Build Your Own Chatbot

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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

Testing

Availability

Mobile

Business Logic

Natural Language Understanding

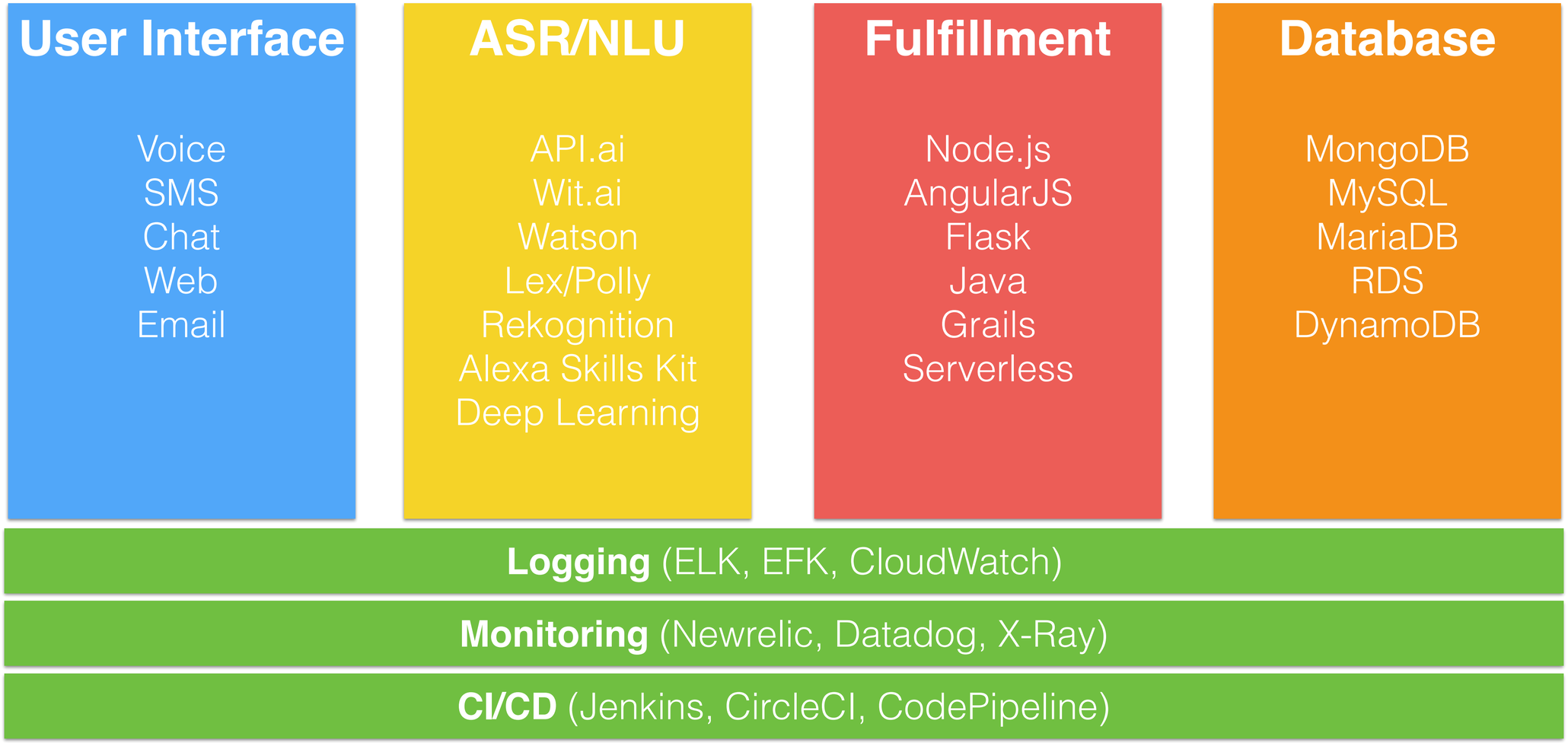
Scalability

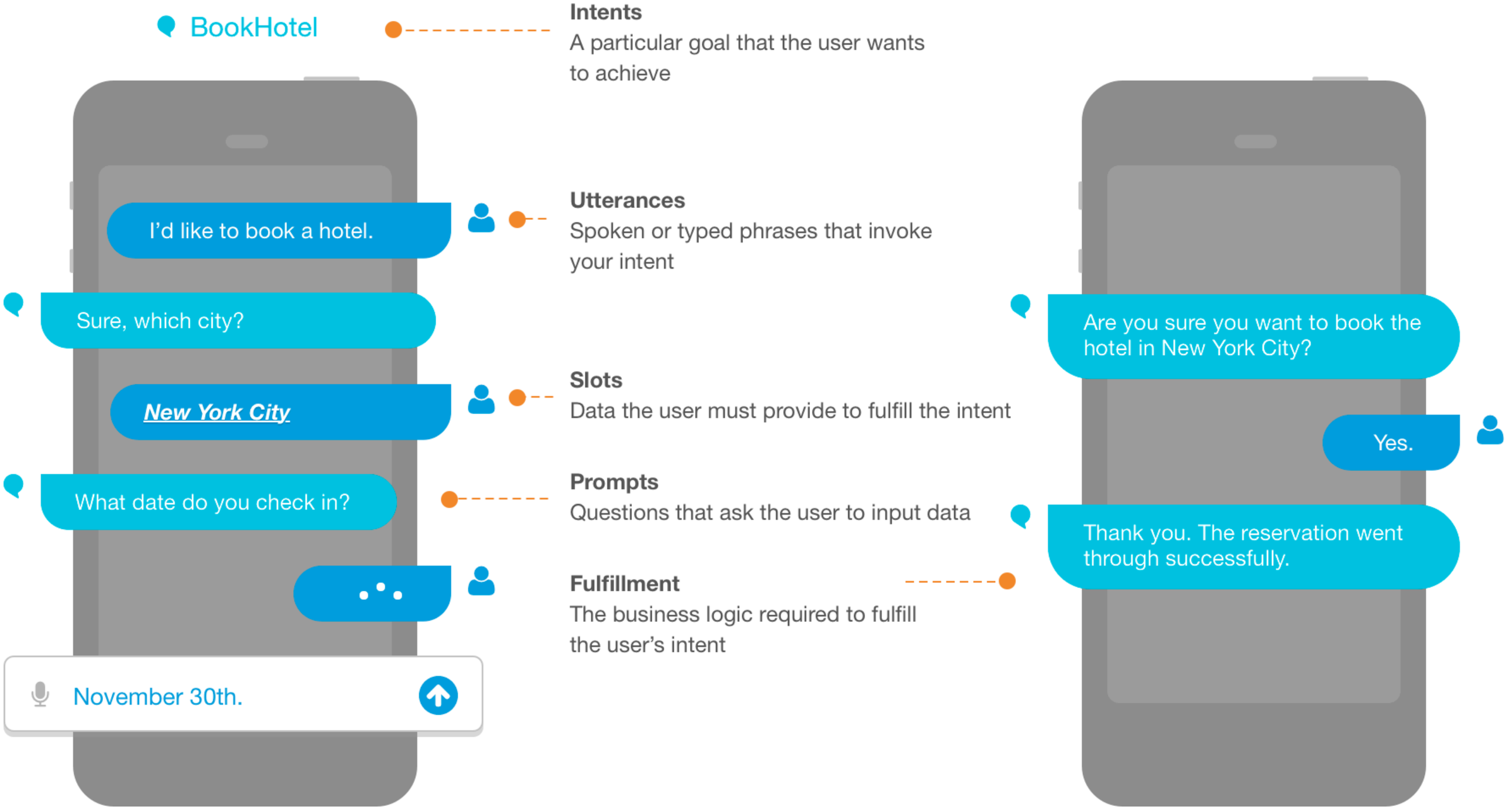
Authentication

Disparate Systems

Dialog Manager

Chatbot Components





