

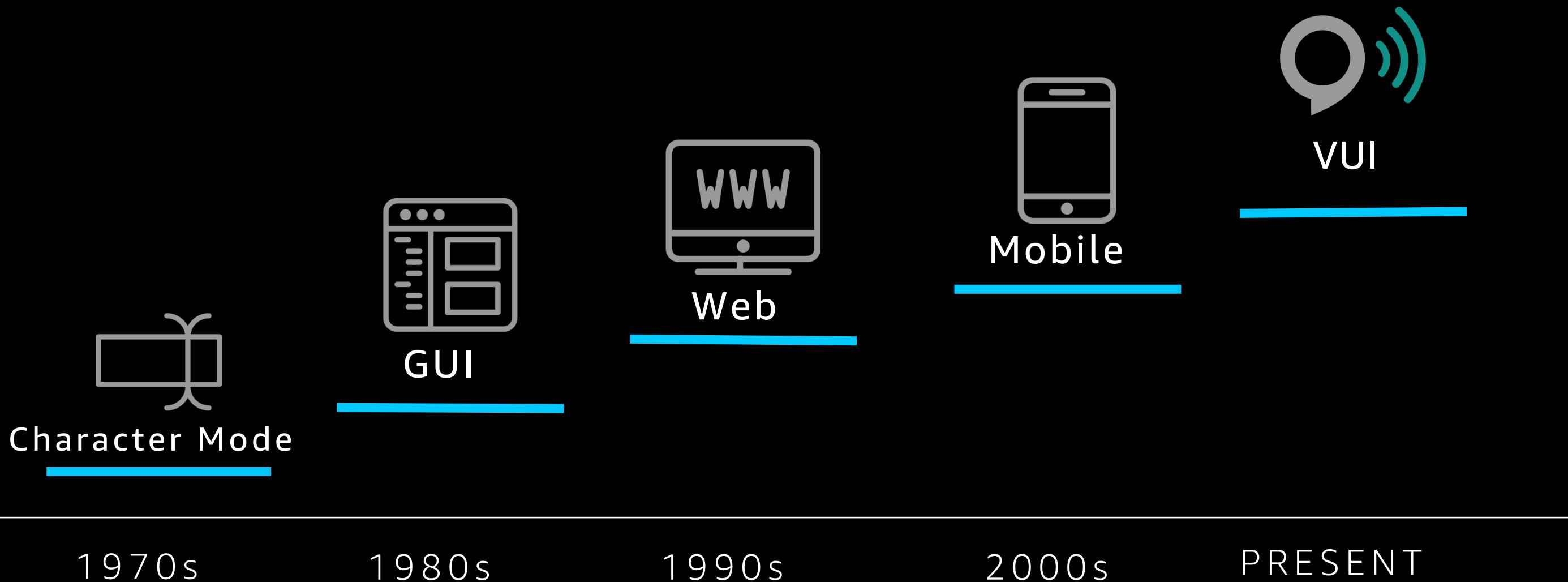
Build Voice-Enabled Experiences with Alexa

Pradyumna Dash

pradyd@amazon.co.uk

Solutions Architect, Amazon Web Services

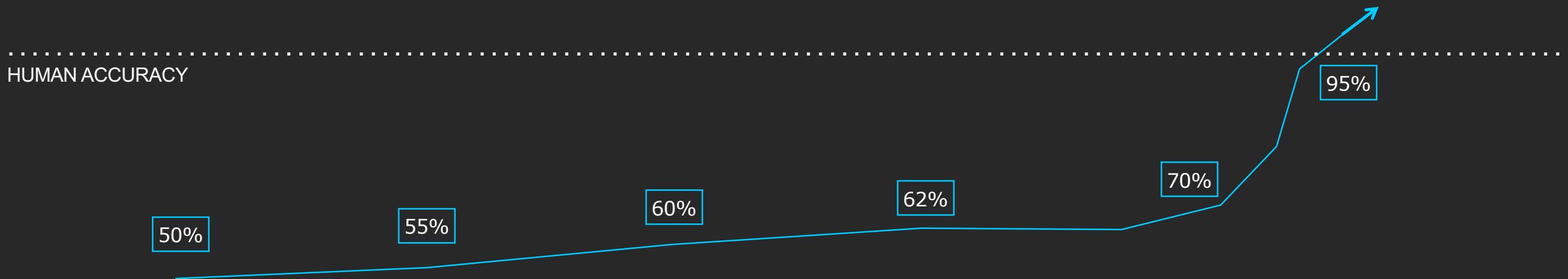
UI's have evolved over the past five decades



VOICE REPRESENTS THE
NEXT MAJOR DISRUPTION IN COMPUTING

ASR accuracy has dramatically increased in the last 4-5 years.

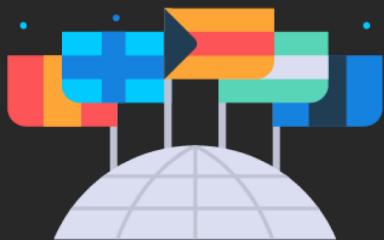
This inflection point has created sustained momentum in consumer adoption of voice technology



Source: MindMeld

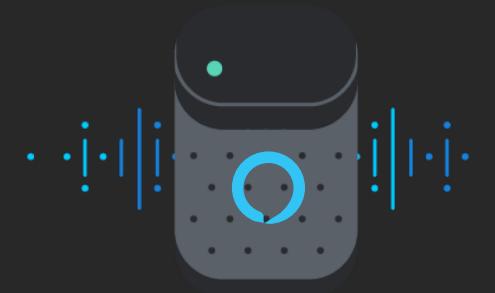
Alexa is Growing Fast

15



SUPPORTED
COUNTRIES

PRODUCTS WITH
ALEXA BUILT-IN



PRODUCTS THAT
WORK WITH ALEXA



150+

28,000+

1,000,000+



ALEXA
SKILLS

HUNDREDS OF
THOUSANDS



ALEXA
DEVELOPERS

Numbers as of Dec 2019

Alexa everywhere



How is Alexa being used in education today?



Use cases for higher education, EdTechs, and learning companies



Make learning fun and accessible



Help educators be more productive



Build smart campus experiences



Extend learning beyond the classroom



Help students study



Foster engagement and productivity

How will Alexa be used in the future?



Alexa, what did Tommy learn about today?

Alexa, give me practice on a history concept I'm struggling with.

Alexa, what concept should I teach in small groups?

Alexa, how did my students perform on their test?

Alexa, what are the latest retention numbers for second year students?

Alexa, what is my class YoY growth rate?

Coventry University



- Rated University of the Year for Student Experience in 2018 Times and Sunday Times league table
- Constantly looking for new ways to use media, technology and novel approaches to teaching/learning to help shape the way their students engage with their education
- The PheonixBot skill improves accessibility for students with visual impairments and reading difficulties and helps new students acclimate to campus with convenient answers to common questions about moving to Coventry, navigating campus, and accessing university services



