

Build Your Own Chatbot

Of course, using Java!

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



Tell me a Yoda quote

Developer challenges

Automated Speech
Recognition

Scalability

Business Logic

Dialog Manager

Authentication

Availability

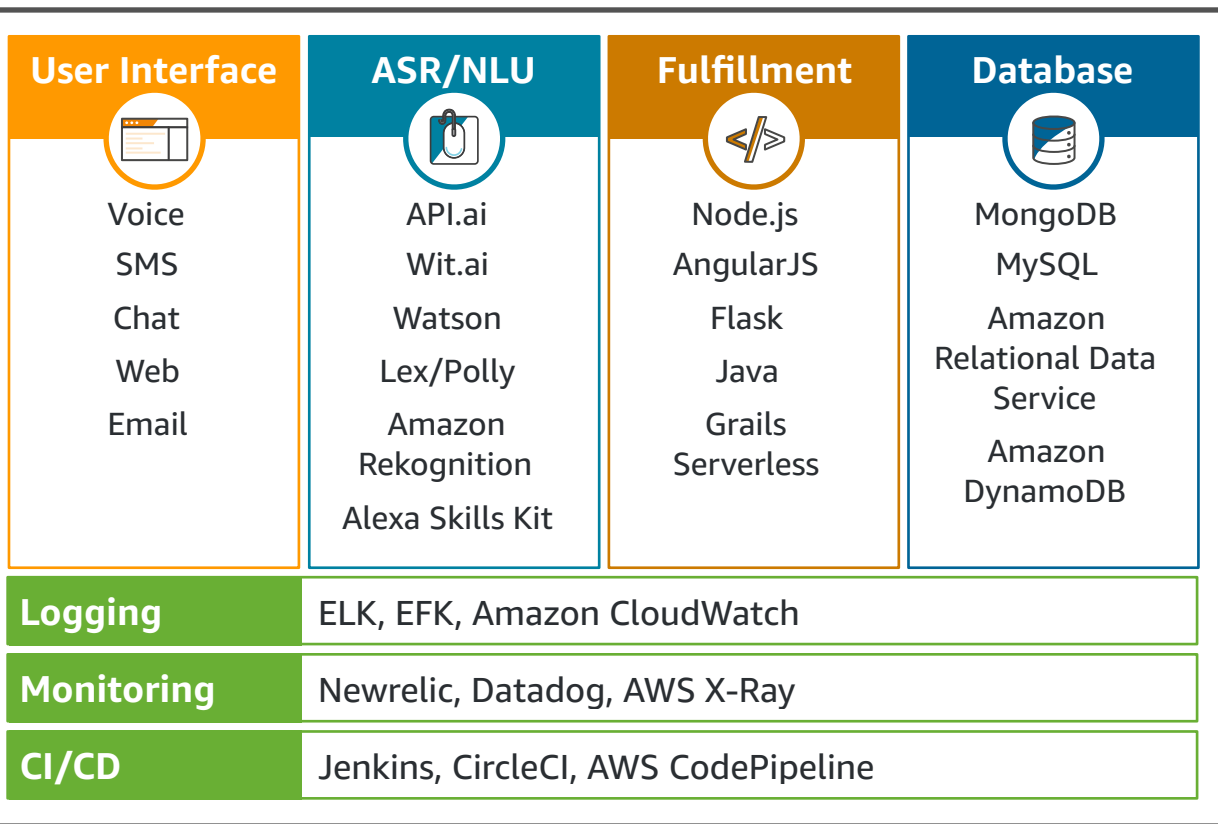
Testing

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.