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

“Tell me a Yoda quote”

Tell | me | a | Yoda | quote

Automatic Speech Recognition

Get a quote | Yoda

Natural Language Understanding

Intent / Slot / Prompt

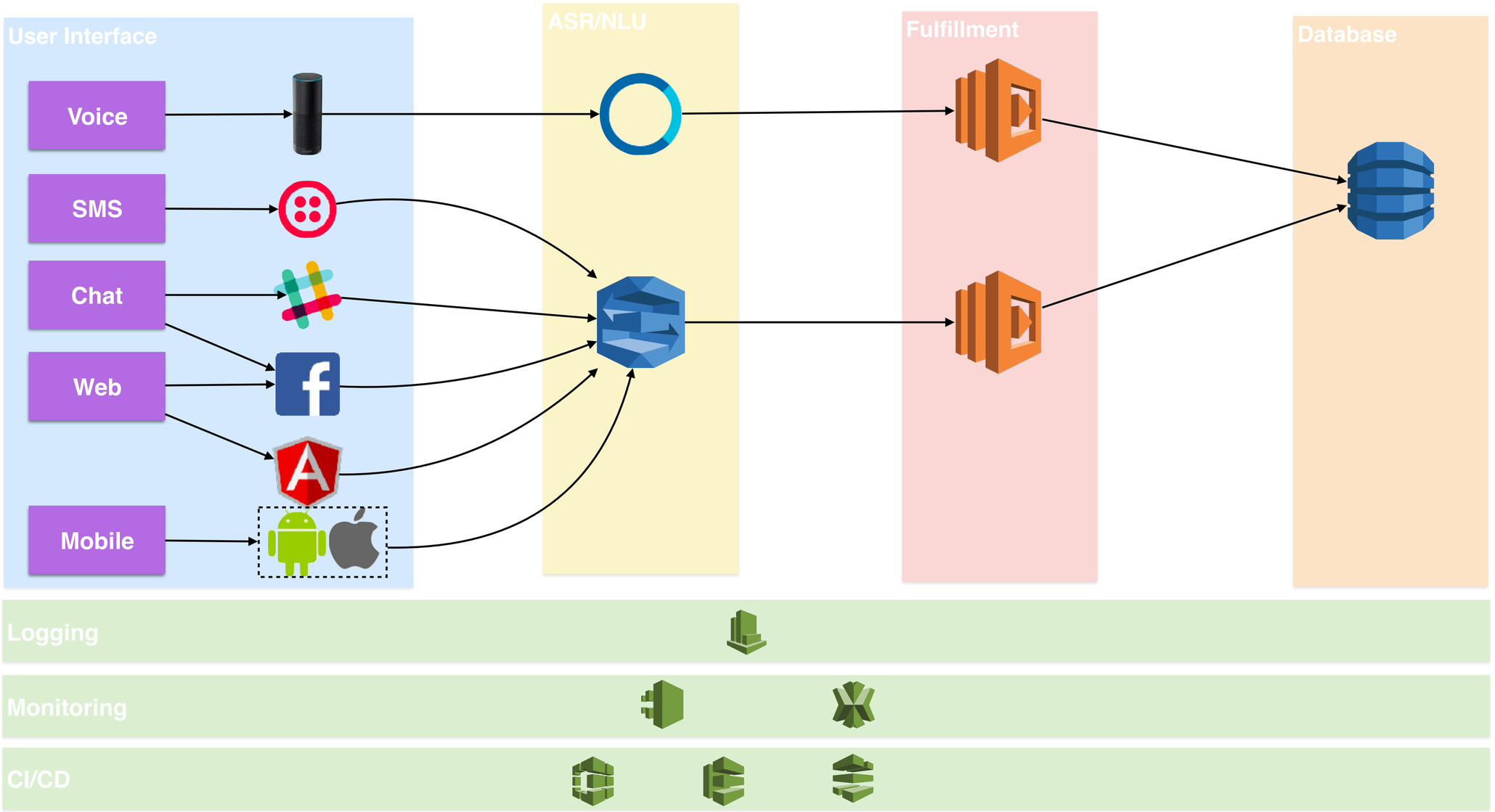
Quote	
Character	Yoda
Movie	IV

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.”

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)