Lancaster University



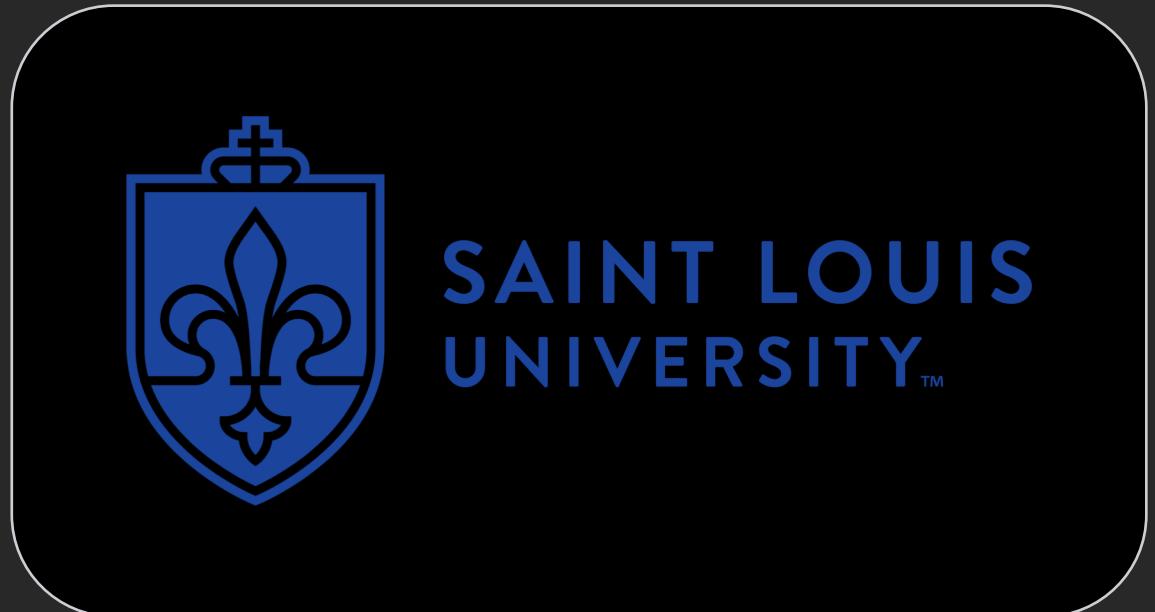
- Consistently ranked in the top 10 of UK league tables, Lancaster University is recognised for its teaching and research quality
- After launching their successful mobile app (used by more than 98% of students) in 2017, Lancaster University was looking for new ways to innovate and improve the student experience on campus
- Ask LU delivers a personalized voice experience that helps students getting answers to questions about timetables, tutors, and grades, allows them to booking spaces to meet with their peers, and helps students with disabilities access additional resources and facilities



Saint Louis University (SLU)



- Saint Louis University (SLU) is a private Jesuit University with 7,000 undergraduate students, with more than 4,000 students living on campus
- SLU wanted to connect students to information they need to acclimate to campus so that they can focus on what matters: their studies
- Their private skill, Ask SLU, launched in 2018, encompassed 250 questions about campus life. Their newly launched public skill answers 350 questions. It was built with the Q&A chat bot, so it can be accessed as a chat bot in a browser, on Alexa-enabled devices, and through SMS text messaging.





