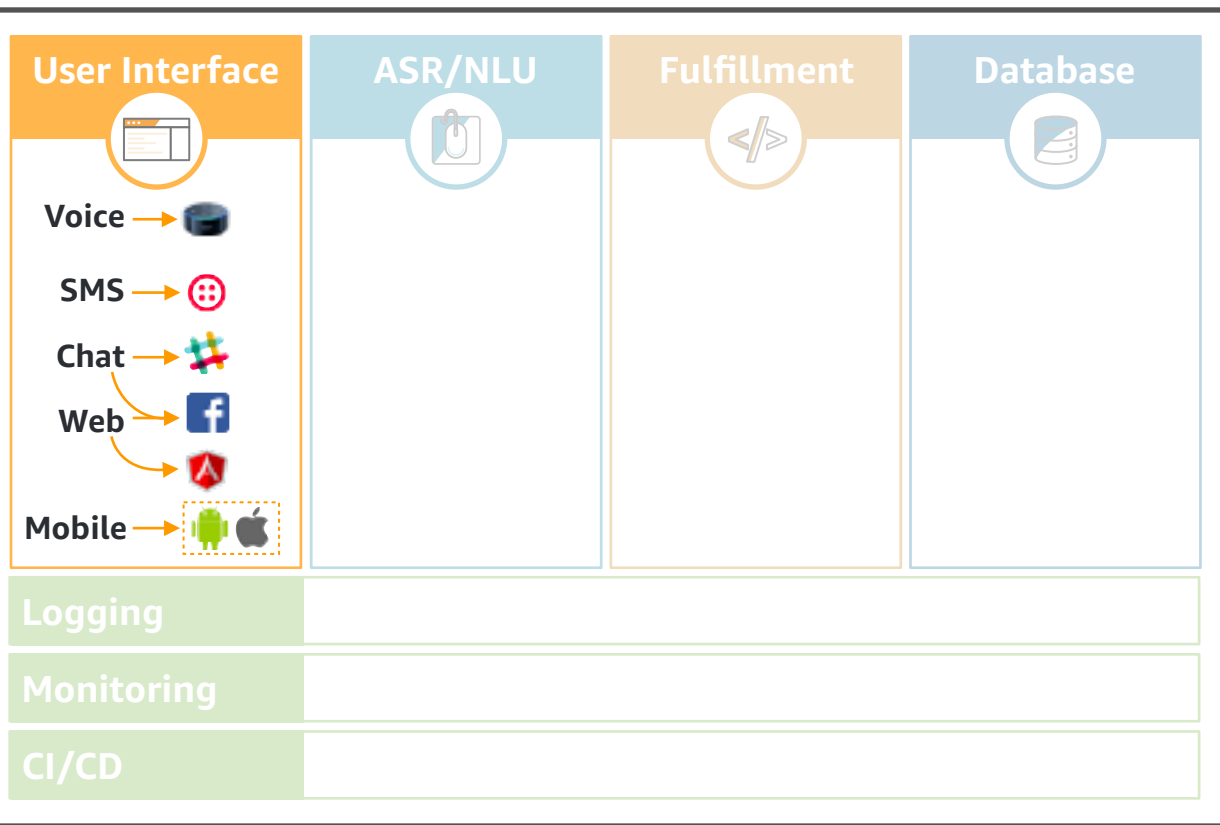
CHATBOT Architecture



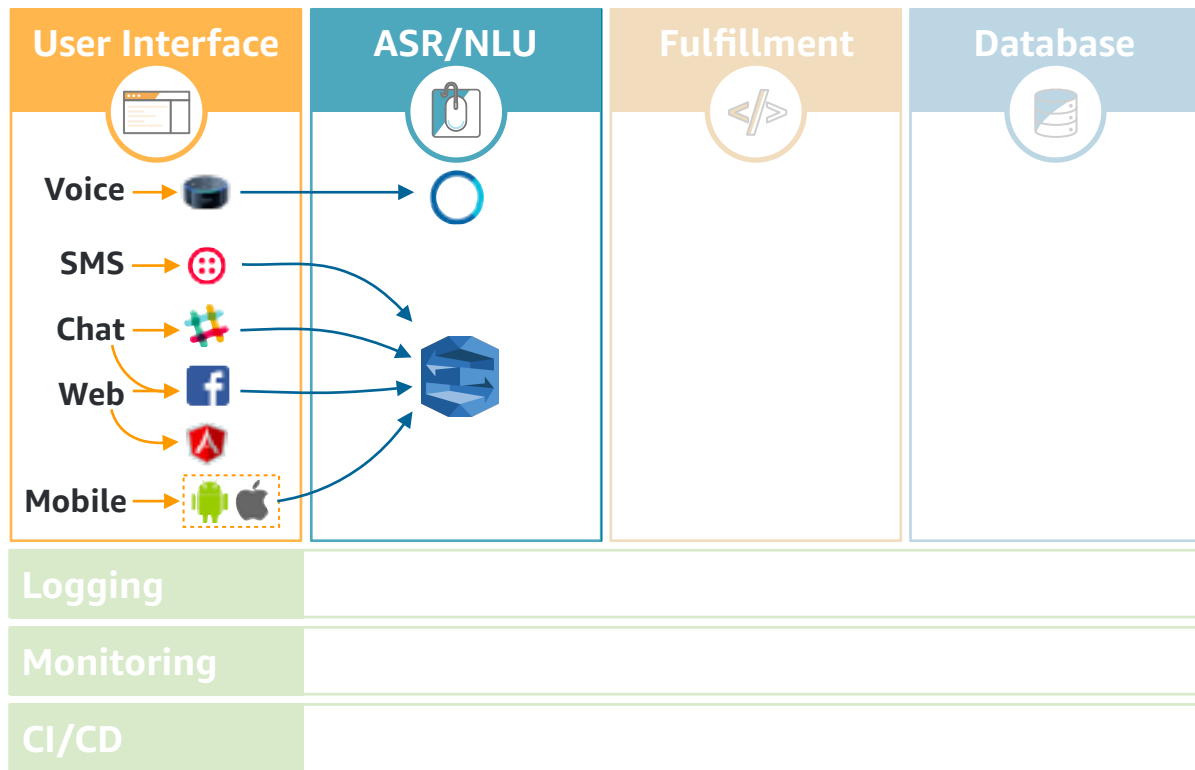
