



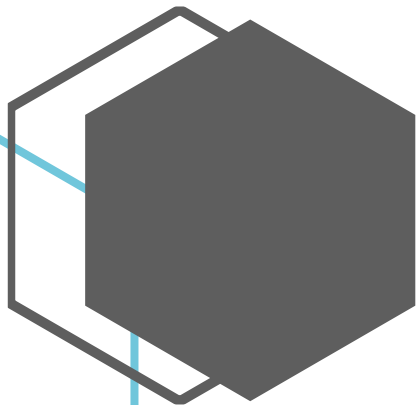
# CSCI 5410

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## Assignment 2 – Part B

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Banner ID: B00899629

GitLab URL: [https://git.cs.dal.ca/benny/csci5410\\_B00899629\\_Benny\\_Tharigopala](https://git.cs.dal.ca/benny/csci5410_B00899629_Benny_Tharigopala)



## AWS Lex Chatbot

### AWS Lex - Chatbot Creation & Configuration

#### Configure bot settings [Info](#)

##### Creation method

☒ **Create a blank bot**  
Create a basic bot with no preconfigured languages, intents, and slot types.

☐ **Start with an example**  
An example bot has preconfigured languages, intents, and slot types. You can change these settings.

☐ **Start with transcripts**  
Automatically generate intents from conversation transcripts that you upload. Only English (US) language is available when starting with a transcript.

##### Bot configuration

**Bot name**

Ride\_Request

Maximum 100 characters. Valid characters: A-Z, a-z, 0-9, -, \_

**Description - optional**  
This description appears on bot list page. It can help you identify the purpose of your bot.

IT Helpdesk for a Car rental organization.

Maximum 200 characters.

Figure 1: Configuring the Bot

1

**IAM permissions** [Info](#)

IAM permissions are used to access other services on your behalf.

**Runtime role**

Choose a role that defines permissions for your bot. To create a custom role, use the IAM console.

☒ Create a role with basic Amazon Lex permissions.

☐ Use an existing role.

**i** Creating a role takes a few minutes. Don't delete the role or edit the trust or permissions policies in this role until we've finished creating it.

**New role**

Amazon Lex creates a runtime role with permission to upload to Amazon CloudWatch Logs.

AWSServiceRoleForLexV2Bots\_4KLT6WYRGRF

**Children's Online Privacy Protection Act (COPPA)** [Info](#)

Is use of your bot subject to the [Children's Online Privacy Protection Act \(COPPA\)](#) [↗](#)?

☐ Yes

☒ No

**Idle session timeout**

You can configure how long a session is maintained when the user does not provide any input and the session is idle. Amazon Lex retains context information until a session ends.

**Session timeout**

By default, session duration is 5 minutes, but you can specify any duration between 1 and 1440 minutes (24 hours).

Figure 2: Configuring Permissions and Privacy Settings

The screenshot shows the 'Add language to bot' configuration page in the AWS Lex console. The page is titled 'Add language to bot' with an 'Info' link. On the left, a sidebar shows 'Step 1: Configure bot settings' and 'Step 2: Add languages'. The main content area is for configuring the language 'English (US)'. It includes a 'Select language' dropdown set to 'English (US)', a 'Description - optional' text area (maximum 200 characters), a 'Voice interaction' dropdown set to 'Kimberly', a 'Voice sample' text input with a 'Play' button, and an 'Intent classification confidence score threshold' set to '0.40' (range 0.00 to 1.00). At the bottom are 'Cancel', 'Add another language', and 'Done' buttons.

aws Services Search for services, feat [Alt+S] N. Virginia voclabs/user1981579-bn489600@dal.ca @ 7897-6020-

Lex > Bots > Create bot

Step 1  
Configure bot settings

Step 2  
Add languages

### Add language to bot [Info](#)

▼ Language: English (US)

Select language  
English (US) ▼

Description - optional  
  
Maximum 200 characters.

Voice interaction  
The text-to-speech voice that your bot uses to interact with users.  
Kimberly ▼

Voice sample  
Hello, my name is Kimberly. Let me know how I ca

Intent classification confidence score threshold  
0.40  
Min: 0.00, max: 1.00.

Cancel Add another language Done

Figure 3: Configuring Language, Voice and confidence score

The screenshot shows the 'Bots (1)' page in the AWS Lex console. It includes a search bar, a table of bots, and a 'Create bot' button. The table has columns for Name, Description, Status, Latest Version, and Last updated. One bot is listed: 'Ride\_Request' with description 'IT Helpdesk for a Car Rental organization.', status 'Available', and last updated '16 hours ago'.

Lex > Bots

Bots (1) [Info](#)

< 1 >

	Name ▲	Description ▼	Status ▼	Latest Version ▼	Last updated ▼
<input type="radio"/>	Ride_Request	IT Helpdesk for a Car Rental organization.	Available	-	16 hours ago

Figure 4: AWS Lex Bot Console

## Slot type: RideCategory

### Slot type: RideCategory [info](#)

A slot type is a list of values used to capture values for a slot.

▼ Slot type details

Slot type name

RideCategory

Maximum 100 characters. Valid characters: A-Z, a-z, 0-9, -, \_

Description - optional

Helps you identify a slot type on the list

Selfdrive or Taxi.

Maximum 200 characters.

Type: Custom

ID: RV7WQCRIUKY

Slot value resolution

Amazon Lex resolves the slot values in an utterance to only the values you provide, or it expands the resolution to related or similar values.

☐ Expand values (default)  
Values used as training data.

☒ Restrict to slot values  
Use only values provided.