Building for Voice with Alexa

Creating an Alexa Skill

Voice User Interface



+



Programming Logic

Creating an Alexa Skill

Voice User Interface



+



Programming Logic

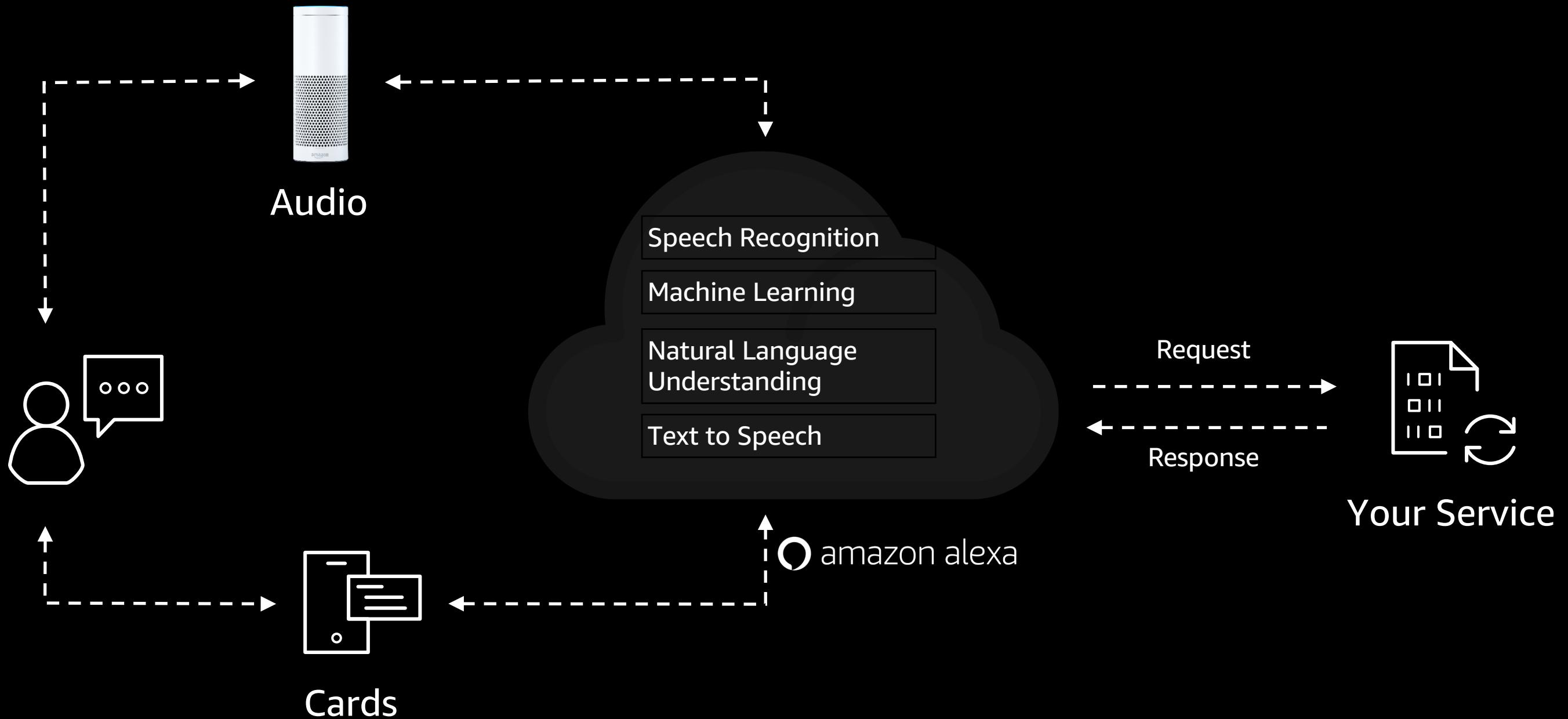


developer.amazon.com

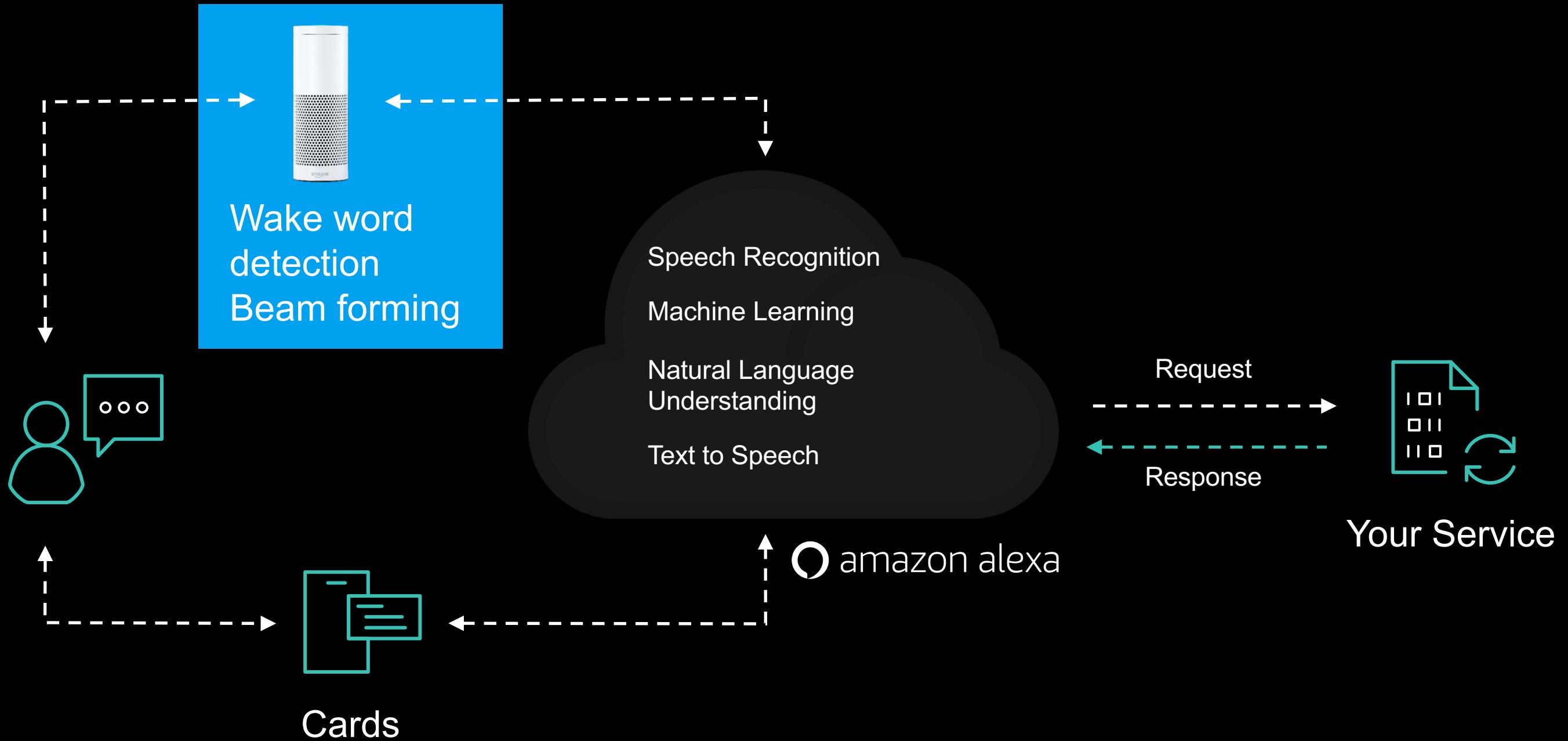


[aws.amazon.com](https://aws.amazon.com/lambda)

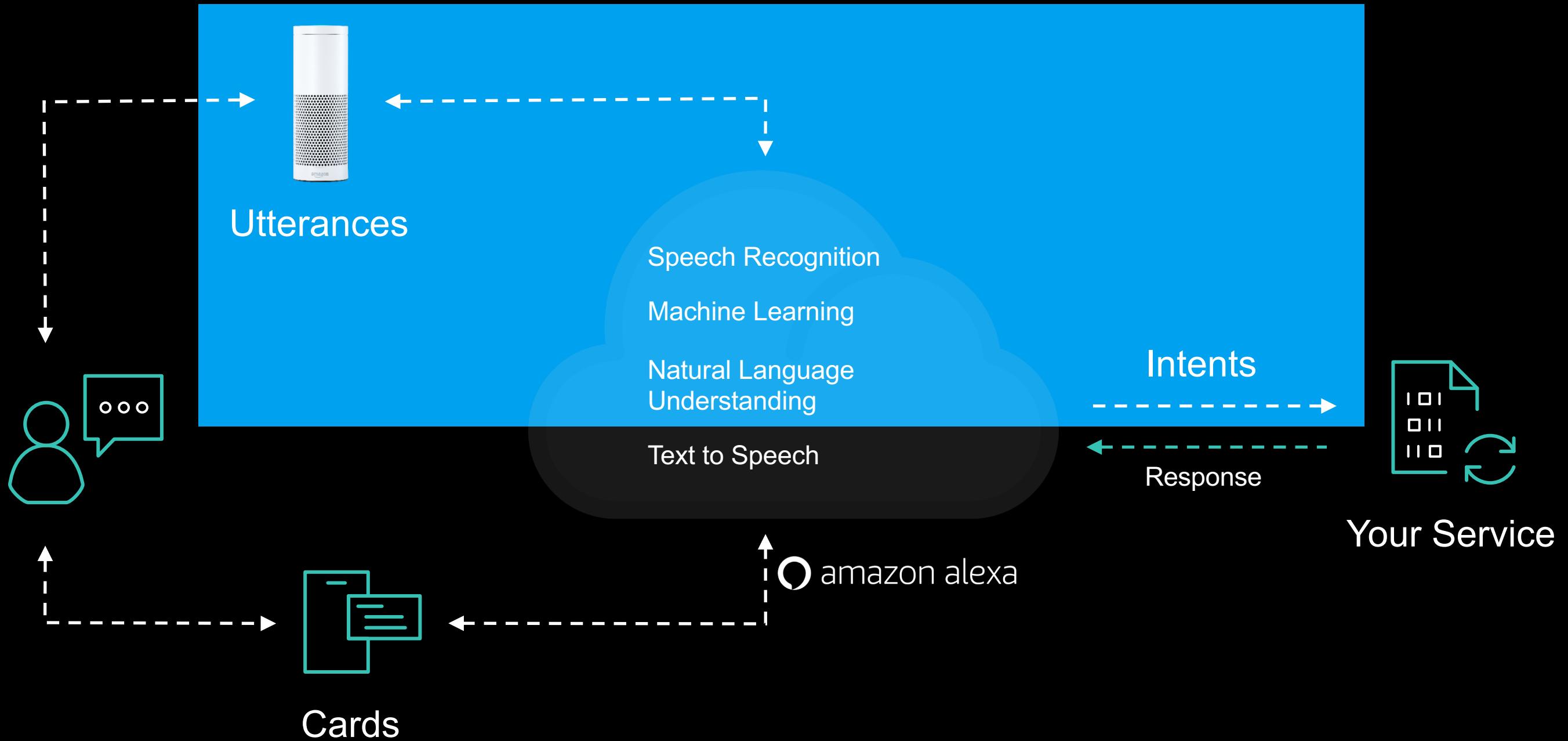
Alexa Skills Kit



Alexa Skills Kit: Signal Processing



Alexa Skills Kit: Speech to text



ASR – Automatic Speech Recognition

för tē tīmz

ASR – Automatic Speech Recognition

fōr tē tīmz

Forty Times? 40x

ASR – Automatic Speech Recognition

för tē tīmz

Forty Times?

40x

For Tea Times?



ASR – Automatic Speech Recognition

för tē tīmz

Forty Times?

40x

For Tea Times?



For Tee Times?



ASR – Automatic Speech Recognition

för tē tīmz

Forty Times?