CHATBOT Architecture



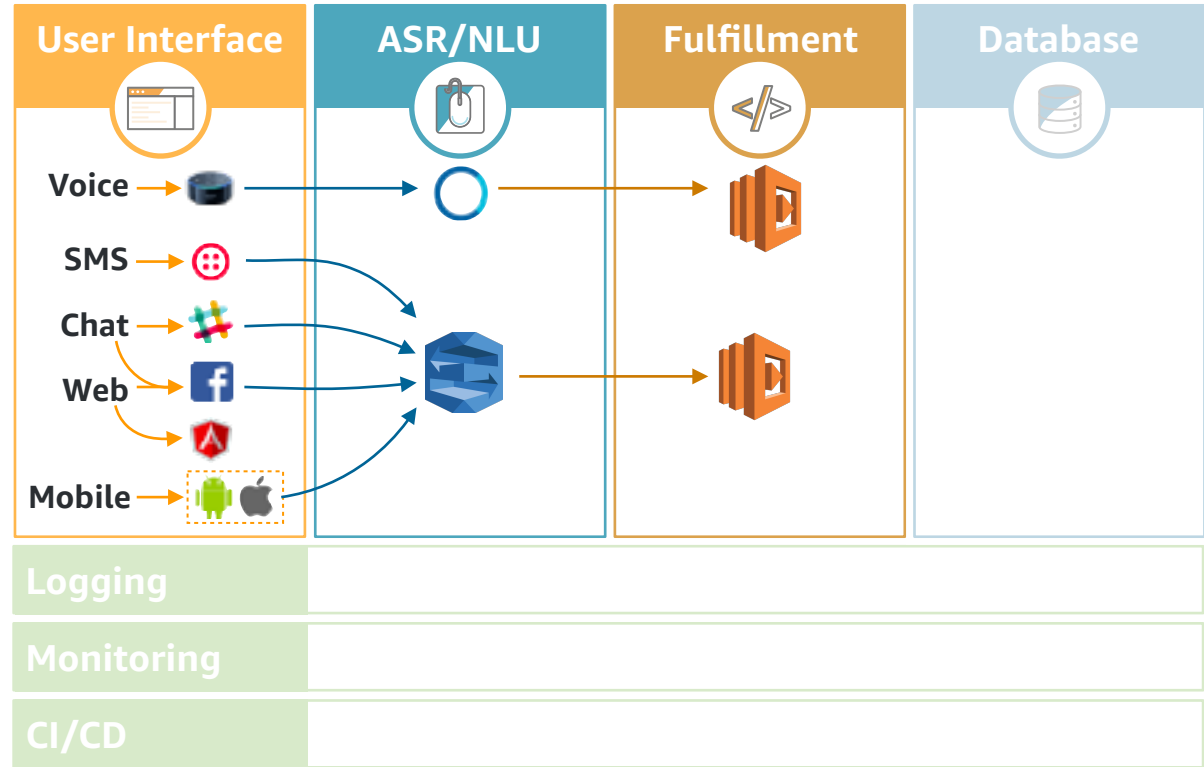
CHATBOT Architecture



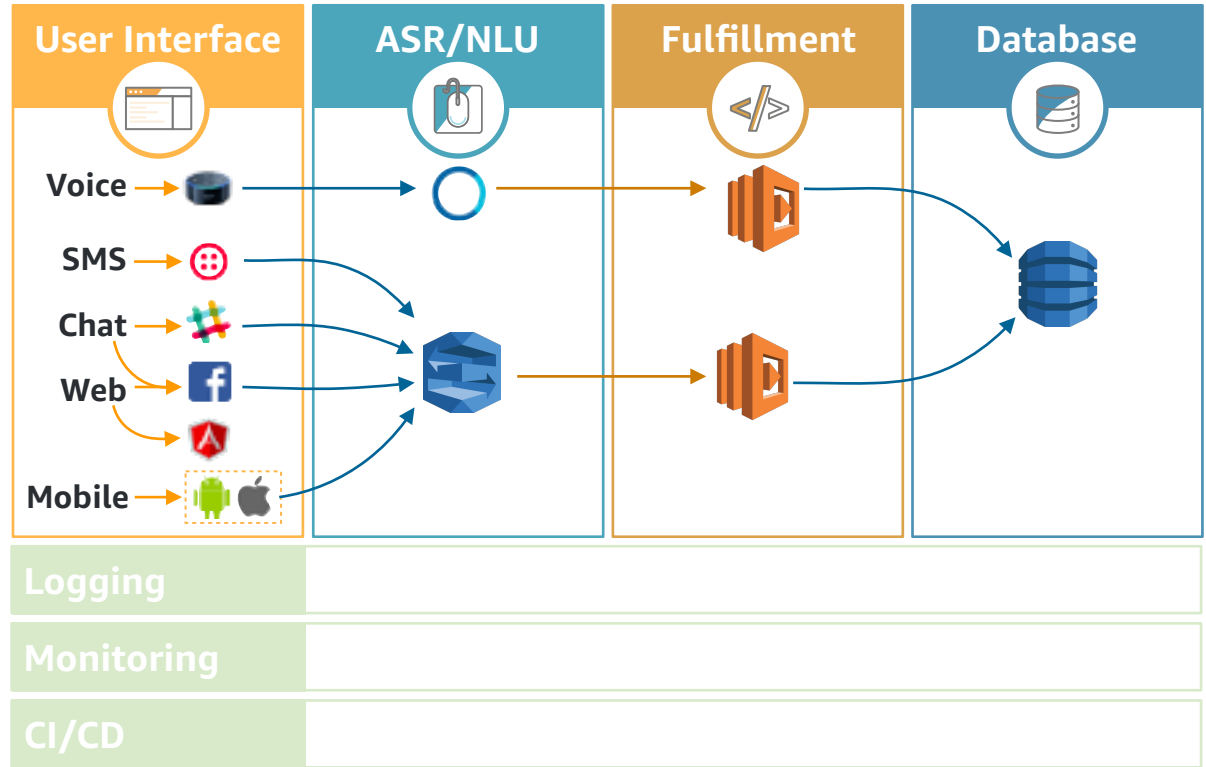