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

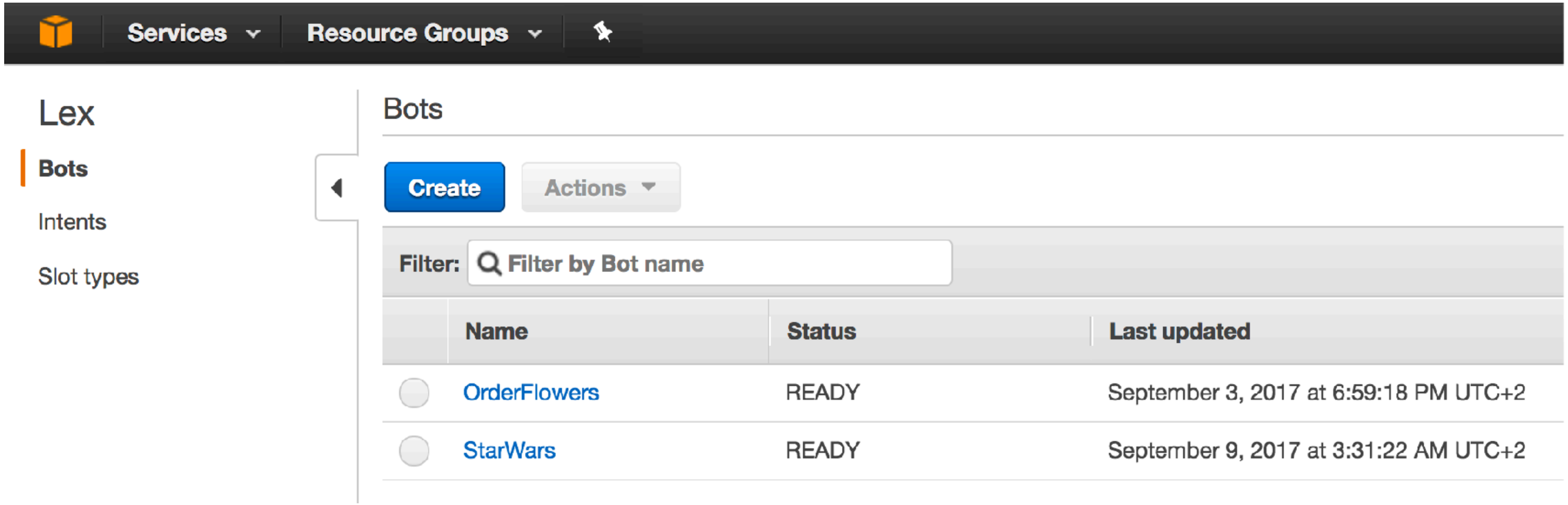
JSON Document

```
{
  "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 everythin
    "Impossible to see the future i
    "Clear your mind must be",
    "Much to learn you still have .
  ],
  "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



Multi-turn conversations

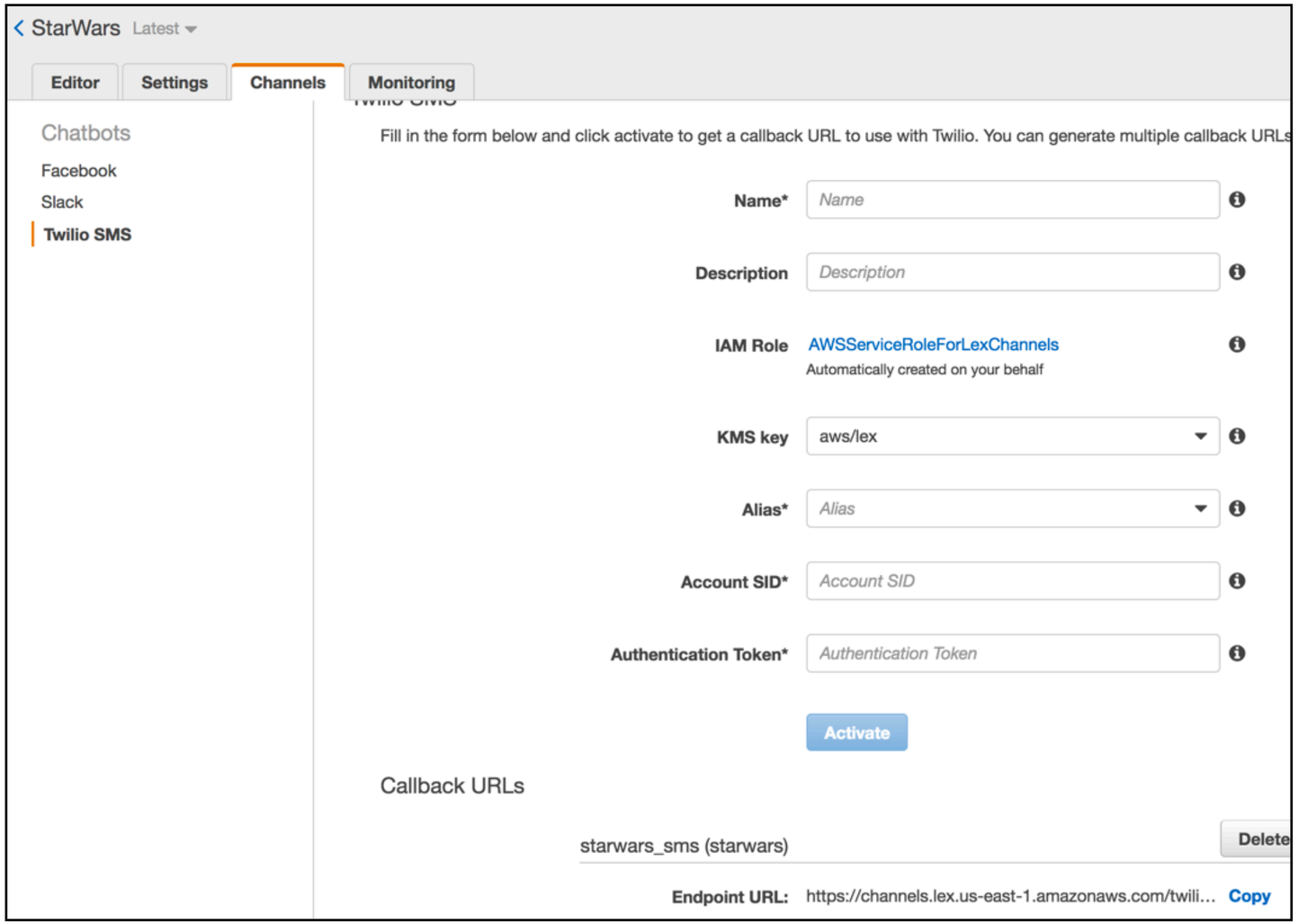
- Default session timeout is 5 mins, can be up to 24 hours

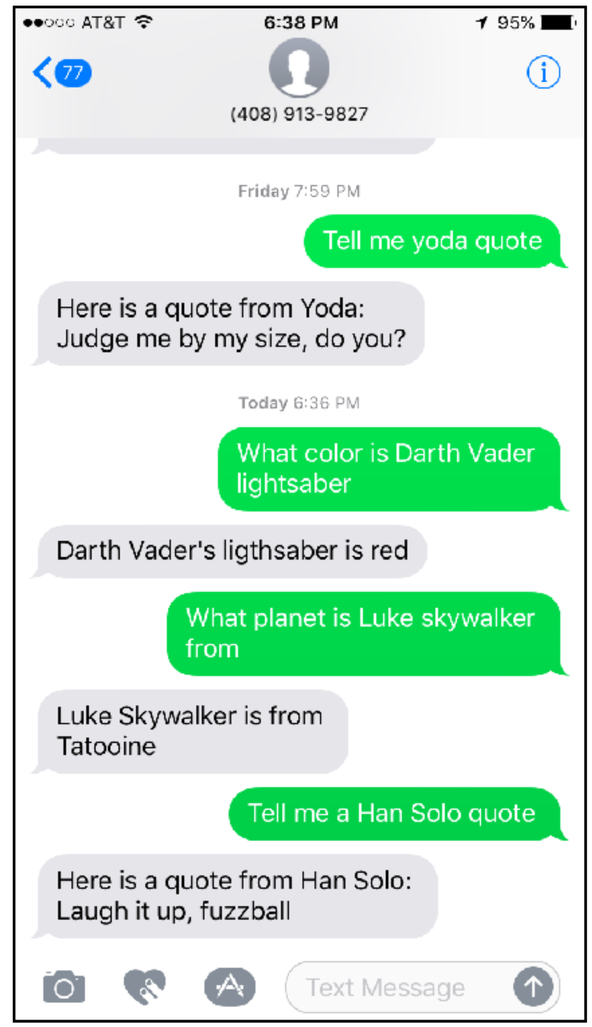
Lex and Twilio/SMS Integration

- 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



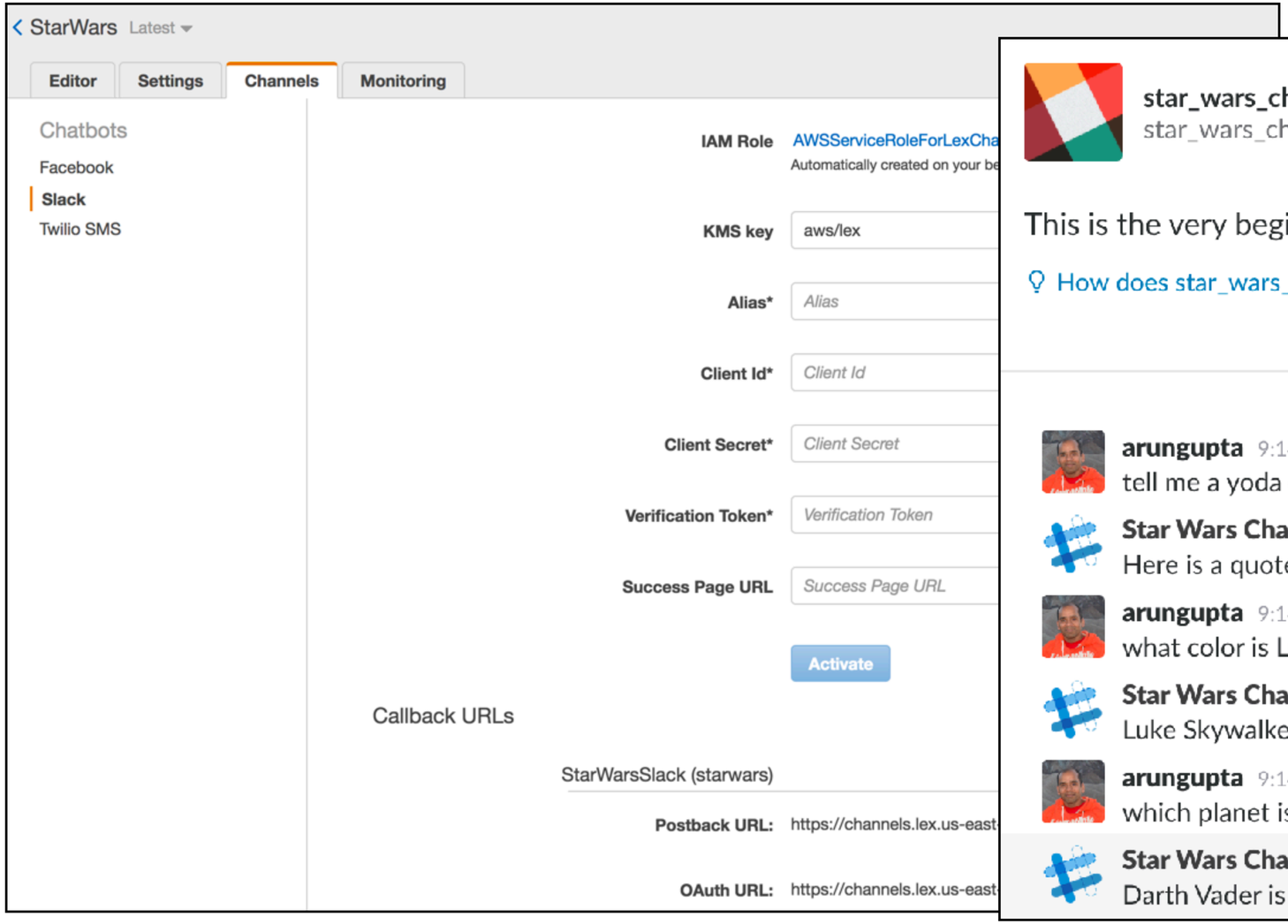


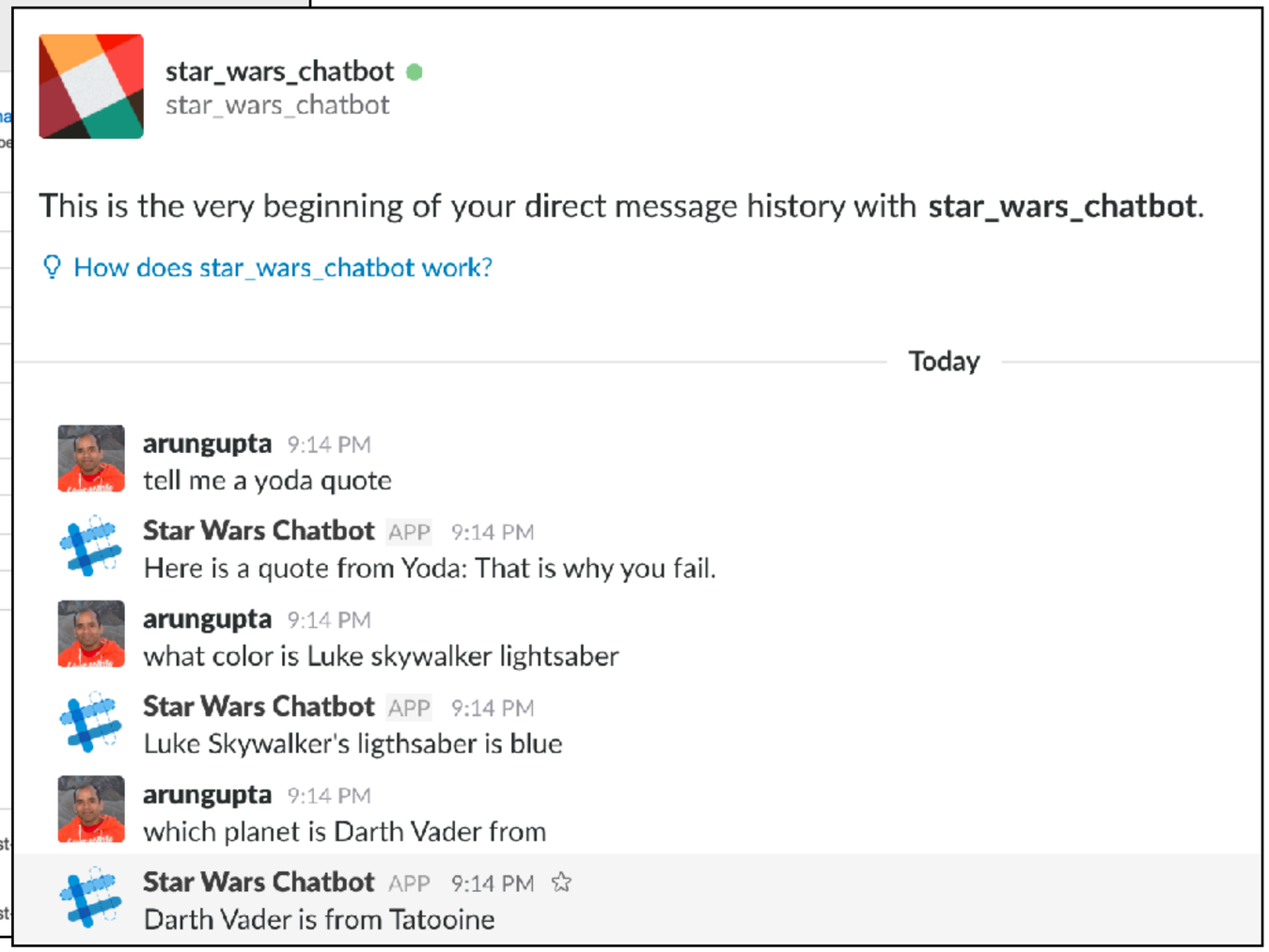
Lex and Slack Integration

- 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



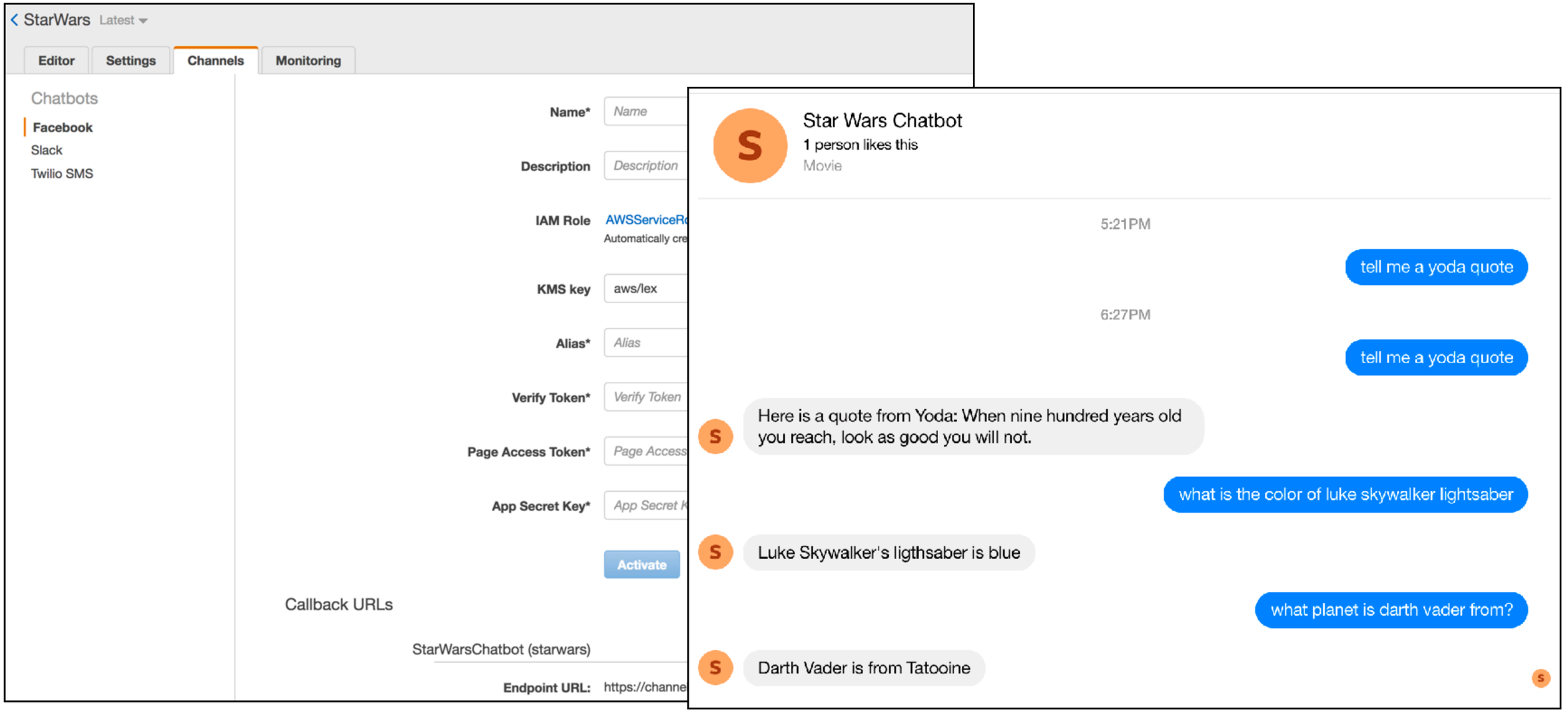