40x

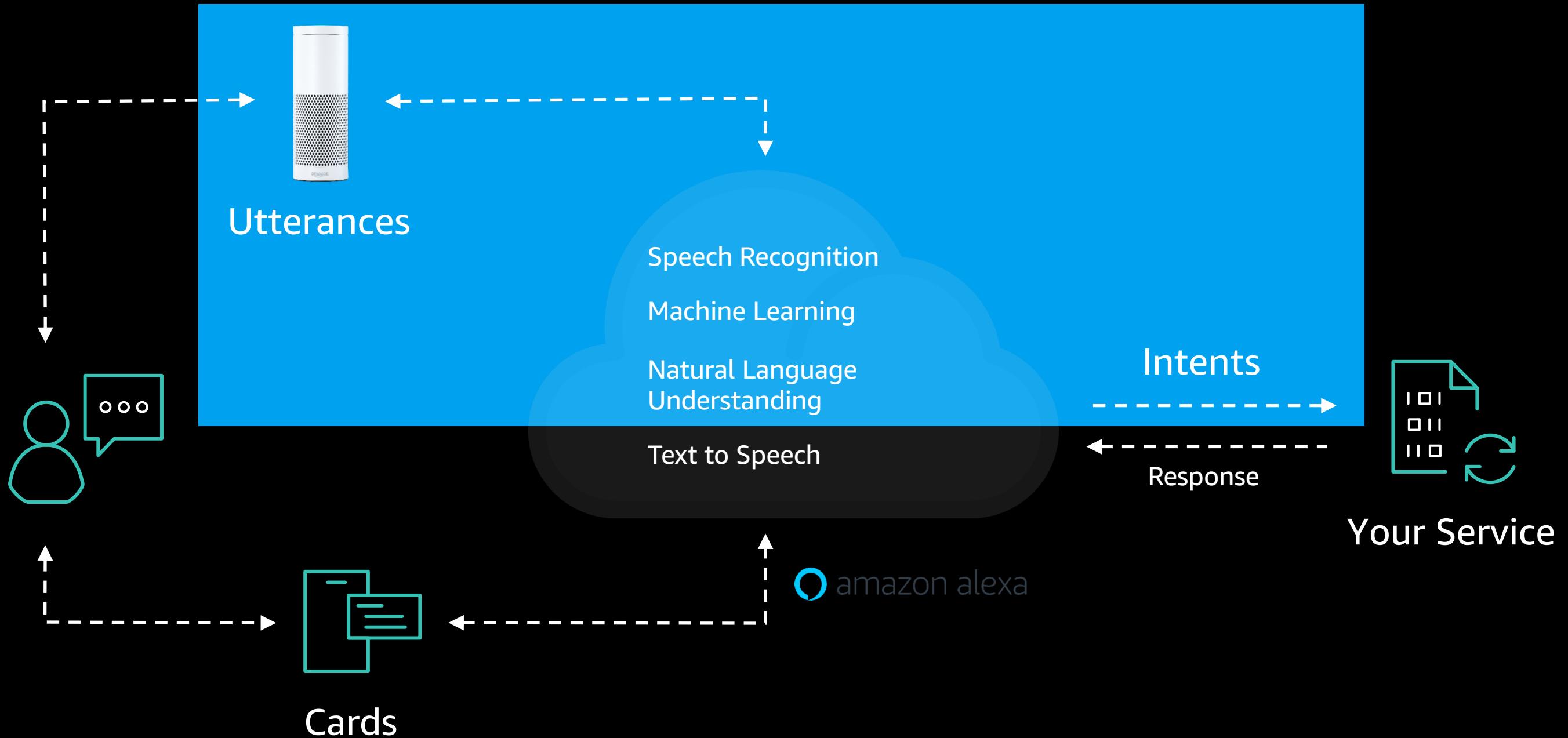
For Tea Times?



Four Tee Times?