CHATBOT Architecture



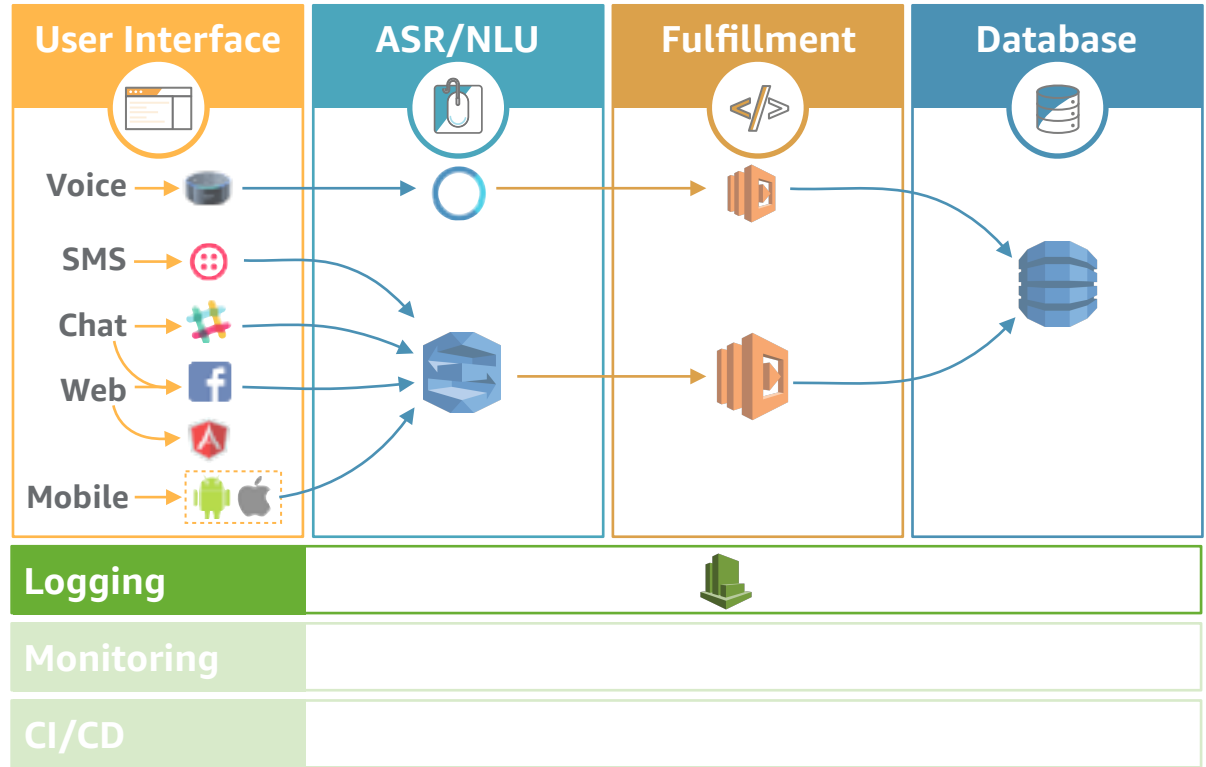
CHATBOT Architecture