Slot type values

Modify the list of values used to train the machine learning model to recognize values for a slot.

self-drive

Self-drive X

self X

Self X

self drive X

drive myself X

Tab or ; for new value

Taxi

taxi X

Taxi X

cab X

Cab X

Tab or ; for new value

Maximum 140 characters. Valid characters: A-Z, a-z, 0-9, @, #, \$

☐ Use slot values as custom vocabulary [info](#)

Figure 5: Creating a new slot for Ride Category (Self-drive / Taxi)

4

## Slot type: TypeOfVehicles

### Slot type: TypeOfVehicles [Info](#)

A slot type is a list of values used to capture values for a slot.

▼ Slot type details

Slot type name

Maximum 100 characters. Valid characters: A-Z, a-z, 0-9, -, \_

Description - *optional*  
Helps you identify a slot type on the list

Maximum 200 characters.

Type: Custom  
ID: 9Y6QXKRLAB

**Slot value resolution**

Amazon Lex resolves the slot values in an utterance to only the values you provide, or it expands the resolution to related or similar values.

☐ Expand values (default)  
Values used as training data.

☒ Restrict to slot values  
Use only values provided.

Figure 6: Creating a new slot for Vehicle Type (SUV / Sedan / Minivan)

**Slot value resolution**

Amazon Lex resolves the slot values in an utterance to only the values you provide, or it expands the resolution to related or similar values.

☐ Expand values (default)  
Values used as training data.

☒ Restrict to slot values  
Use only values provided.

**Slot type values**

Modify the list of values used to train the machine learning model to recognize values for a slot.

suv ×

SUV ×

Suv ×

×

Tab or ; for new value

Sedan ×

sedan ×

SEDAN ×

×

Tab or ; for new value

Tab or ; for new value

Add value

Maximum 140 characters. Valid characters: A-Z, a-z, 0-9, @, #, \$

☐ Use slot values as custom vocabulary [Info](#)

Figure 7: Slot Type Values for Vehicle Type

Lex > Bots > Bot: Ride\_Reque... > Versions > Version: Draft > All languages > Language: English (US) > Intents

**Intents (4)** Info Delete Add intent ▼

An intent represents an action that the user wants to perform.

	Name ▼	Description	Last edited ▼
<input type="radio"/>	BookSelfDriveRide	Helps Users book a self-drive ride.	14 hours ago
<input type="radio"/>	FallbackIntent	Default intent when no other intent matches	14 hours ago
<input type="radio"/>	BookCab	Help Users book a Cab.	15 hours ago
<input type="radio"/>	Greeting	Greet the User	15 hours ago

Figure 8: List of Intents for the Bot

## Intent: Greeting

**Intent: Greeting** Info

An intent represents an action that fulfills a user's request. Intents can have arguments called slots that represent variable information.

▼ **Conversation flow** Info

Initial request - sample utterance

hi

Prompt for more information - slot

Hey there! What's your name?

Capture information - slot value

<first name>

Confirm intent - confirmation prompt

Do you want to book a vehicle ?

1 of 3

2 of 3

e.g. Thank you for the information. We have started the process.

Notify that fulfillment started - fulfillment updates

e.g. We are still working on it, thank you for your patience.

Provide fulfillment status - fulfillment updates

e.g. The process is completed, thank you.

Fulfillment completed successfully - success response

e.g. Sorry, something went wrong. We will get back to you.

Fulfillment failed to complete - failure response

▼ **Intent details** Info

Intent name

Greeting

Maximum 100 characters. Valid characters: A-Z, a-z, 0-9, -, \_

Description - optional

Greet the User

Maximum 200 characters.

Draft version ▼ English (US) Successfully built Intent saved Build Test

Figure 9: Conversation Flow for the Greeting Intent

Representative phrases that you expect a user to speak or type to invoke this intent. Amazon Lex extrapolates based on the sample utterances to interpret any user input that may vary from the samples. The priority order of the sample utterances is not used to determine intent classification output.

### Figure 10: Utterances for the Greeting Intent

Information that a bot needs to fulfill the intent. The bot prompts for slots required for intent fulfillment, in priority order below.

Add slot

**Figure 11: Slot setup and organization for the Greeting Intent**



### Confirmation prompts and decline responses [Info](#)

Prompts help to clarify whether the user wants to fulfill the intent or cancel it.

☒ Active

▼ Prompts to confirm the intent

Message: *Hi {name}! Do you want to book a vehicle ?*

Responses sent when the user declines the intent

Message: *Your booking process has ended! Thank you ...*

**Confirmation prompt**

What will the bot say to prompt the user to confirm this intent.

Hi {name}! Do you want to book a vehicle ?

**Decline response**

What will the bot say if the user says NO to the confirmation prompt.

Your booking process has ended! Thank you for your time!

**Advanced options**

Configure confirmation prompts and decline responses.

### Fulfillment [Info](#)

Run a lambda function to fulfill the intent and inform users of the status when it's complete.

► On successful fulfillment

Message: -

In case of failure

Message: -

### Closing response [Info](#)

You can define the response when closing the intent.

☒ Active

▼ Response sent to the user after the intent is fulfilled

Message: *Do you want to opt for the self-drive or Cab option?*

**Message**

Do you want to opt for the self-drive or Cab option?

► Variations - optional

**More response options**

Add custom payloads, SSML, and card groups.