Alexa Skills Kit: Utterances Into Intents



S P E A K I N G W I T H A L E X A

Alexa,

wake word

S P E A K I N G W I T H A L E X A

Alexa, ask restaurant finder for breakfast

wake word launch

Invocation name

utterance

for a good breakfast place

to find places to eat in the morning

a spot that serves the most important meal of the day

Intents and Slots

Alexa, open restaurant finder

wake word

launch

invocation name

Recommend a restaurant within four miles

utterance

slot

{distance: "4"}

slot value

RecommendationIntent

intent

Intents and Slots

Tell me about Italian food **within four miles**



slot slot

{distance: "4"} {cuisine: "Italian food"}

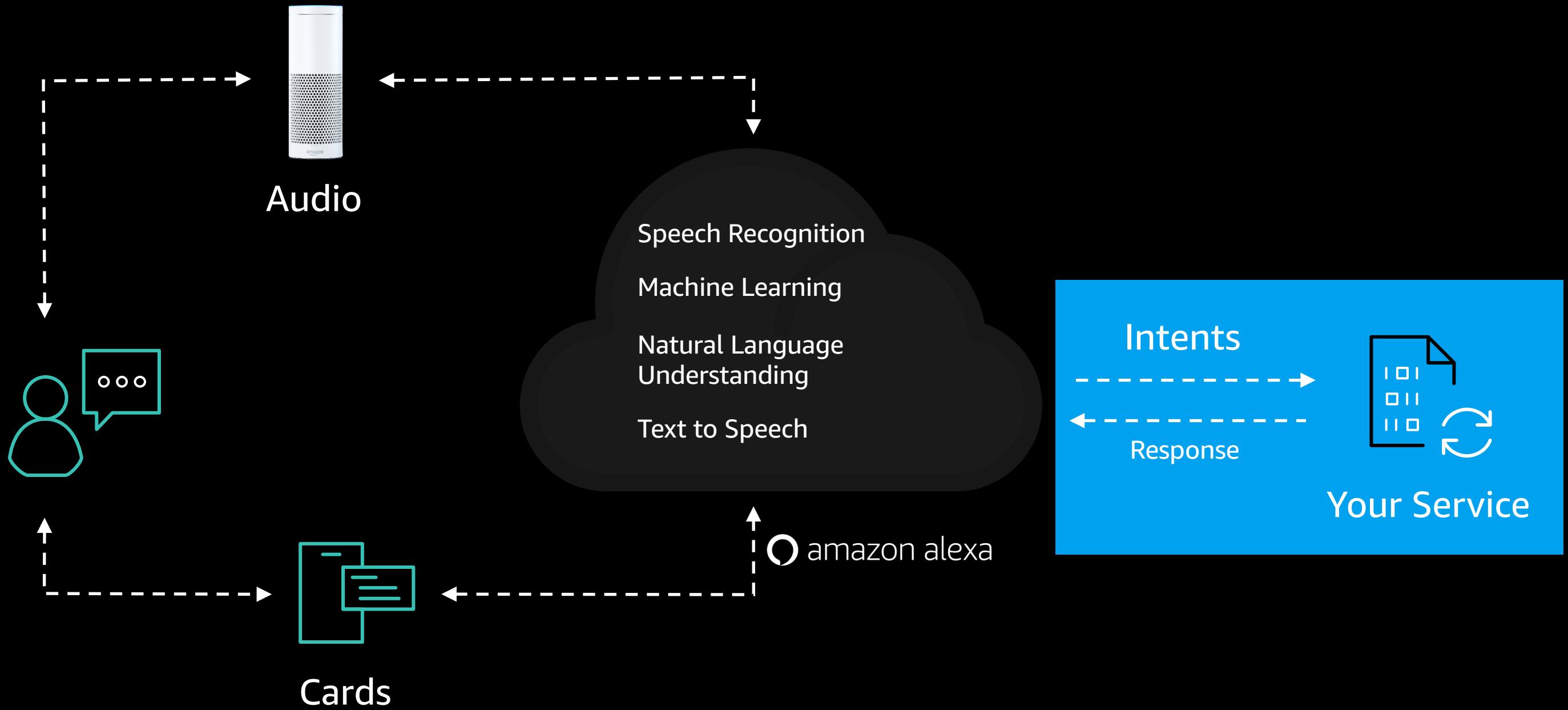
slot value

RecommendationIntent

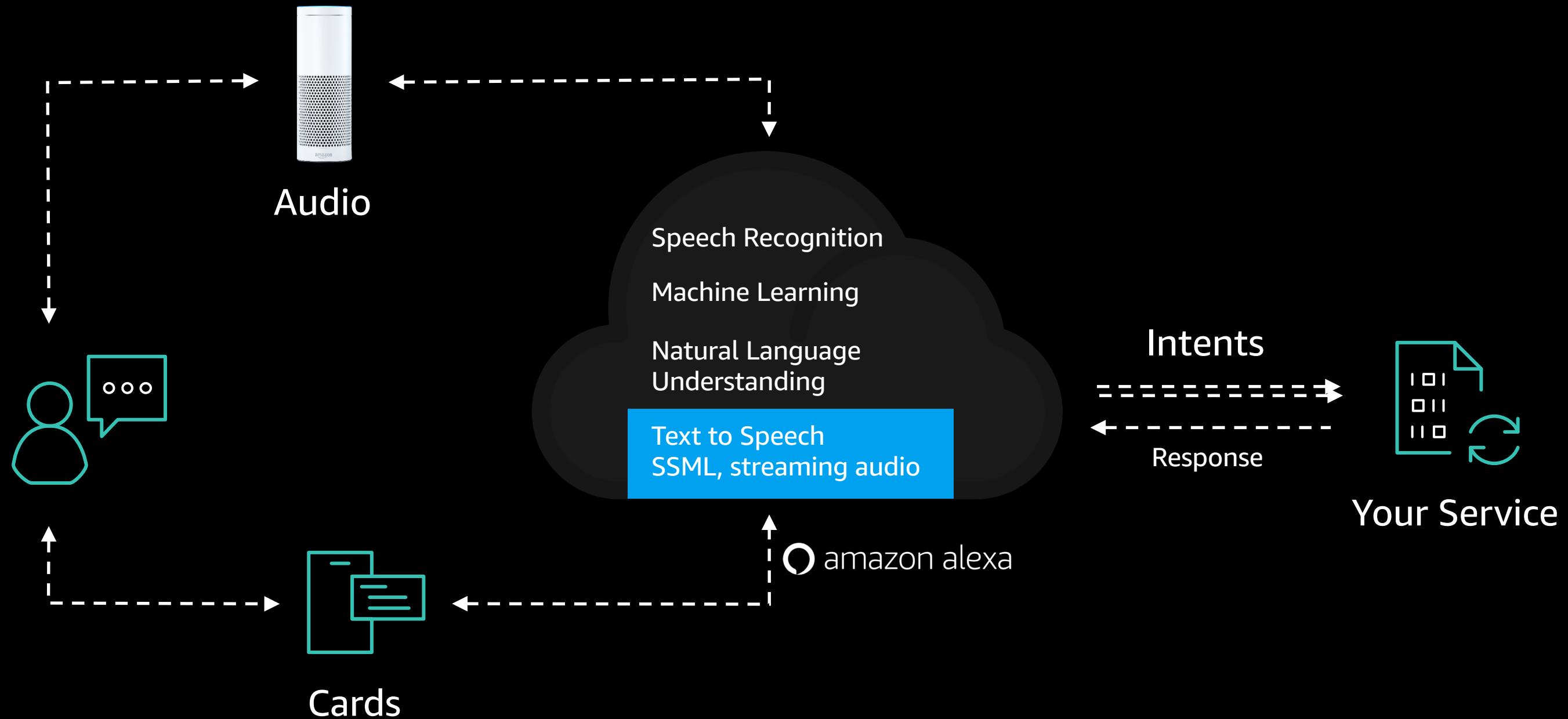


intent

Alexa Skills Kit: Requests and Responses



Alexa Skills Kit: Output



SSML

- Speech Synthesis Markup Language
- TTS (Text-to-Speech)

SSML

- Pauses

well, okay

well <break time="3s"/> okay

SSML

- Pronunciation Hints

```
<say-as interpret-as="spell-out">
```

Hello

```
</say-as>
```

SSML

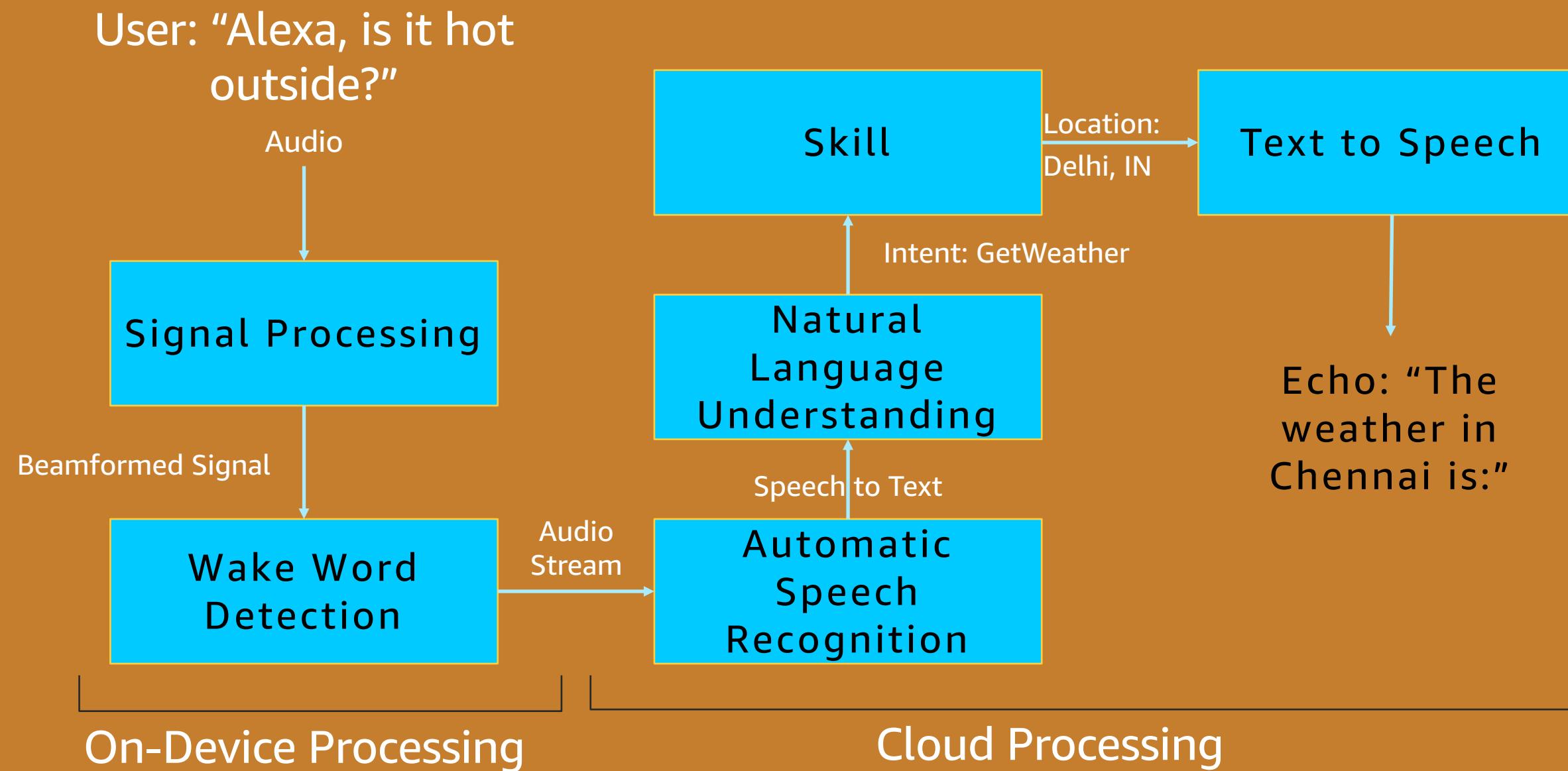
- Speechcons

```
<say-as interpret-as="interjection">
```