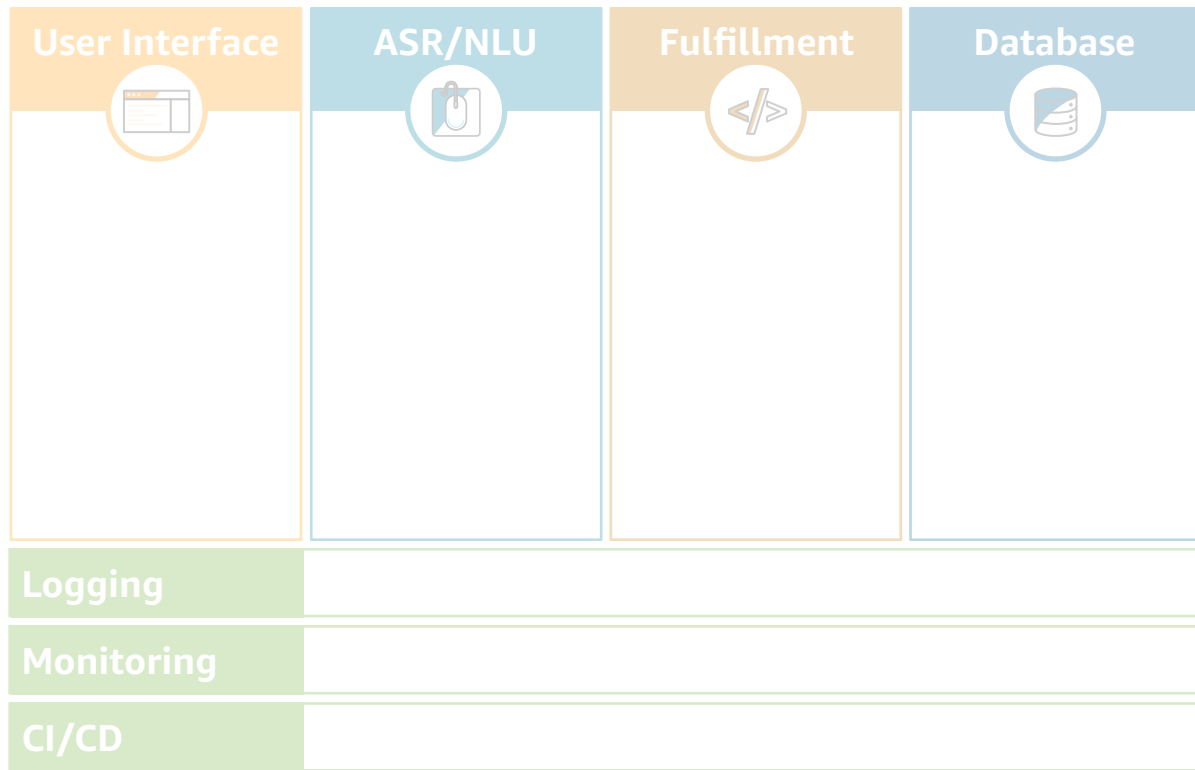


Are you sure you want to book the hotel in New York City?

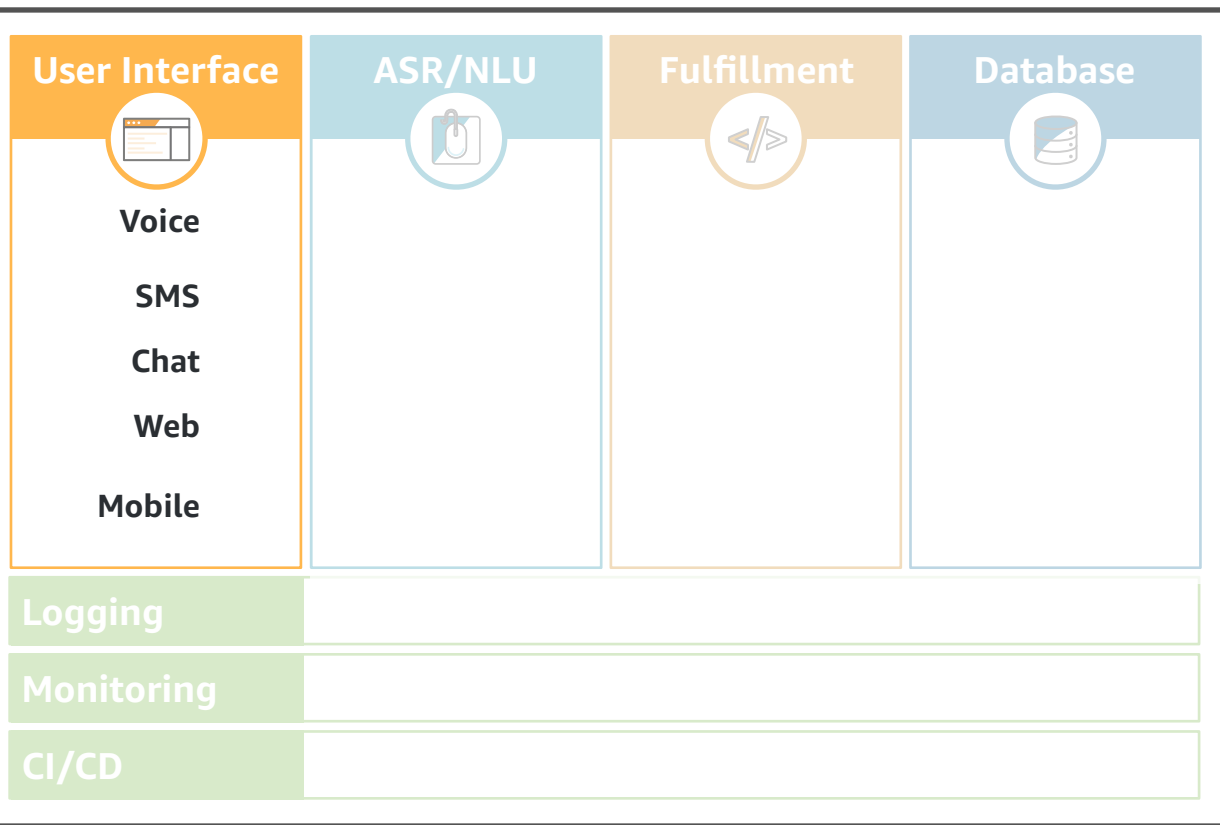
Yes.