Figure 12: Confirmation Prompt &amp; Closing Response for the Greeting Intent

## Intent: BookSelfDriveRide

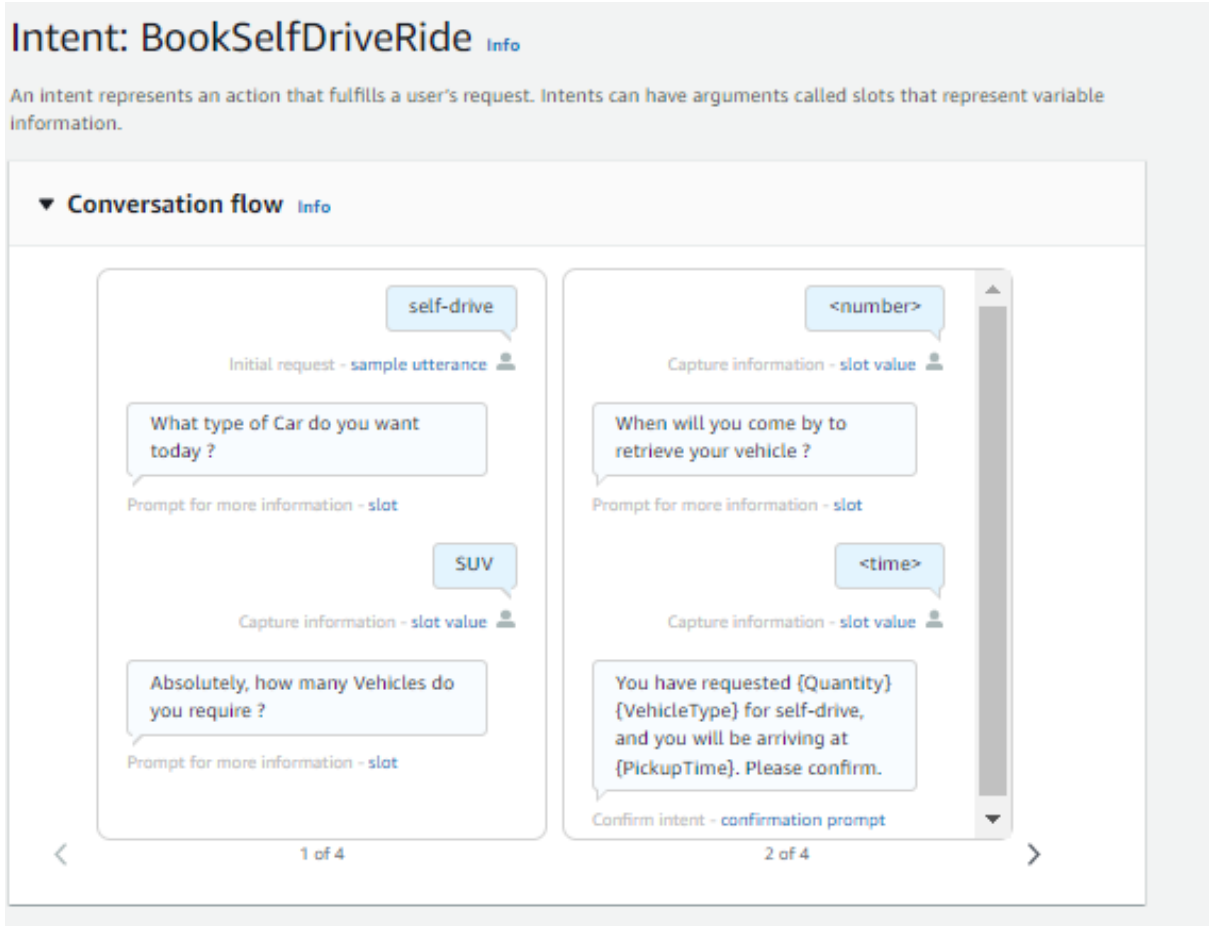


Figure 13: Conversation Flow for the Intent - "Book a vehicle for Self-Drive"

**▼ Intent details** [Info](#)

**Intent name**  
  
Maximum 100 characters. Valid characters: A-Z, a-z, 0-9, -, \_

**Description - optional**  
  
Maximum 200 characters.

ID: SBROSHSQTE

**▼ Contexts - optional**

**Input contexts**

**Output contexts**

**Sample utterances (6)** [Info](#)  
Representative phrases that you expect a user to speak or type to invoke this intent. Amazon Lex extrapolates based on the sample utterances to interpret any user input that may vary from the samples. The priority order of the sample utterances is not used to determine intent classification output.

Preview

Plain Text

self-drive

self

own

on my own

drive own

drive own car

Figure 14: Utterances for the Intent - "Book a vehicle for Self-Drive"

▼ Slots (3) - optional [Info](#)

Information that a bot needs to fulfill the intent. The bot prompts for slots required for intent fulfillment, in priority order below.

Add slot

Q Filter

▼ Prompt for slot: VehicleType

Message: What type of Car do you want today ?

Slot type

TypeOfVehicles

✕

☒ Required for this intent

The bot will prompt for this slot during the conversation if a value is not provided by the user.

Name

VehicleType

Slot type

TypeOfVehicles ▼

Prompts

What type of Car do you want today ?

You can use the advanced options setting to configure rich messages such as a custom payload, card groups, and SSML.

Advanced options

Figure 15: Vehicle Type Slot for the Intent - "Book a vehicle for Self-Drive"

**Slot: VehicleType** > **Slot prompts editor** ×

▶ Variations - optional

⋮ **Card group** Info ×

You can define up to three cards per group. One of the cards is selected during a conversation.

Add card

**Card 1** ×

Each card can have up to six optional buttons.

You can use response card with Facebook Messenger, Slack, Twilio, or your own client applications.

Image URL

http://www.example.com/image.png

Must be an Amazon S3 object URL.

Title

car type

Maximum 250 characters. Valid characters: A-Z, a-z, 0-9, @, #, \$

Subtitle

Maximum 250 characters. Valid characters: A-Z, a-z, 0-9, @, #, \$

▼ Buttons - optional

Button 1 title

⋮ SUV

Button title can have up to 50 characters.