Balle balle

```
</say-as>
```

Under the hood

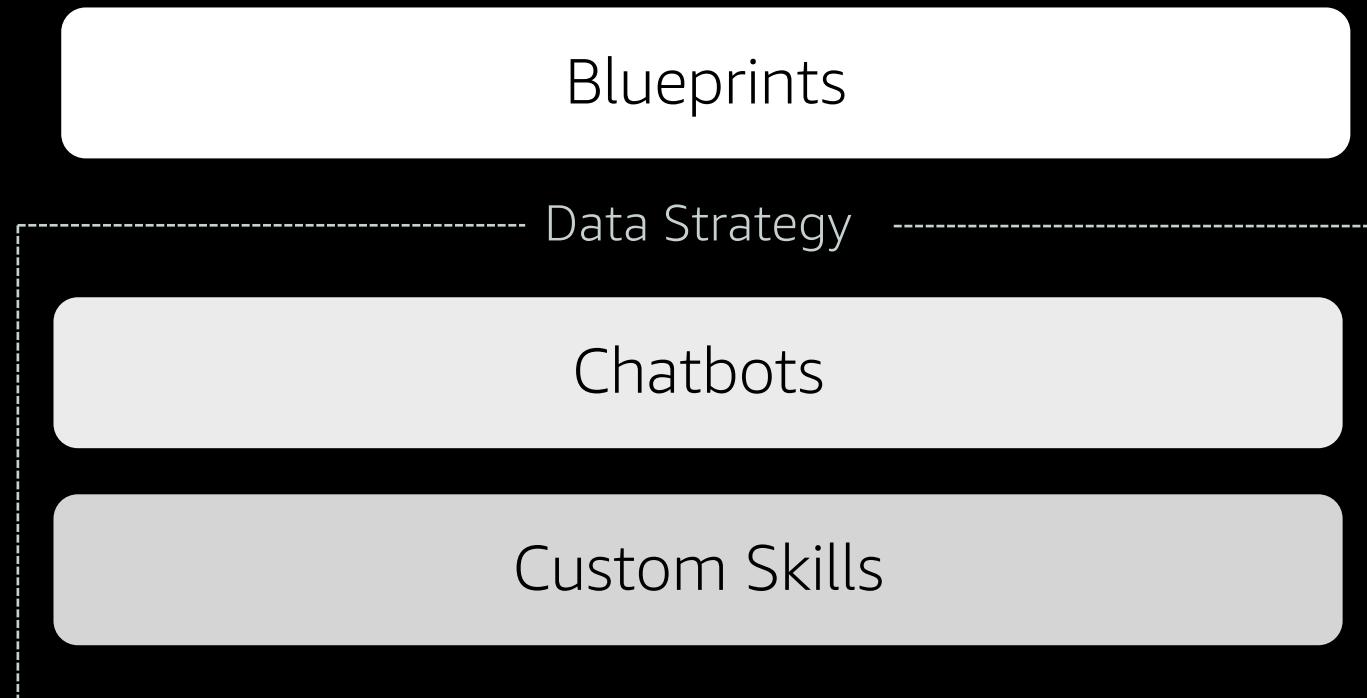


Recap: Voice Design Concepts

Concepts	Description
Wake word:	The wake word tells Alexa to start listening to your commands
Launch word:	A launch word signals Alexa that a skill invocation will likely follow. E.g tell, ask, open, launch, and use.
Invocation name:	To begin interacting with a skill, a user says the skill's invocation name. e.g "Alexa, Open University Helper."
Utterance:	An utterance is a user's spoken request. These spoken requests can invoke a skill, provide inputs for a skill, confirm an action for Alexa, and so on.
Prompt:	A string of text that should be spoken to the customer to ask for information.
Intent:	An intent represents an action that fulfills a user's spoken request. Intents can optionally have arguments called slots.
Slot value:	Slots are input values provided in a user's spoken request. These values help Alexa figure out the user's intent. In the example below, the user gives input information, the travel date of Friday. This value is a slot of intent, which Alexa will pass on to Lambda for skill code processing. Slots can be defined with different types. Amazon's built-in e.g AMAZON.DATE type to convert words that indicate dates (such as "today" and "next Friday") into a date format, you might add a custom LIST_OF_ACTIVITIES slot type to reference a list of activities such as hiking, shopping, skiing, and so on.

Crawl, walk, or run

There are many ways you can get started building your Alexa skill.



Blueprints

With Skill Blueprints, you can use templates to create your own personal Alexa skill in minutes—no coding required.



Quizzes

Challenge your friends with open-ended questions.



University

Post lectures or speaker series from your university for anyone to listen.



Business Q&A

Provide answers to common workplace questions.



Flashcards

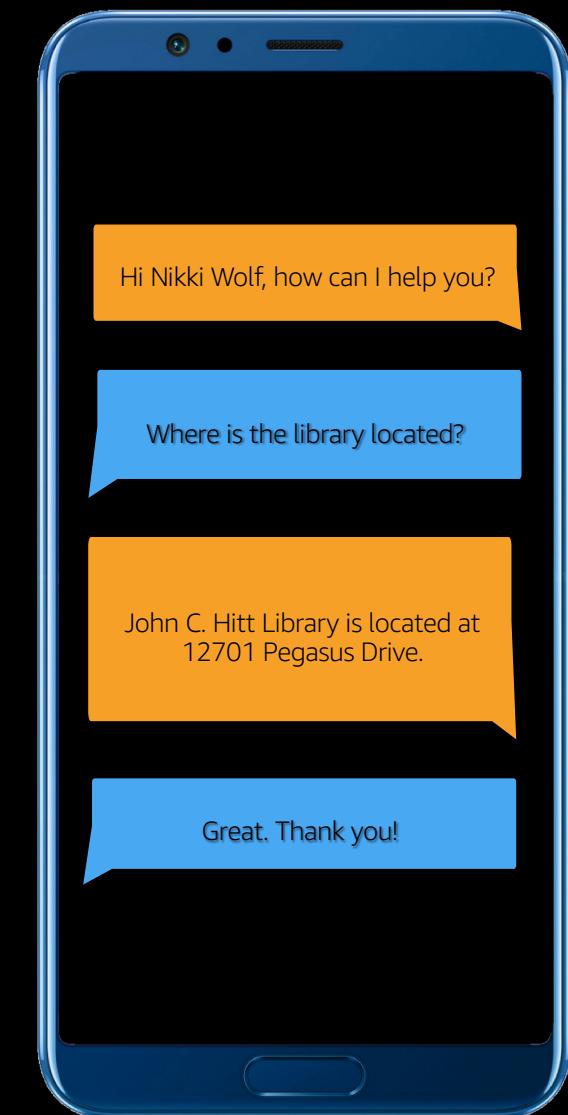
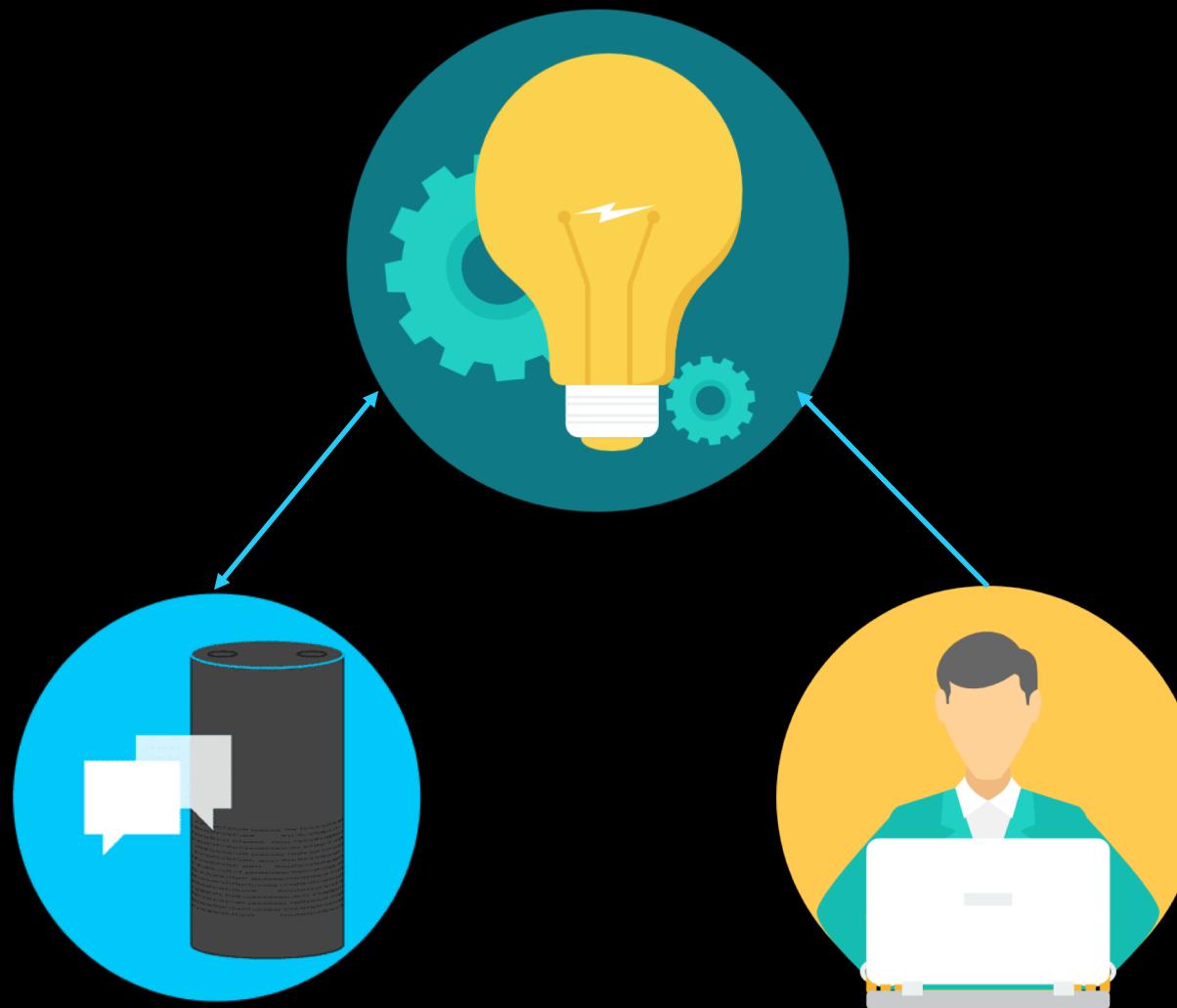
Study, test yourself, and master any subject by voice.