Thank you. The reservation went through successfully.

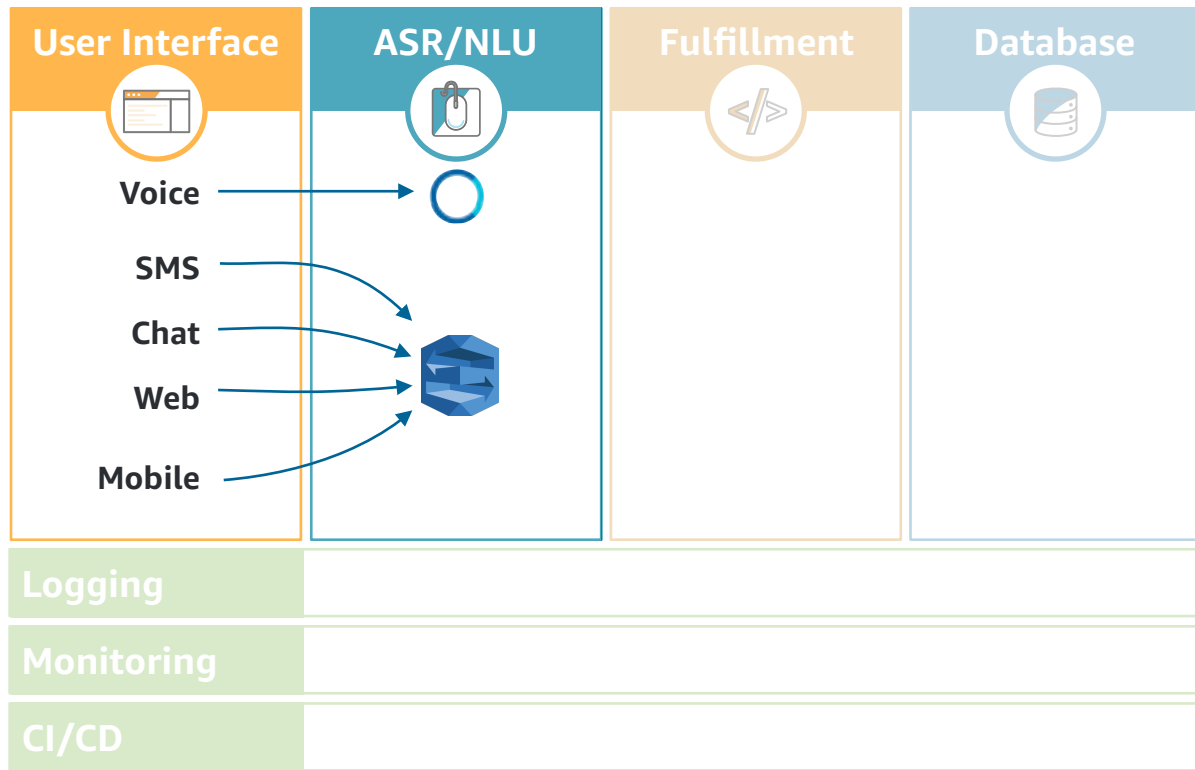
CHATBOT Architecture



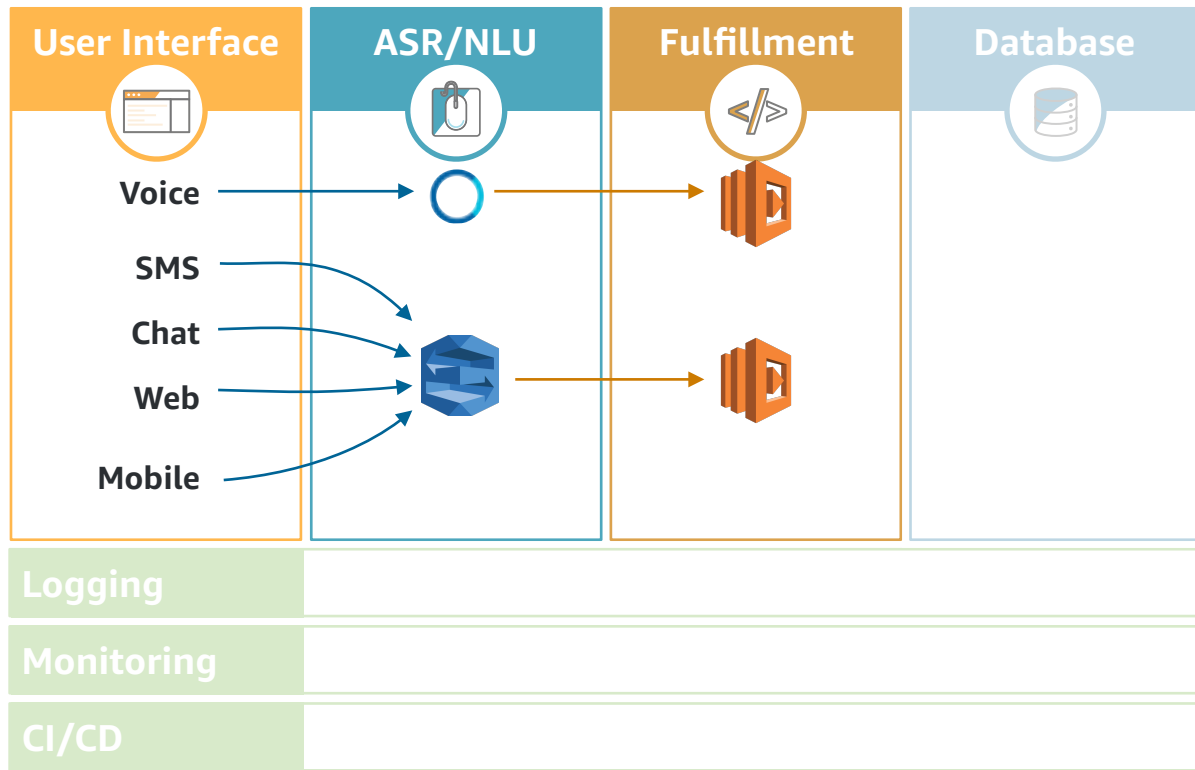
CHATBOT Architecture



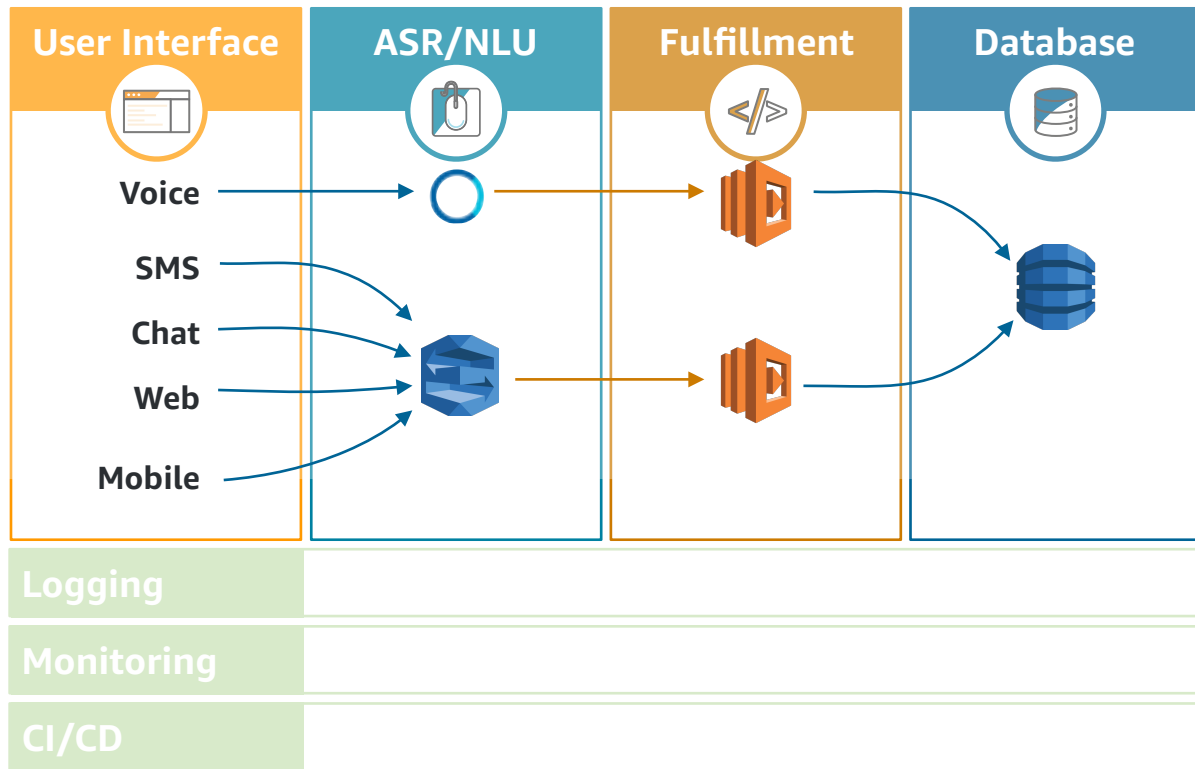
CHATBOT Architecture



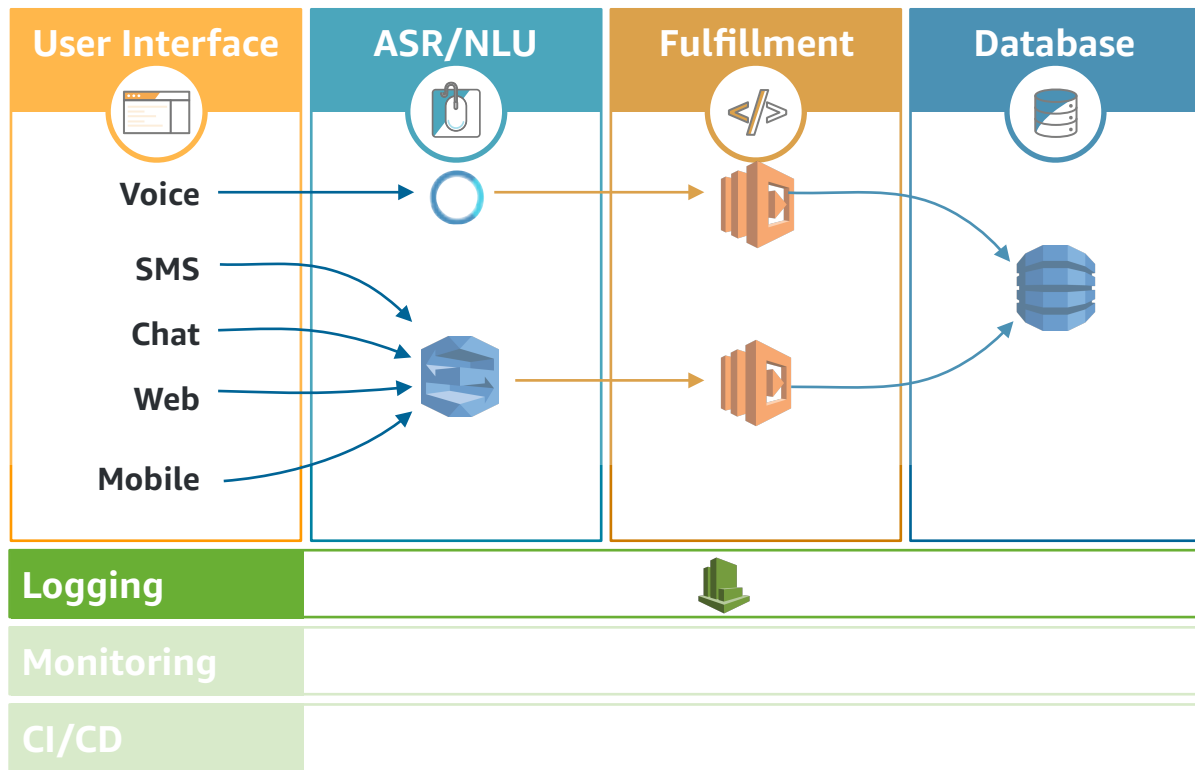
CHATBOT Architecture