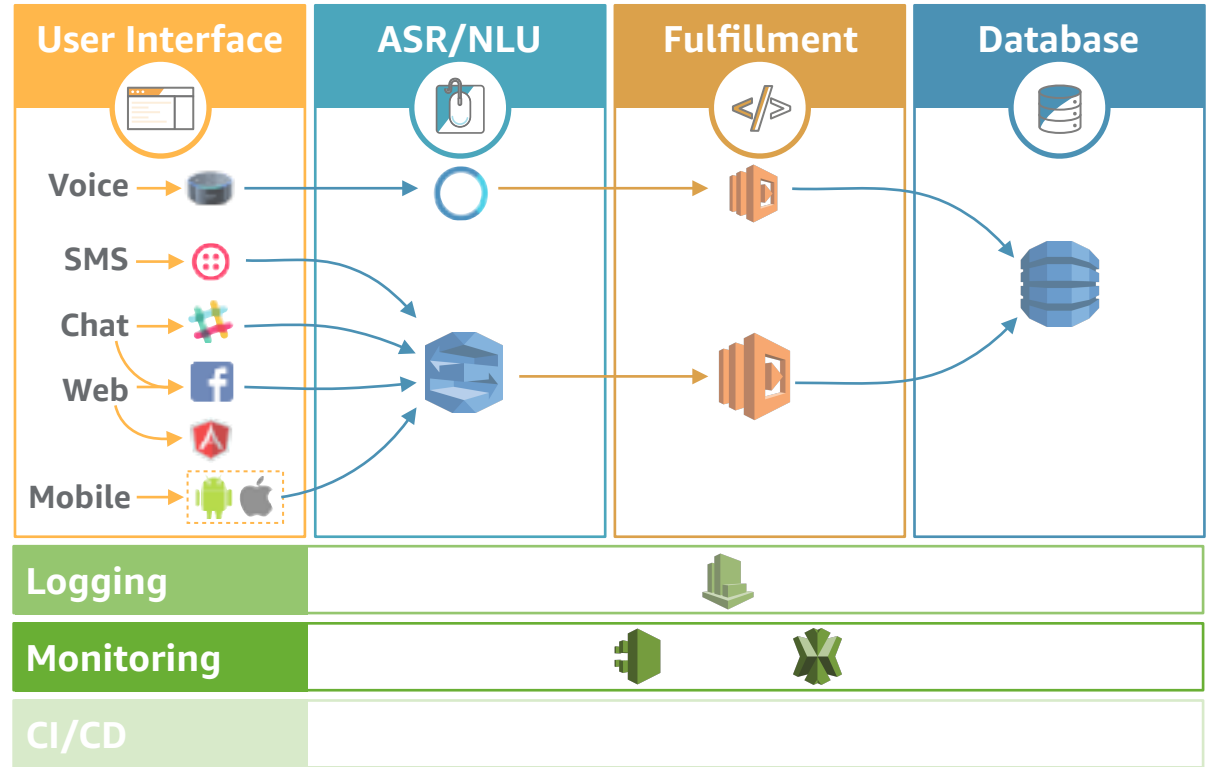
CHATBOT Architecture



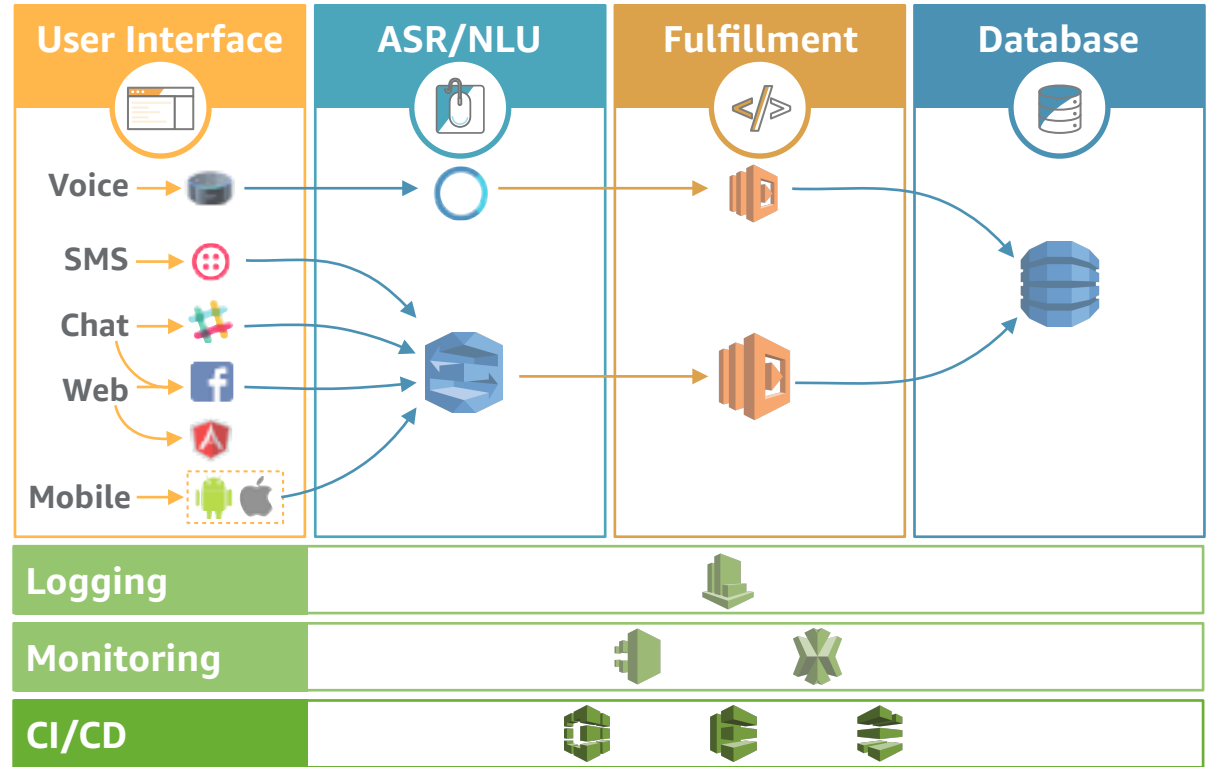
CHATBOT Architecture



CHATBOT Architecture



CHATBOT 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)