Lex and Facebook Integration

- 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



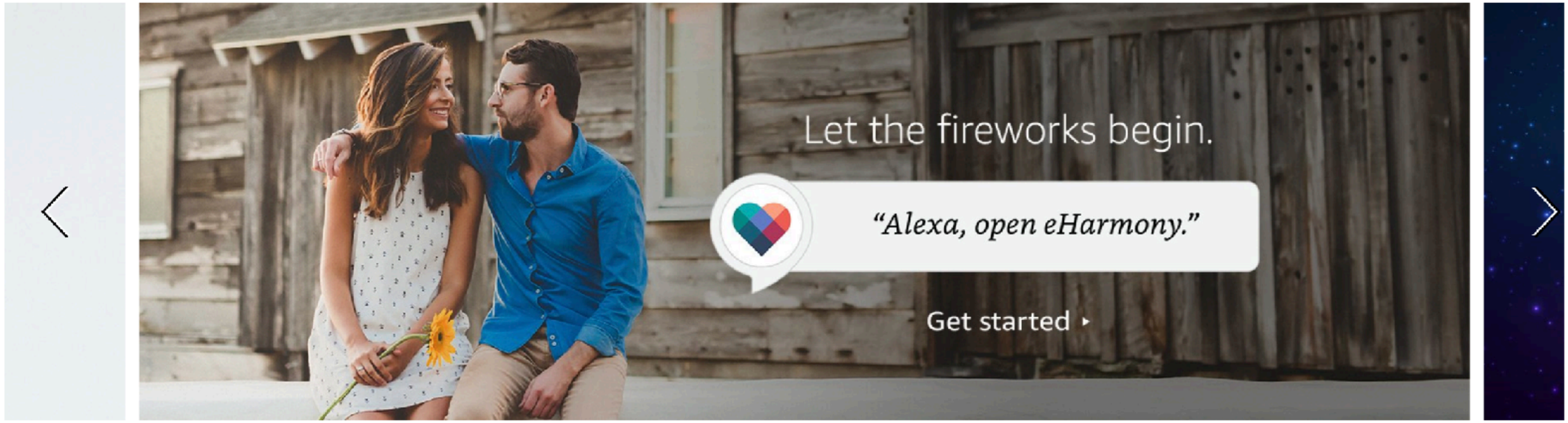
Web Application

Mobile

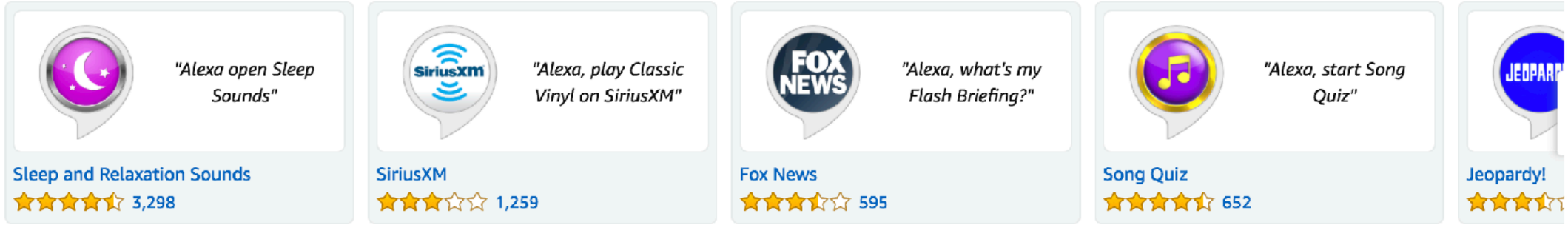
What is Alexa?

- 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!



"Alexa, what are your top skills?"



amazon.com/skills

Alexa, ask Star Wars tell me a Yoda quote

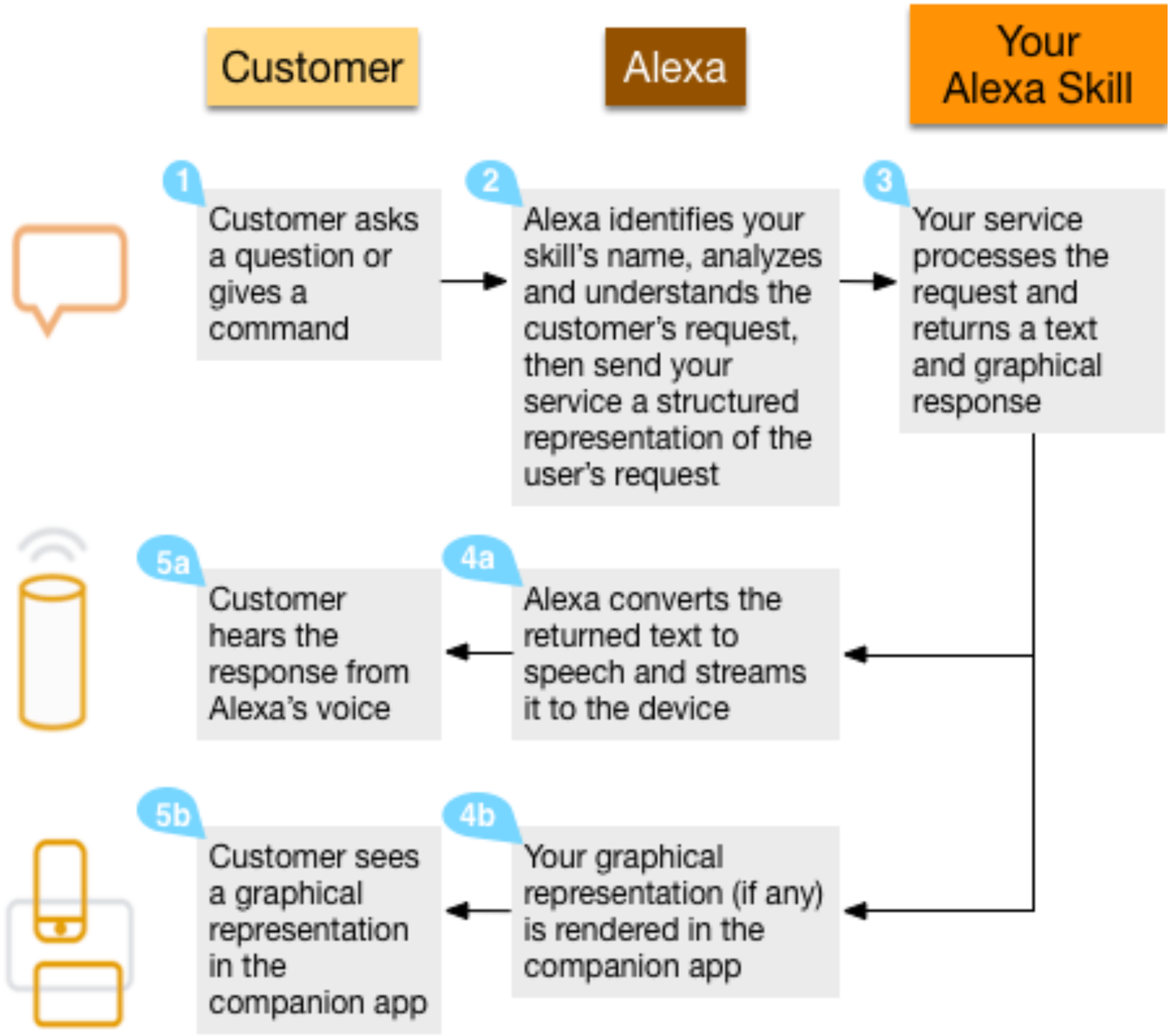
Wake word

Starting phrase

Skill invocation name

Utterance

NOTE to Alyssa: Can you please break this image into multiple images and animate them?



Two sides of Alexa skill

+

Voice User Interface

Programming Logic

Two sides of Alexa skill

+

developer.amazon.com

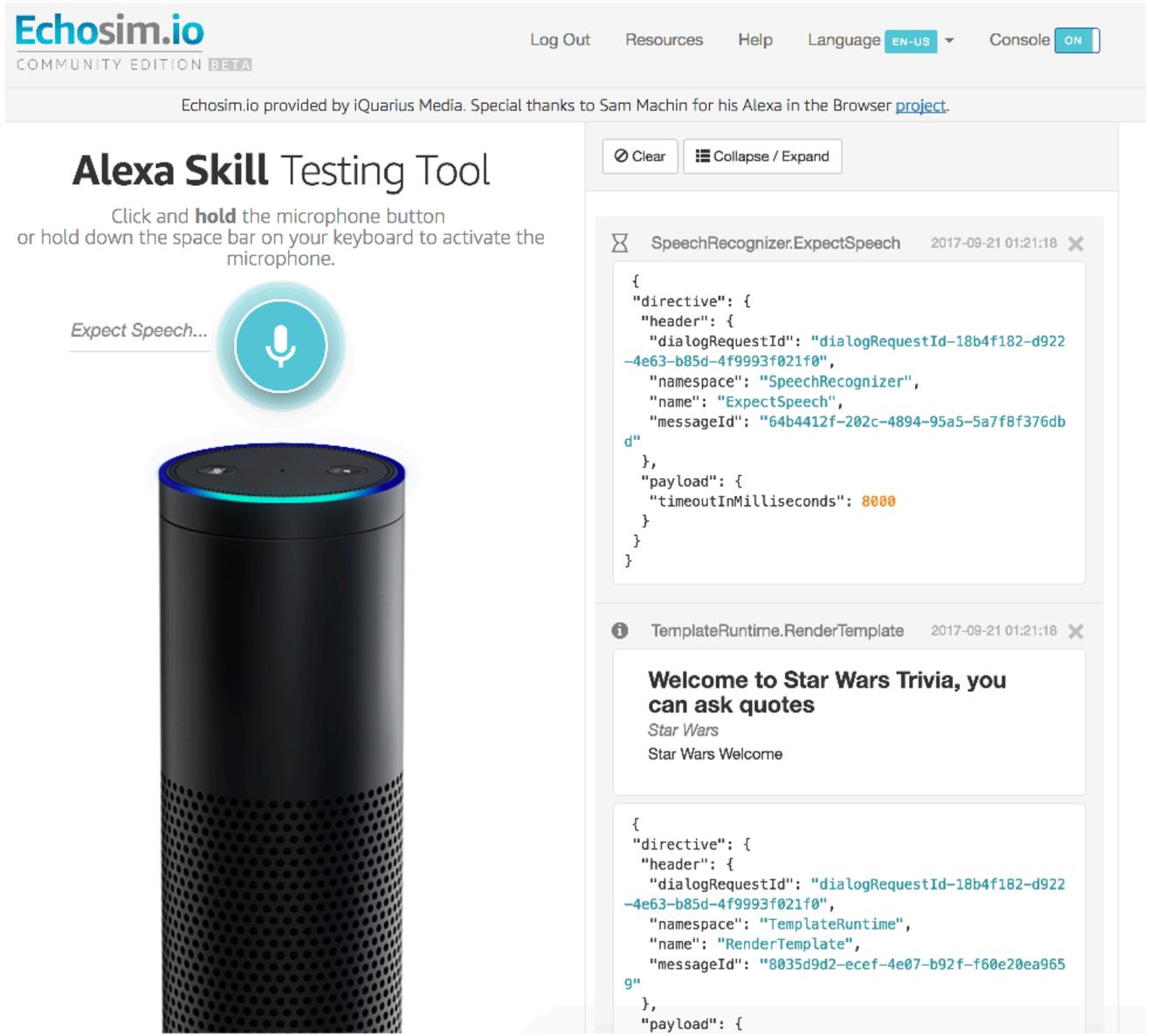
aws.amazon.com

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 of web service on any cloud provider