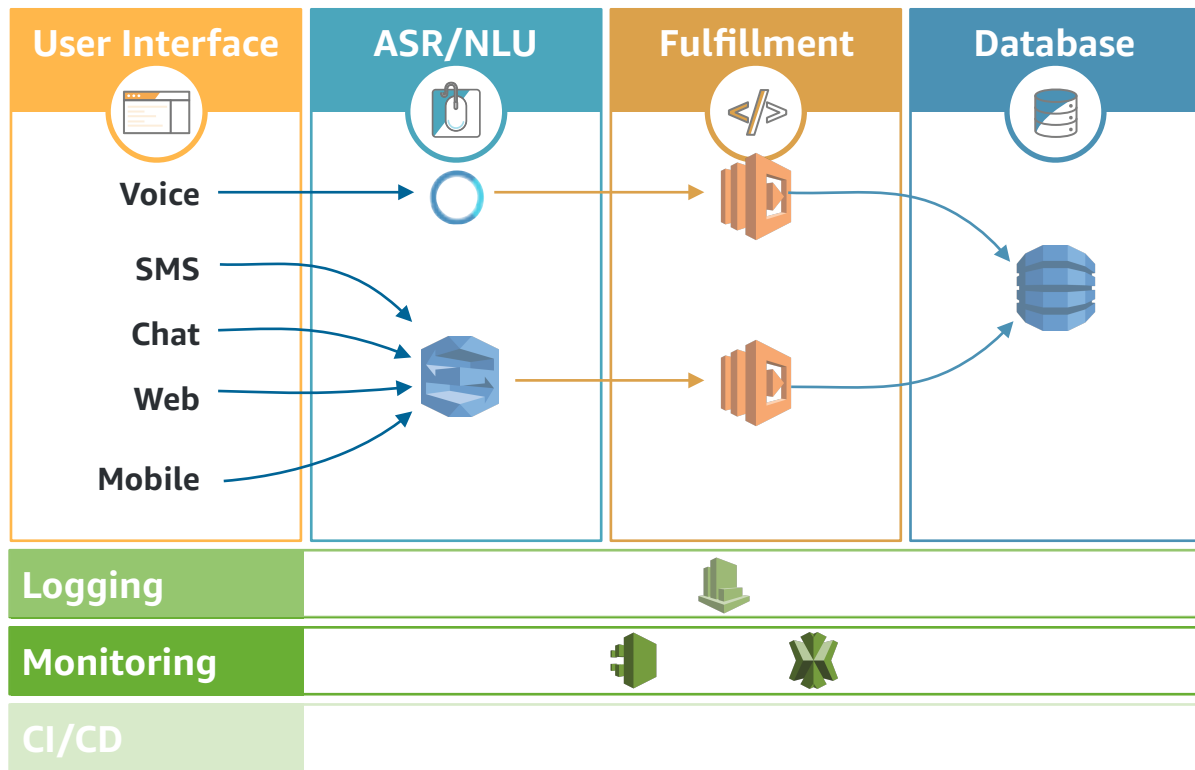
CHATBOT Architecture



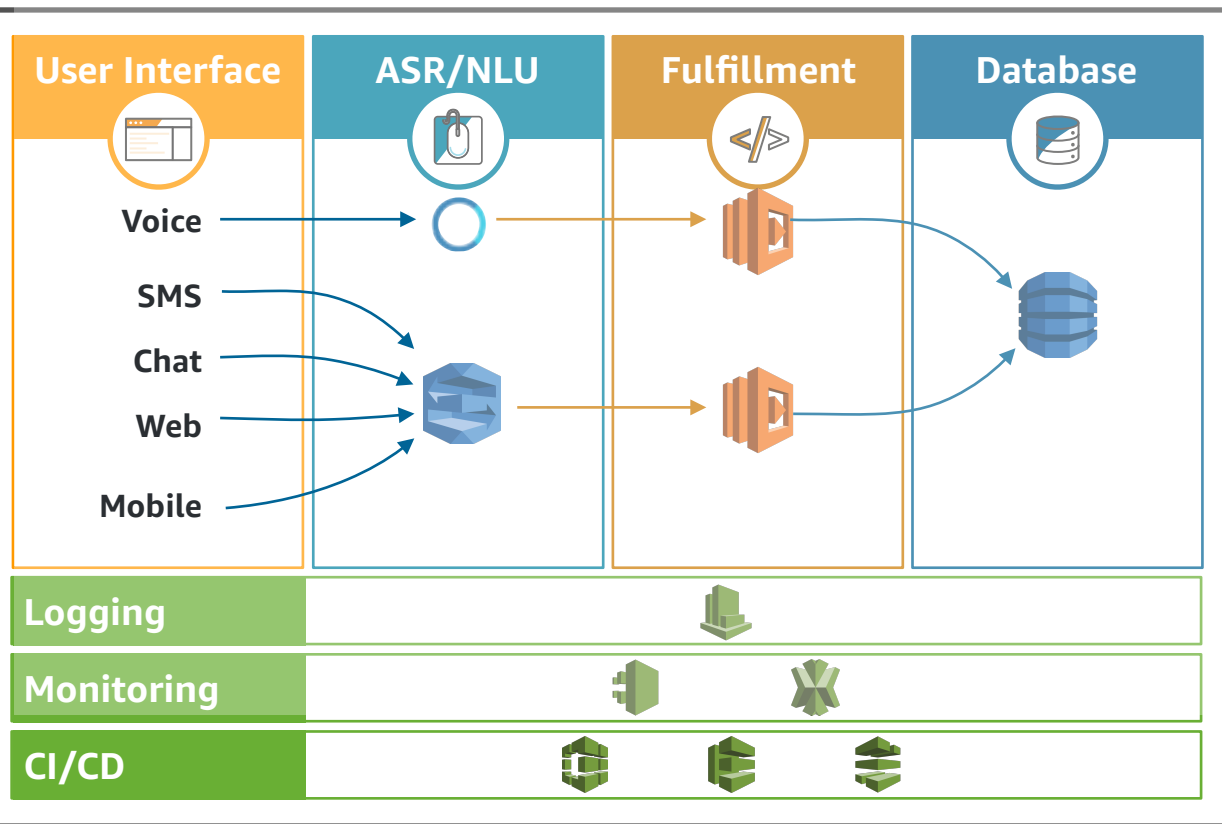
CHATBOT Architecture



CHATBOT Architecture



CHATBOT Architecture



BYOC Build Your Own Chatbot



Build a Amazon 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

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

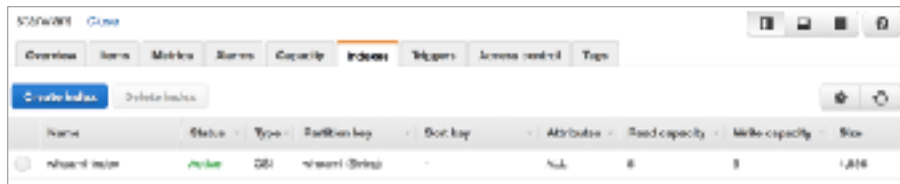
Simple and cost effective

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 of the user.

Name	Status	Type	Partition key	Sort key	Attributes	Read capacity	Write capacity	Size
yoda	Active	DB	Amazon (DB)	-	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 Amazon 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



Amazon Lex and Twilio

SMS INTEGRATION

Twilio: Build software that communicates with everyone in the world

Create a Twilio SMS endpoint

Specify Twilio credentials in Amazon Lex bot

Create a Twilio SMS endpoint (phone #)