Button 1 value

SUV

Button value can have up to 50 characters.

Remove button

Button 2 title

⋮ Minivan

Button title can have up to 50 characters.

Button 2 value

minivan

Button value can have up to 50 characters.

Remove button

Button 3 title

⋮ Sedan

Button title can have up to 50 characters.

Button 3 value

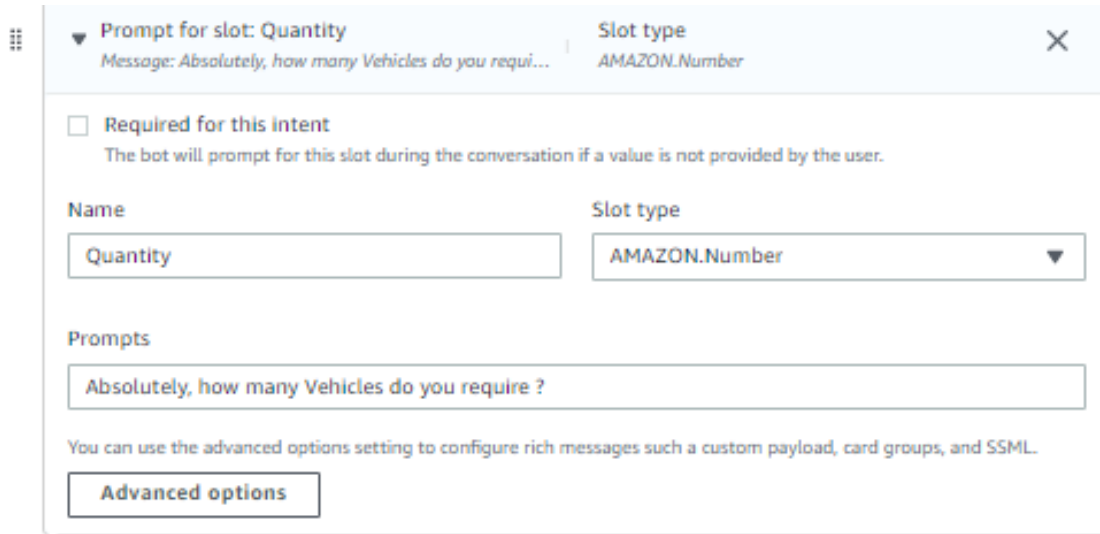
sedan

Button value can have up to 50 characters.

Remove button

Add button

Figure 16: Adding a Card Group to restrict values to 3 types of Vehicles in the Vehicle Type slot



☰

▼ Prompt for slot: Quantity  
Message: Absolutely, how many Vehicles do you require...

Slot type  
AMAZON.Number

☐ Required for this intent  
The bot will prompt for this slot during the conversation if a value is not provided by the user.

Name  
Quantity

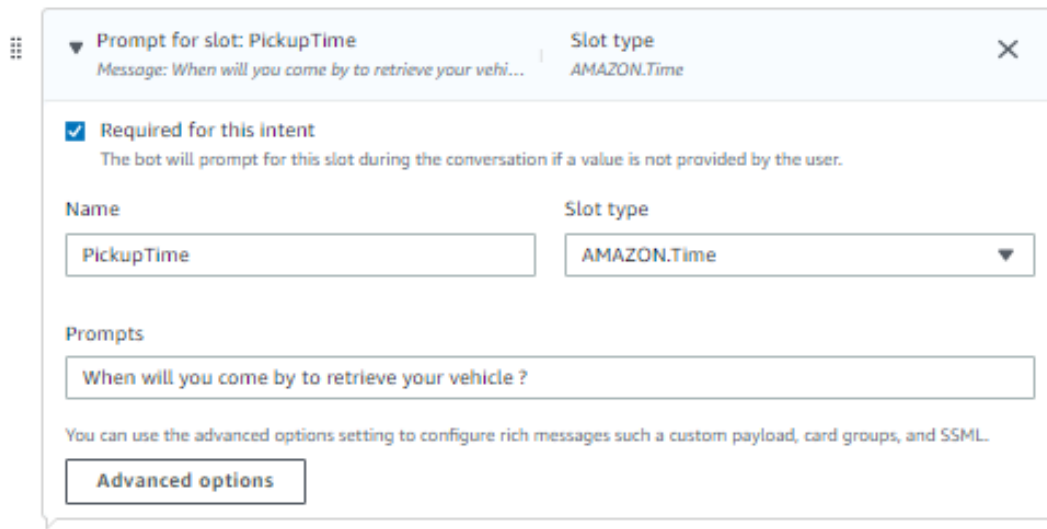
Slot type  
AMAZON.Number ▼

Prompts  
Absolutely, how many Vehicles do you require ?

You can use the advanced options setting to configure rich messages such as a custom payload, card groups, and SSML.

Advanced options

Figure 17: Quantity Slot for the Intent - "Book a vehicle for Self-Drive"



☰

▼ Prompt for slot: PickupTime  
Message: When will you come by to retrieve your vehi...

Slot type  
AMAZON.Time

☒ Required for this intent  
The bot will prompt for this slot during the conversation if a value is not provided by the user.

Name  
PickupTime

Slot type  
AMAZON.Time ▼

Prompts  
When will you come by to retrieve your vehicle ?

You can use the advanced options setting to configure rich messages such as a custom payload, card groups, and SSML.

Advanced options

Figure 18: Pickup Time Slot for the Intent - "Book a vehicle for Self-Drive"

### Confirmation prompts and decline responses [Info](#)

Prompts help to clarify whether the user wants to fulfill the intent or cancel it.