blueprints.amazon.com

Chatbots

Chatbots allow you to build a more customized skill that offers a multi-modal voice experience—in under an hour, no coding required.



Skills

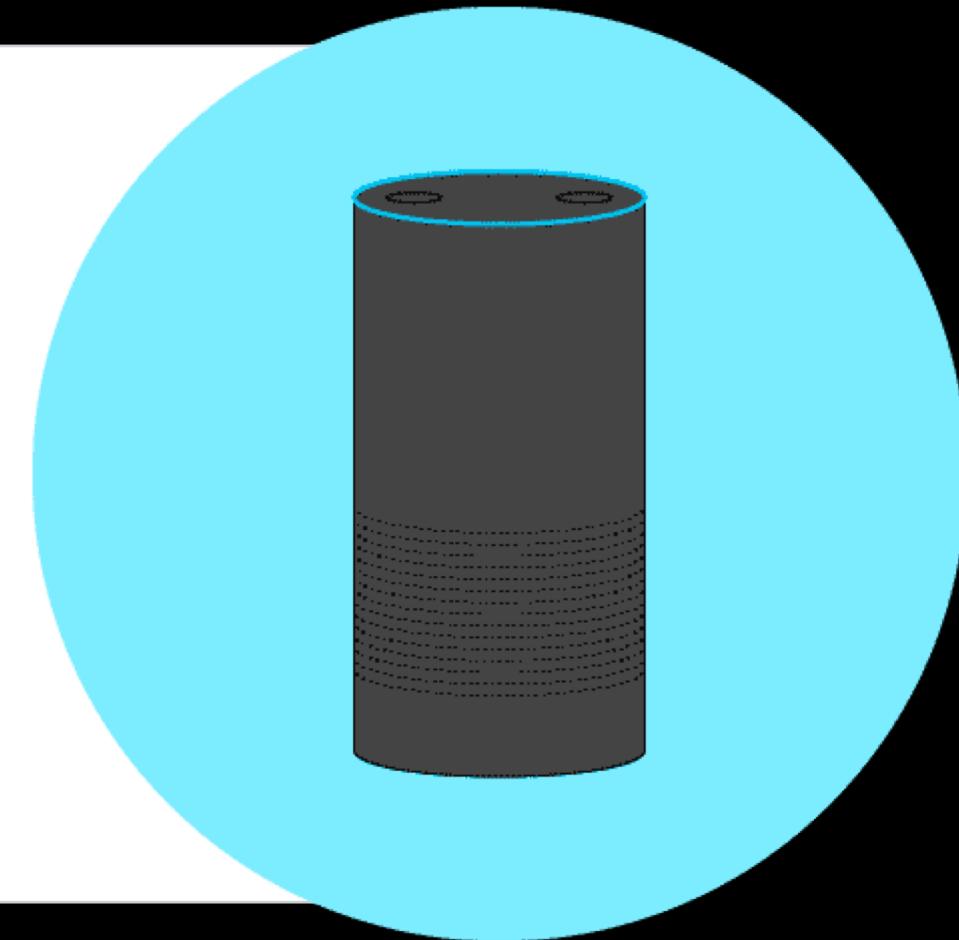
Create a custom skill using the Alexa Skills Kit.

Video/audio

Flash briefing

Custom skill

- One shot
- Multi-turn/conversational



Get started



How do you want to get started on your Alexa journey?



Try an
Alexa Blueprint



Build an
Education Bot



Take an
Alexa Training



Run an
Immersion Day



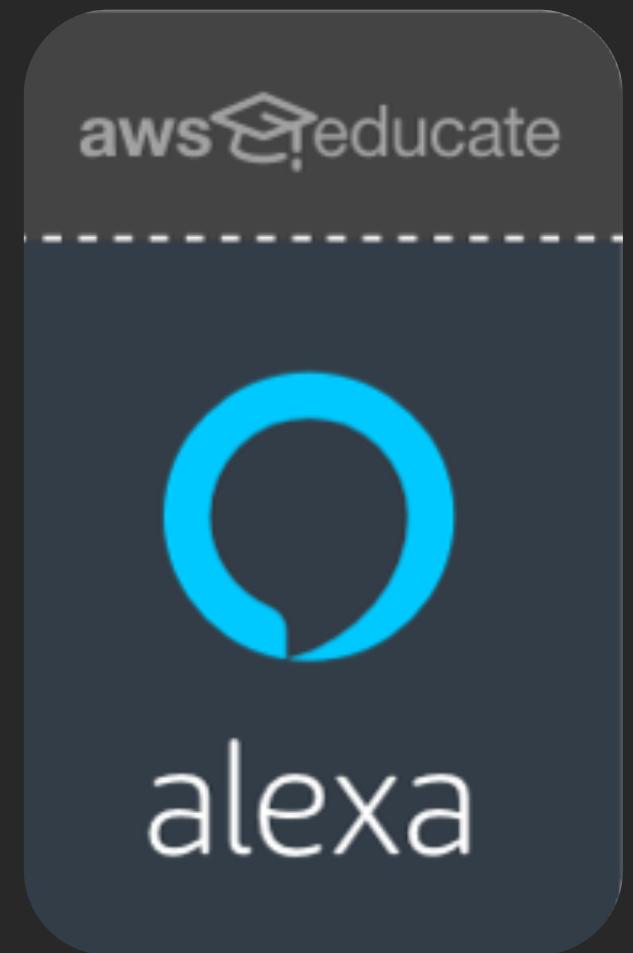
Host a
Hackathon

Alexa Badge for AWS Educate



Get students engaged in your skill design while preparing them for the next-generation tech careers.