- **Beta Test** your Skill
- Submit your Skill for **Certification**

Alexa Skills Kit

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


Echosim.io
COMMUNITY EDITION BETA
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 01:21:18
{
"directive": {
"header": {
"dialogRequestId": "dialogRequestId-18b4f182-d922-4e63-b85d-4f9993f021f0",
"namespace": "SpeechRecognizer",
"name": "ExpectSpeech",
"messageId": "64b4412f-202c-4894-95a5-5a7f8f376dbd"
},
"payload": {
"timeoutInMilliseconds": 8000
}
}
}
TemplateRuntime.RenderTemplate
2017-09-21 01:21:18
Welcome to Star Wars Trivia, you can ask quotes
Star Wars
Star Wars Welcome
{
"directive": {
"header": {
"dialogRequestId": "dialogRequestId-18b4f182-d922-4e63-b85d-4f9993f021f0",
"namespace": "TemplateRuntime",
"name": "RenderTemplate",
"messageId": "8035d9d2-ecef-4e07-b92f-f60e20ea9659"
},
"payload": {

echosim.io

Security

Role ARN	arn:aws:iam::091144949931: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 th

Edit trust relationship

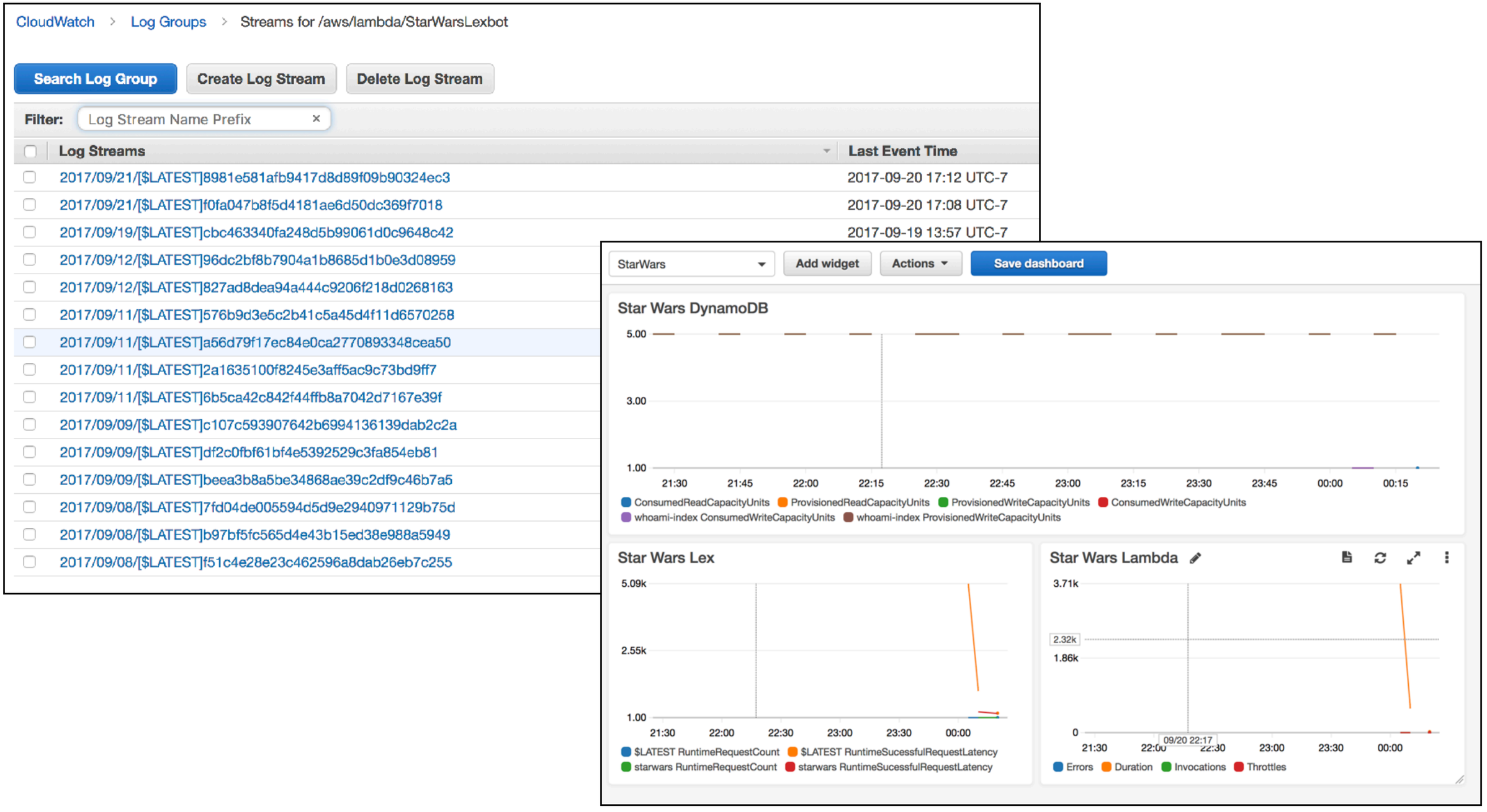
Trusted entities

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


CloudWatch > Log Groups > Streams for /aws/lambda/StarWarsLexbot
Search Log Group
Create Log Stream
Delete Log Stream
Filter:
Log Stream Name Prefix
Log Streams
Last Event Time
2017/09/21/[$LATEST]8981e581afb9417d8d89f09b90324ec3
2017-09-20 17:12 UTC-7
2017/09/21/[$LATEST]f0fa047b8f5d4181ae6d50dc369f7018
2017-09-20 17:08 UTC-7
2017/09/19/[$LATEST]cbc463340fa248d5b99061d0c9648c42
2017-09-19 13:57 UTC-7
2017/09/12/[$LATEST]96dc2bf8b7904a1b8685d1b0e3d08959
2017/09/12/[$LATEST]827ad8dea94a444c9206f218d0268163