▼ Prompts to confirm the intent

Message: You have requested {Quantity} {VehicleType}...

Responses sent when the user declines the intent

Message: Your request was not placed! Pleasure meeti...

**Confirmation prompt**

What will the bot say to prompt the user to confirm this intent.

You have requested {Quantity} {VehicleType} for self-drive, and you will be arriving at {PickupTime}. Please confir

**Decline response**

What will the bot say if the user says NO to the confirmation prompt.

Your request was not placed! Pleasure meeting you. Bye now!

**Advanced options**

Configure confirmation prompts and decline responses.

### Fulfillment [Info](#)

Run a lambda function to fulfill the intent and inform users of the status when it's complete.

► On successful fulfillment

Message: -

In case of failure

Message: -

### Closing response [Info](#)

You can define the response when closing the intent.

▼ Response sent to the user after the intent is fulfilled

Message: Thank you for your business! Your booking is confirmed!

**Message**

Thank you for your business! Your booking is confirmed!

► Variations - optional

**More response options**

Add custom payloads, SSML, and card groups.

Figure 19: Confirmation Prompt & Closing Response for the Intent - "Book a vehicle for Self-Drive"

## Intent: BookCab

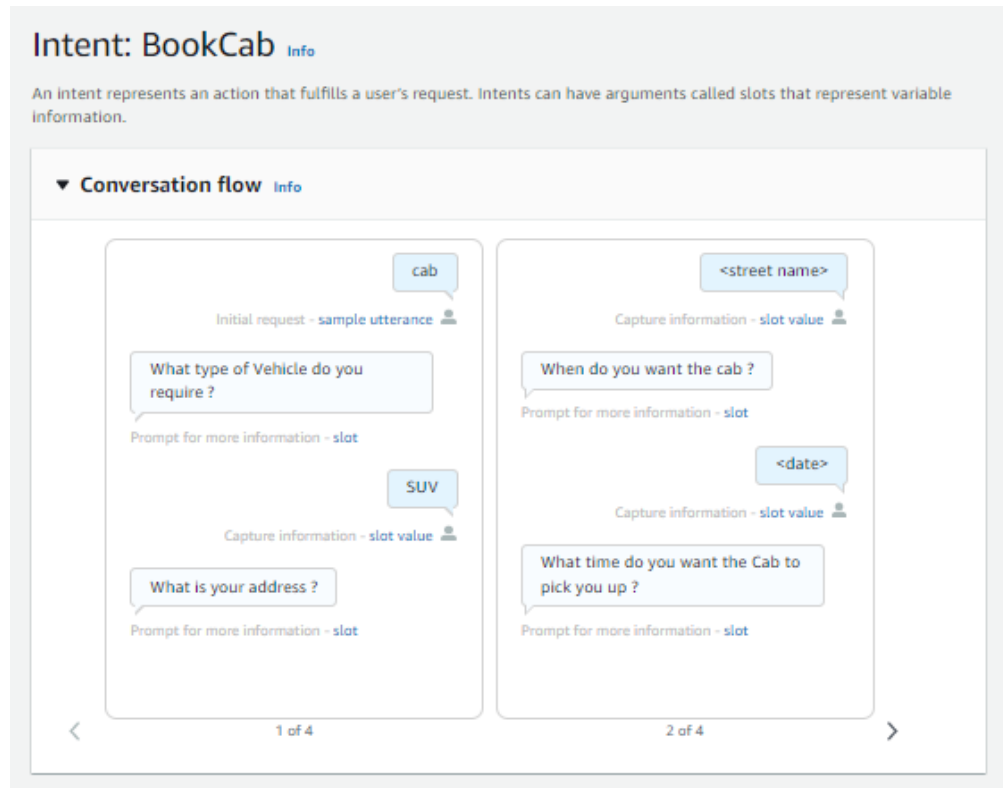


Figure 20: Conversation Flow for the Intent - "Book a Cab"