- 10-15 hours of dedicated Alexa skills training
- Designed to introduce students to the technology behind Alexa and teach them how to build and publish new skills
- The four learning modules begin with introductory AWS services and lead to the Alexa Skills Kit
- Complimentary



Resources



aws.amazon.com/education/alexza-edu
blueprints.amazon.com
amazon.com/qnabot
github.com/alexa
alexza.design/factskill
alexza.design/4conversation
alexza.design/cakewalk
twitch.tv/amazonalexa
<https://tinyurl.com/uyjmp58>

Let's Build



amazon alexa

Alexa, open space facts

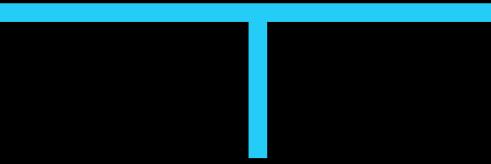
Wake word

Launch

Skill invocation
name

open, begin, start, launch, ask, tell

Alexa, ask space facts for trivia



Wake word



Launch



Skill invocation
name



Utterance

Alexa, ask space facts for trivia

Wake word

Launch

Skill invocation
name

Utterance

tell me something
give me information
a fact
give me trivia

NLU engine to the rescue

Natural Language Understanding

Sample Utterances

In order to **map user input** to a behavior, we provide **training data** for each intent.

- 1 GetNewFactIntent a fact
- 2 GetNewFactIntent a space fact
- 3 GetNewFactIntent tell me a fact
- 4 GetNewFactIntent tell me a space fact
- 5 GetNewFactIntent give me a fact
- 6 GetNewFactIntent give me a space fact
- 7 GetNewFactIntent tell me trivia
- 8 GetNewFactIntent tell me a space trivia
- 9 GetNewFactIntent give me trivia
- 10 GetNewFactIntent give me a space trivia
- 11 GetNewFactIntent give me some information
- 12 GetNewFactIntent give me some space information
- 13 GetNewFactIntent tell me something

Intent Schema (JSON)

```
2 < "intents": [ ←  
3 <   {  
4 <     "intent": "GetNewFactIntent"  
5 <   },  
6 <   {  
7 <     "intent": "AMAZON.HelpIntent"  
8 <   },  
9 <   {  
10 <     "intent": "AMAZON.StopIntent"  
11 <   },  
12 <   {  
13 <     "intent": "AMAZON.CancelIntent"  
14 <   }  
15 ]
```

An array of intents.

Each intent is a behavior for your skill.

Intents are the Connection

```
2 "intents": [
3 {
4     "intent": "GetNewFactIntent"
5 },
6 {
7     "intent": "AMAZON.HelpIntent"
8 },
9 {
10    "intent": "AMAZON.StopIntent"
11 },
12 {
13     "intent": "AMAZON.CancelIntent"
14 }
15 ]
```

1	GetNewFactIntent	a fact
2	GetNewFactIntent	a space fact
3	GetNewFactIntent	tell me a fact
4	GetNewFactIntent	tell me a space fact
5	GetNewFactIntent	give me a fact
6	GetNewFactIntent	give me a space fact
7	GetNewFactIntent	tell me trivia
8	GetNewFactIntent	tell me a space trivia
9	GetNewFactIntent	give me trivia
10	GetNewFactIntent	give me a space trivia
11	GetNewFactIntent	give me some information
12	GetNewFactIntent	give me some space info
13	GetNewFactIntent	tell me something

Intents are the Connection - JSON

```
2 "session": {  
3     "sessionId": "SessionId.f88758e4-6542-4a95-ac7d-9bbee242fc07",  
4     "application": {  
5         "applicationId": "amzn1.ask.skill.6eb2da15-243a-48bd-98f4-89e68  
6     },  
7     "attributes": {},  
8     "user": {  
9         "userId": "amzn1.ask.account.AHCUC7W0T6ET3WZLN70IJPFQR442CYAMDG  
10    },  
11    "new": true  
12 },  
13 "request": {  
14     "type": "IntentRequest",  
15     "requestId": "EdwRequestId.93453916-2cf9-4c3a-8cf3-4e04b4ef1d80",  
16     "locale": "en-US",  
17     "timestamp": "2017-03-07T17:12:54Z",  
18     "intent": {  
19         "name": "GetNewFactIntent",  
20         "slots": {}  
21     }  
22 }
```

Intents are the Connection - Code

```
105  var handlers = {
106    'LaunchRequest': function () {
107      this.emit('GetFact');
108    },
109    'GetNewFactIntent
```

Built-in Intents

A library of intents for common actions.

Amazon provides training data, but they can be augmented.

REQUIRED FOR CERTIFICATION

AMAZON.CancelIntent

AMAZON.HelpIntent

AMAZON.StopIntent

AMAZON.NextIntent

AMAZON.NoIntent

AMAZON.RepeatIntent

AMAZON.StartOverIntent

AMAZON.ShuffleOnIntent

AMAZON.YesIntent

Communicating with the endpoint

Your endpoint needs to receive and react to a JSON object

The Endpoint



Must be Internet-accessible

Adhere to ASK service interface

- JSON

Web service or AWS Lambda

Uses HTTP over SSL/TLS

- port 443

Communicating with the Endpoint

Request body:

- session: Information about the current conversation.
- request: Details about the type of request.
 - LaunchRequest
 - IntentRequest
 - SessionEndedRequest

Json Request

```
2 "session": {  
3     "sessionId": "SessionId.f896cf58-3c03-4cc7-  
4     "application": {  
5         "applicationId": "amzn1.ask.skill.6eb2da1  
6     },  
7     "attributes": {},  
8     "user": {  
9         "userId": "amzn1.ask.account.AHCUC7WOT6ET  
10    },  
11    "new": true  
12 },  
13 "request": {  
14     "type": "LaunchRequest",  
15     "requestId": "EdwRequestId.e3224700-65e7-4b  
16     "locale": "en-US",  
17     "timestamp": "2017-03-06T23:46:04Z"  
18 },  
19 "version": "1.0"
```

Communicating with the Endpoint

Response body:

- outputSpeech: Information about the current conversation.
- card: (Optional) Graphical component to your response.
- reprompt: (Optional) Message to for the user, if timeout is met.
- shouldEndSession: Indicates if service should wait for user input.

Lambda Response

```
1  {
2      "version": "1.0",
3      "response": {
4          "outputSpeech": {
5              "type": "SSML",
6              "ssml": "<speak> Here's your fact: Mexi
7          },
8          "card": {
9              "content": "Mexico City is the largest
10             "title": "American Space Facts",
11             "type": "Simple"
12         },
13         "shouldEndSession": true
14     },
15     "sessionAttributes": {}
16 }
```

Listen



Types of requests

The journey from user utterance to intents.

Alexa, open space facts

LaunchRequest

Alexa, exit

SessionEndedRequest

Alexa, ask space facts for trivia

Intent Request : GetNewFactIntent

Understanding the SDK

```
const handler = {  
  canHandle(handlerInput) {  
    // Returns true if the handler can service the request  
  },  
  handle(handlerInput) {  
    // Code to handle the request  
  }  
}
```

Understanding the SDK

```
const handler = {  
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Understanding the SDK

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const handler = {  
  canHandle(handlerInput) {  
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  },  
  handle(handlerInput) {  
    // Code to handle the request  
  }  
}
```

Alexa SDK: emit, ask, tell

Ask vs Tell

Tell:

```
this.emit(':tell', speechOutput);
```

Present data to user, ends conversation (session).

Ask:

```
this.emit(':ask', speechOutput, reprompt);
```

Wait for user input, doesn't end conversation (session).

Emit – output speech/event

Speech:

```
this.emit(':ask', speechOutput, reprompt);  
"outputSpeech": {  
    "type": "SSML",  
    "ssml": "<speak> Here's your fact:
```

Event:

```
this.emit('GetFact');
```

A way to route behavior in your code.



Questions?

Thank You

Pradyumna Dash
Solutions Architect, Amazon Web Services
pradyd@amazon.co.uk