Amazon 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

FREE Tier: 200 million requests/month

25GB indexed data storage

JSON Document

```
{
  "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"
}
```



The screenshot shows the AWS IAM console interface. The 'Groups' tab is selected, and the user 'yoda' is highlighted in the list. The table below shows the details for the user 'yoda'.

Name	Status	Type	Partition key	Sort key	Attributes	Read capacity	Write capacity	Size
yoda	Active	DB	Amazon DynamoDB	-	N/A	0	0	1,024



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: Q Filter by Bot name

Name	Status	Last updated
OrderFlowers	READY	September 3, 2017 at 6:59:18 PM UTC+2
StarWars	READY	September 9, 2017 at 1:31:23 AM UTC+2



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

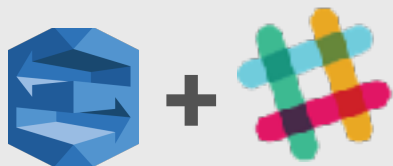
Create a Twilio SMS endpoint (phone #)

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 Slack

INTEGRATION

Create a Slack application: api.slack.com

Add a Bot to the application

Always online

Enable interactive messages

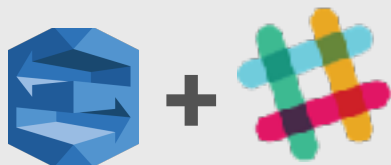
Specify Slack credentials in Lex bot

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

star_wars_chatbot

This is the very beginning of your direct message history with star_wars_chatbot.

[How does star_wars_chatbot work?](#)

Today

anuragpta 9:14 PM
tell me a yoda quote

Star Wars Chatbot APP 9:14 PM
Here is a quote from Yoda: That is why you fail.

anuragpta 9:14 PM
what color is Luke Skywalker's lightsaber

Star Wars Chatbot APP 9:14 PM
Luke Skywalker's lightsaber is blue

anuragpta 9:14 PM
which planet is Darth Vader from

Star Wars Chatbot APP 9:14 PM
Darth Vader is from Tatooine



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>





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"	Sleep and Relaxation Sounds	★★★★☆ 5,255
	"Alexa, play Classical Music on Amazon Music"	Classical Music	★★★★☆ 1,259
	"Alexa, what's my Flash Briefing?"	FOX NEWS	★★★★☆ 582
	"Alexa, start Song Quiz"	Song Quiz	★★★★☆ 652
		Longway!	★★★★☆

Alexa, ask Star Wars tell me a Yoda quote



Customer

Alexa

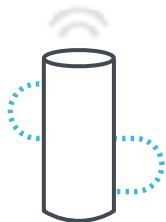
Your Alexa Skill



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

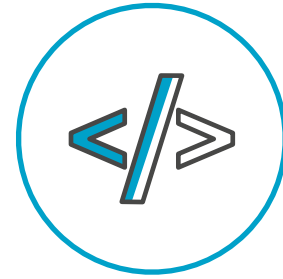
4b Your graphical representation (if any) is rendered in the companion app

Two Sides of an Alexa Skill



Voice User
Interface

+



Programming
Logic

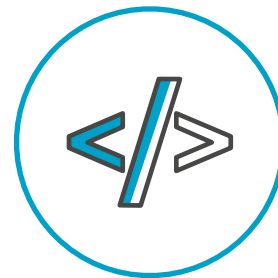
Two Sides of an Alexa Skill



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 Quinus 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.

Tapnet 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": "64b44121-2924-4901-05a5-847f0f176db"
    }
  },
  "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-b12f-f0e020e0d05"
    }
  },
  "payload": {
```

echosim.io



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

Maven Plugin

```
<groupId>com.github.seanroy</groupId>  
<artifactId>lambda-maven-plugin</artifactId>  
<version>2.2.3</version>
```



References

Amazon Lex

aws.amazon.com/lex

Developer Portal

developer.amazon.com

Slides & code

github.com/arun-gupta/chatbot