Set Callback URL in Messaging
of Twilio SMS endpoint

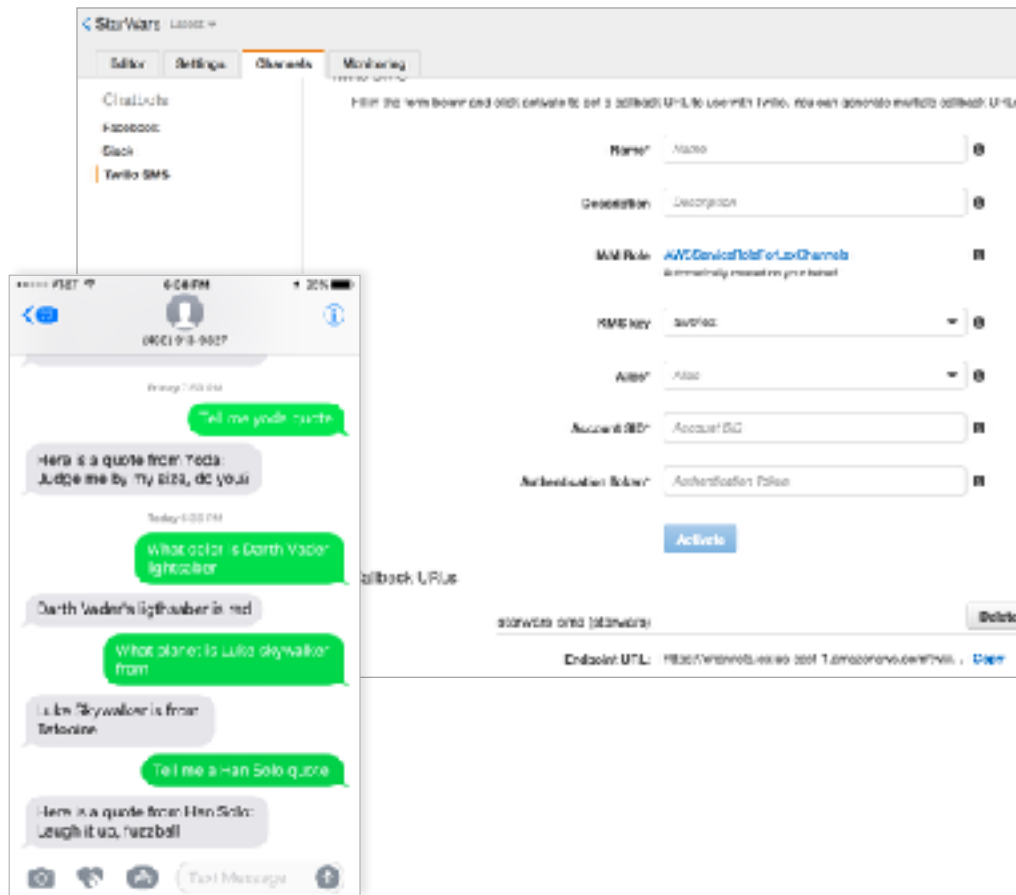
When message comes in

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



Amazon Lex and Twilio

SMS INTEGRATION





Amazon Lex and Slack INTEGRATION

Create a Slack application: api.slack.com

Add a Bot to the application

Always online

Enable interactive messages

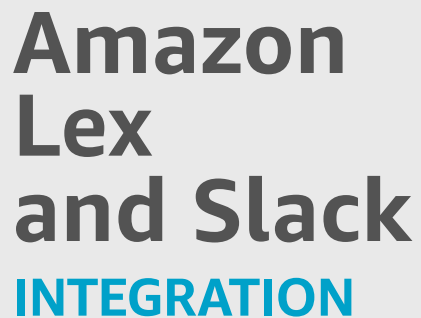
Specify Slack credentials in Amazon Lex bot

Specify URLs in Slack application

Postback: Amazon Lex bot's endpoint for Slack events

OAuth: Lex bot's handshake with Slack

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





Amazon Lex and Facebook

INTEGRATION

Create a Facebook application

Specify application credentials in Amazon 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>



Amazon Lex and Facebook INTEGRATION

The screenshot displays the Amazon Lex console interface. The top navigation bar includes 'Star Wars', 'Settings', 'Channels', and 'Monitoring'. The 'Channels' tab is active, showing a list of channels on the left: 'Overview', 'Facebook', ' Slack', and 'Twilio SMS'. The right pane shows configuration fields for a channel, including 'Name', 'Description', 'IAM Role' (set to 'AWSLexRoleDefaultPolicy'), 'SMS bot', 'App', 'Verify Schema', 'Page Apprise Token', and 'App Secret Key'. A 'Subscribe' button is visible at the bottom of this pane.