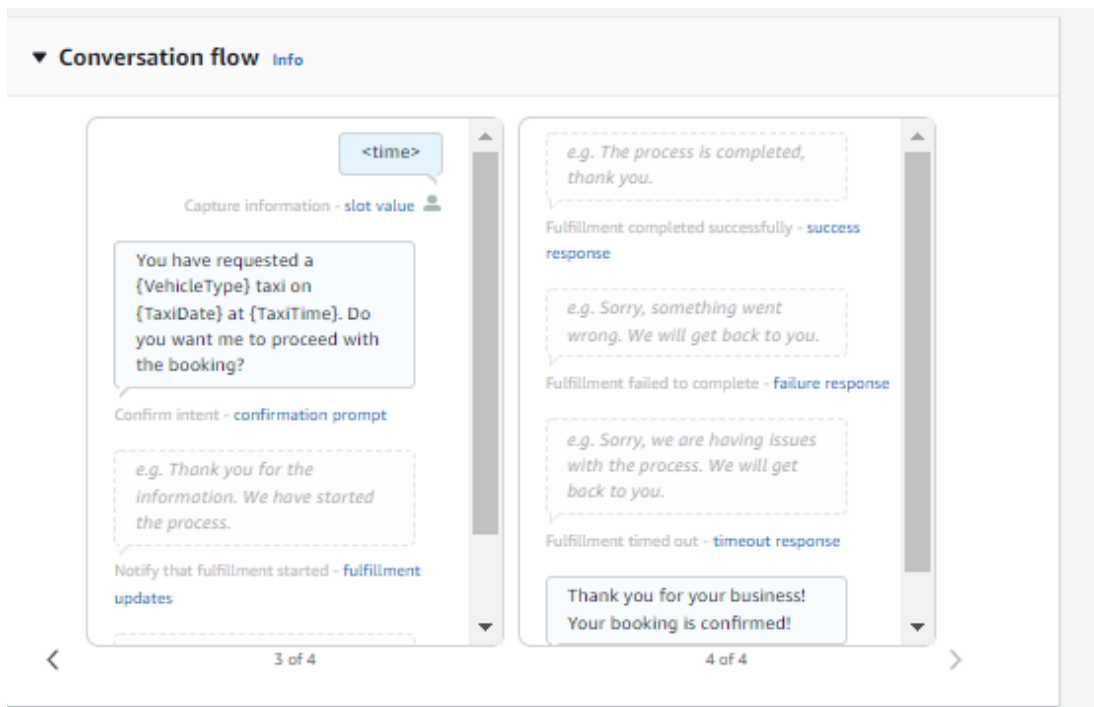


Figure 21: Conversation Flow for the Intent - "Book a Cab" (Continued)



**▼ Intent details** [Info](#)

**Intent name**  
  
Maximum 100 characters. Valid characters: A-Z, a-z, 0-9, -, \_

**Description - optional**  
  
Maximum 200 characters.

**ID:** QSHDAGDUAM

Figure 22: Intent Details

**Sample utterances (9)** [Info](#)

Representative phrases that you expect a user to speak or type to invoke this intent. Amazon Lex extrapolates based on the sample utterances to interpret any user input that may vary from the samples. The priority order of the sample utterances is not used to determine intent classification output.

**Preview** **Plain Text**

cab

CAB

I need a cab

I want to book a cab

need a taxi

book a taxi

need cab service

book Uber

book

Maximum 250 characters.

Figure 23: Utterances for the Intent - "Book a Cab"

▼ **Slots (4) - optional** [Info](#) Add slot

Information that a bot needs to fulfill the intent. The bot prompts for slots required for intent fulfillment, in priority order below.

Q Filter

⋮

▼ Prompt for slot: VehicleType  
Message: What type of Vehicle do you require ?

Slot type  
TypeOfVehicles

✕

☒ Required for this intent  
The bot will prompt for this slot during the conversation if a value is not provided by the user.

Name  
VehicleType

Slot type  
TypeOfVehicles ▼

Prompts  
What type of Vehicle do you require ?

You can use the advanced options setting to configure rich messages such a custom payload, card groups, and SSML.  
Advanced options

Figure 24: Vehicle Type slot for the Intent - "Book a Cab"

⋮

▼ Prompt for slot: Address  
Message: What is your address ?

Slot type  
AMAZON.StreetName

✕

☒ Required for this intent  
The bot will prompt for this slot during the conversation if a value is not provided by the user.

Name  
Address

Slot type  
AMAZON.StreetName ▼

Prompts  
What is your address ?

You can use the advanced options setting to configure rich messages such a custom payload, card groups, and SSML.  
Advanced options

Figure 25: Address slot for the Intent - "Book a Cab"

▼ Prompt for slot: TaxiDate | Slot type: AMAZON.Date

Message: When do you want the cab ?

☒ Required for this intent  
The bot will prompt for this slot during the conversation if a value is not provided by the user.

Name: TaxiDate | Slot type: AMAZON.Date

Prompts: When do you want the cab ?

You can use the advanced options setting to configure rich messages such as a custom payload, card groups, and SSML.

Advanced options

Figure 26: Pickup Date slot for the Intent - "Book a Cab"

▼ Prompt for slot: TaxiTime | Slot type: AMAZON.Time

Message: What time do you want the Cab to pick you up ?

☒ Required for this intent  
The bot will prompt for this slot during the conversation if a value is not provided by the user.

Name: TaxiTime | Slot type: AMAZON.Time

Prompts: What time do you want the Cab to pick you up ?

You can use the advanced options setting to configure rich messages such as a custom payload, card groups, and SSML.

Advanced options

Figure 27: Pickup Time slot for the Intent - "Book a Cab"

### Confirmation prompts and decline responses [Info](#)

Prompts help to clarify whether the user wants to fulfill the intent or cancel it.

**▼ Prompts to confirm the intent**  
Message: You have requested a {VehicleType} taxi on {...}

**Responses sent when the user declines the intent**  
Message: Your request was not placed! Pleasure meeti...

**Confirmation prompt**  
What will the bot say to prompt the user to confirm this intent.

You have requested a {VehicleType} taxi on {TaxiDate} at {TaxiTime}. Do you want me to proceed with the booking

**Decline response**  
What will the bot say if the user says NO to the confirmation prompt.

Your request was not placed! Pleasure meeting you. Bye now!

**Advanced options**  
Configure confirmation prompts and decline responses.

### Fulfillment [Info](#)

Run a lambda function to fulfill the intent and inform users of the status when it's complete.

**► On successful fulfillment**  
Message: -

**In case of failure**  
Message: -

### Closing response [Info](#)

You can define the response when closing the intent.

**▼ Response sent to the user after the intent is fulfilled**  
Message: Thank you for your business! Your booking is confirmed!

**Message**

Thank you for your business! Your booking is confirmed!

**► Variations - optional**

**More response options**  
Add custom payloads, SSML, and card groups.

Figure 28: Confirmation Prompt &amp; Closing Response for the Intent - "Book a Cab"

## Intent: FallbackIntent

This is a default Intent the Lex generates when the bot doesn't recognize the user input as an intent after the configured number of tries for clarification when the conversation is started [3].

### Intent: FallbackIntent [Info](#)

An intent represents an action that fulfills a user's request. Intents can have arguments called slots that represent variable information.

#### ▼ Conversation flow [Info](#)

Thank you for your Business.  
Please rate our Chatbot service!