2017/09/11/[$LATEST]576b9d3e5c2b41c5a45d4f11d6570258
2017/09/11/[$LATEST]a56d79f17ec84e0ca2770893348cea50
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2017/09/11/[$LATEST]6b5ca42c842f44ffb8a7042d7167e39f
2017/09/09/[$LATEST]c107c593907642b6994136139dab2c2a
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2017/09/09/[$LATEST]beea3b8a5be34868ae39c2df9c46b7a5
2017/09/08/[$LATEST]7fd04de005594d5d9e2940971129b75d
2017/09/08/[$LATEST]b97bf5fc565d4e43b15ed38e988a5949
2017/09/08/[$LATEST]f51c4e28e23c462596a8dab26eb7c255
StarWars
Add widget
Actions
Save dashboard
Star Wars DynamoDB
5.00
3.00
1.00
21:30
21:45
22:00
22:15
22:30
22:45
23:00
23:15
23:30
23:45
00:00
00:15
ConsumedReadCapacityUnits
ProvisionedReadCapacityUnits
ProvisionedWriteCapacityUnits
ConsumedWriteCapacityUnits
whoami-index ConsumedWriteCapacityUnits
whoami-index ProvisionedWriteCapacityUnits
Star Wars Lex
5.09k
2.55k
1.00
21:30
22:00
22:30
23:00
23:30
00:00
$LATEST RuntimeRequestCount
$LATEST RuntimeSucessfulRequestLatency
starwars RuntimeRequestCount
starwars RuntimeSucessfulRequestLatency
Star Wars Lambda
3.71k
2.32k
1.86k
0
09/20 22:17
21:30
22:00
22:30
23:00
23:30
00:00
Errors
Duration
Invocations
Throttles

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

Add a snapshot of X-Ray dump

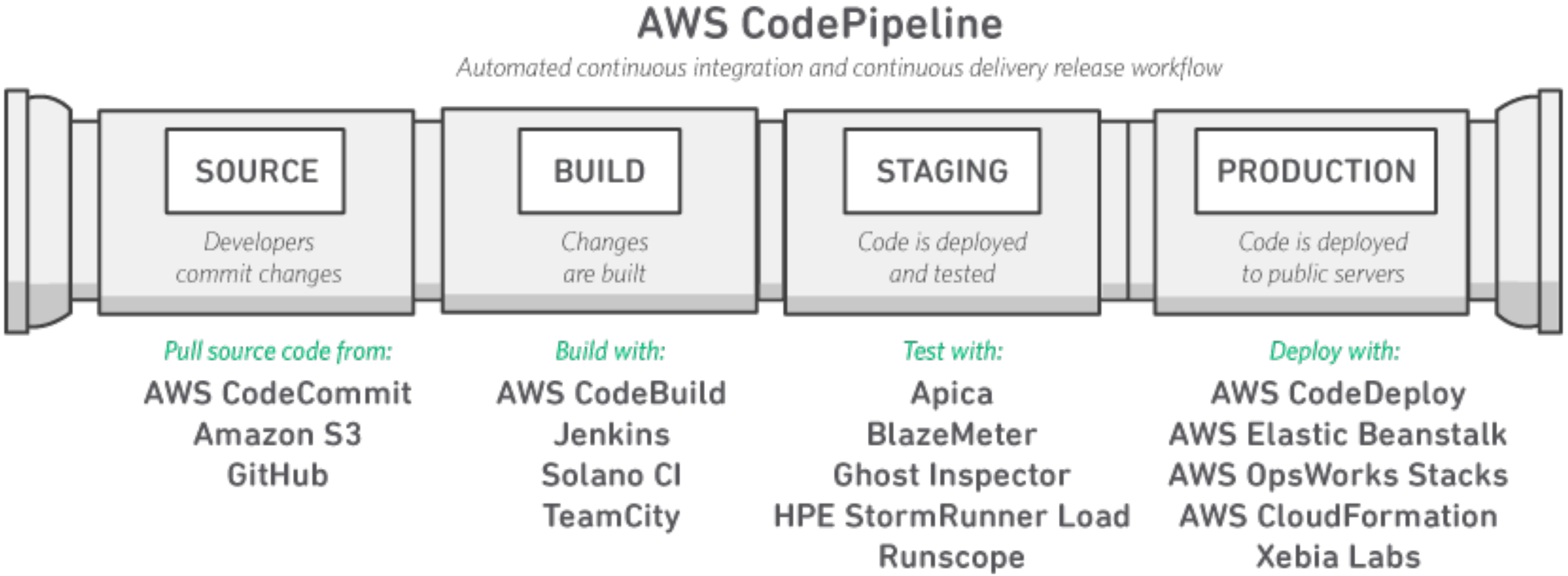
Deployment Pipeline

- 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



Maven Plugin

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

References

- Amazon Lex: aws.amazon.com/lex
- Developer Portal: developer.amazon.com
- Slides & code: github.com/arun-gupta/chatbot