Below the console, a chatbot preview window is shown for 'Star Wars Chatbot', which has '1 person likes this Movie'. The chat history includes:

- 5:21 PM: User asks 'tell me a yoda quote'. The bot responds: 'Here is a quote from Yoda: When nine hundred years old you reach, look as good as you will not.'
- 5:27 PM: User asks 'what is the color of luke skywalker lightsaber'. The bot responds: 'Luke Skywalker's lightsaber is blue.'
- User asks 'what planet is darth vader from?'. The bot responds: 'Darth Vader is from Tatooine.'



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 Cricut Vrylon Stratus4"	CricutEM	★★★★☆ 1,219
	"Alexa, what's my Flash Briefing?"	FOX NEWS	★★★★☆ 582
	"Alexa, start Song Quiz"	Song Quiz	★★★★☆ 652
		longairly!	★★★★☆ 5

Alexa, ask Star Wars tell me a Yoda quote



Customer

Alexa

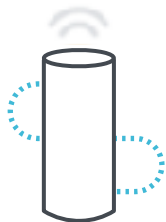
Your Alexa Skill



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

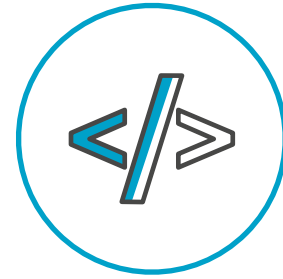
4b Your graphical representation (if any) is rendered in the companion app

Two Sides of an Alexa Skill



Voice User
Interface

+



Programming
Logic

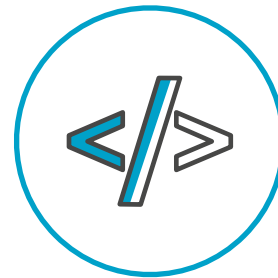
Two Sides of an Alexa Skill



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 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.

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-b21f-f0e020e905"
    }
  },
  "payload": {
```

echosim.io

Alexa is now in the Amazon app





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