Send final response - closing response

< 1 of 1 >

#### ▼ Intent details [Info](#)

Intent name

FallbackIntent

Maximum 100 characters. Valid characters: A-Z, a-z, 0-9, -, \_

Description - optional

Default intent when no other intent matches

Maximum 200 characters.

ID: FALLBCKINT

Figure 29: Conversation Flow for the Intent - "Fallback"

**Closing response** Info Active

You can define the response when closing the intent.

▼ Response sent to the user after the intent is fulfilled  
*Message: Thank you for your Business. Please rate our Chatbot service!*

Message

Thank you for your Business. Please rate our Chatbot service!

► Variations - optional

More response options

Add custom payloads, SSML, and card groups.

Figure 30: Closing Response for the Intent - "Fallback"

## Chatbot Functional Tests:

### Self-drive:

**Test Draft version** ⚙️ ✕  
Last build submitted:  
18 minutes ago 🔄

Inspect

Hi

Hey there! What's your name?

Benny Daniel

Hi Benny Daniel! Do you want to book a vehicle ?

yes

Do you want to opt for the self-drive or Cab option?

self-drive

Figure 31: Requesting a vehicle for self-drive

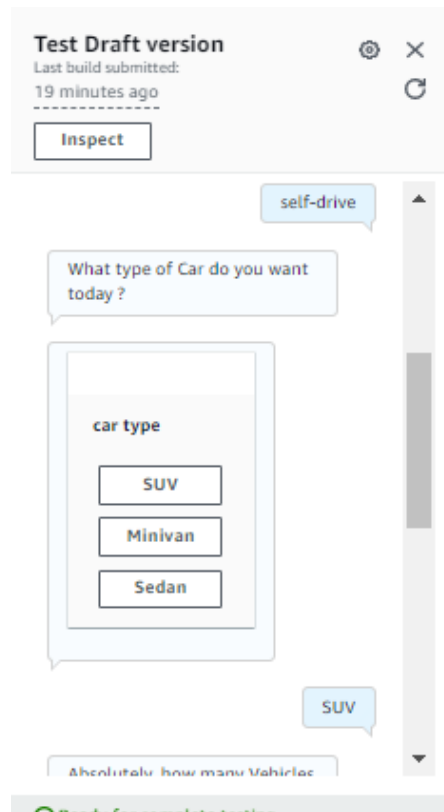


Figure 32: Selecting Car Type

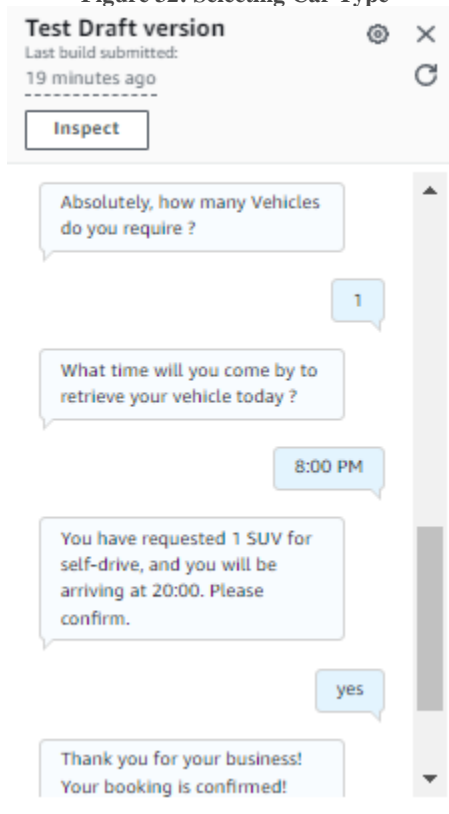


Figure 33: Inputs for number of Vehicles and pickup time followed by a Confirmation prompt and closing response

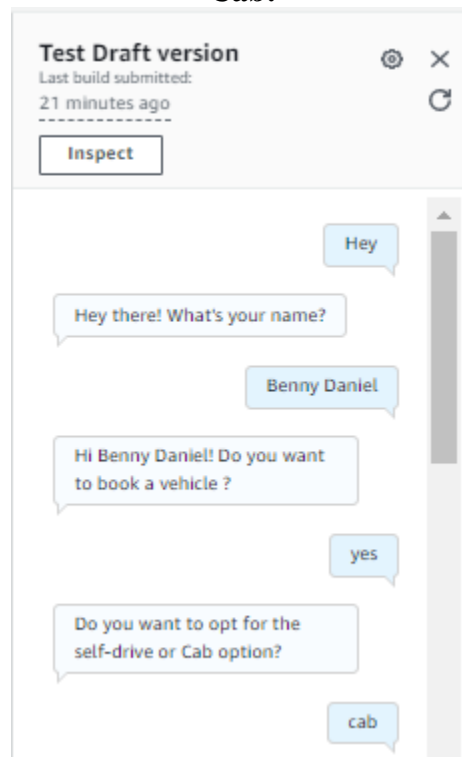
**Cab:**

Figure 34: Requesting a Cab

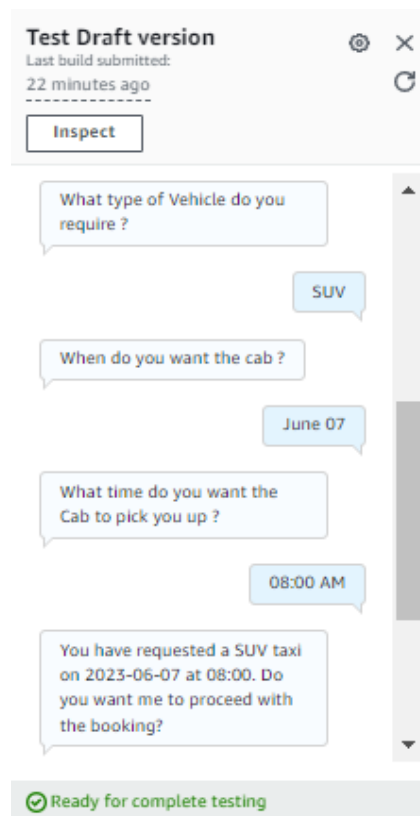


Figure 35 Vehicle Type and Pick up Date &amp; Time:



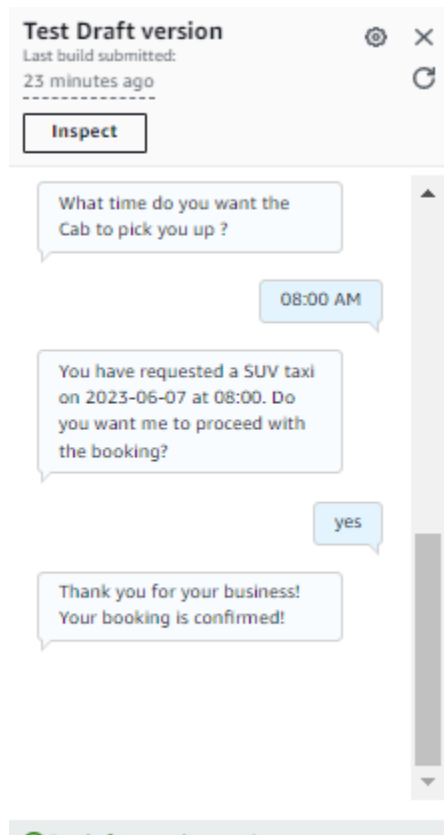
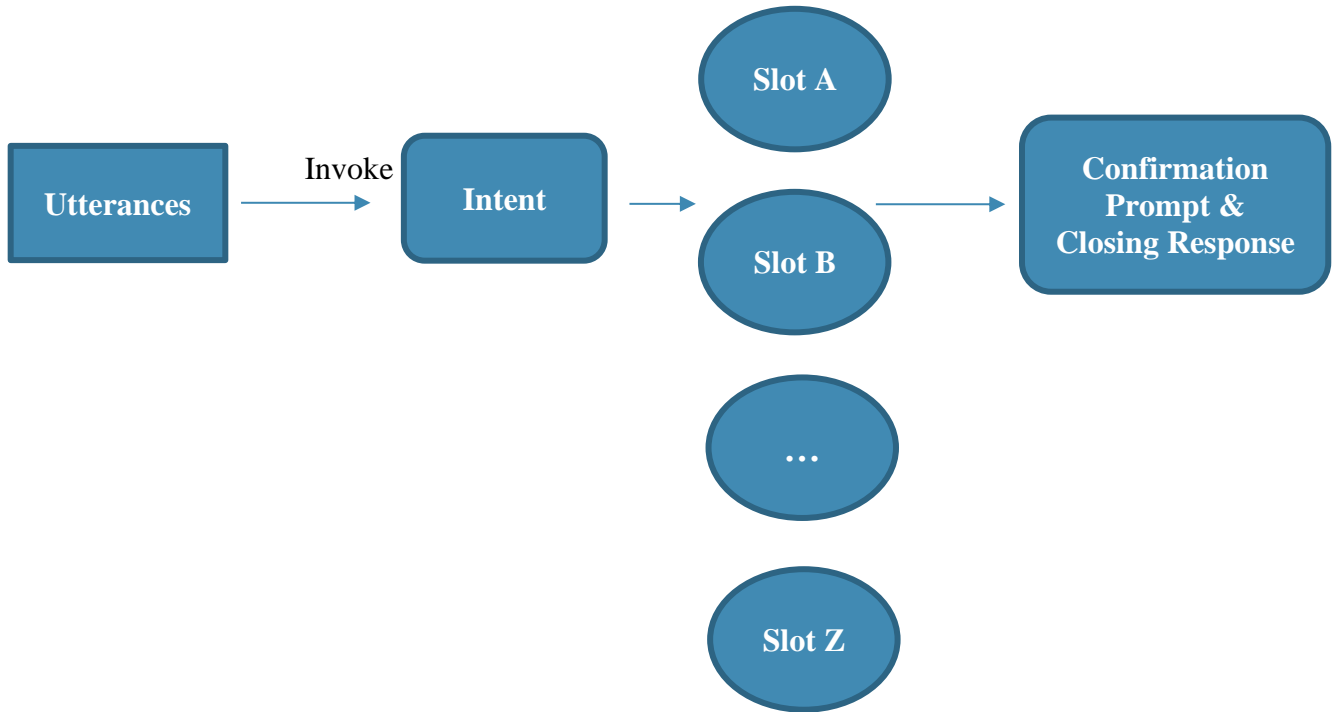


Figure 36: Confirmation Prompt &amp; Closing Response

## Description of Operations:

Amazon Web Services' Lex Chatbot is a versatile tool that can automate service request conversations and responses through Natural Language Understanding (NLU), which are otherwise, manually handled. It is simple, intuitive, employs deep learning technologies and can be seamlessly deployed with any type of application [1]. Amazon Lex V2 bots can communicate in more than one language. Lex chatbots operate based on Utterances, Intents and Slots. An intent represents a task that the User desires to be executed, for instance "Call Home [2]". Each **intent** in Lex has a name and a description associated with it an intent is invoked by an **utterance**. Utterances are words that are stored while configuring the intent, in order to initiate the conversation flow relevant to the intent.

An intent consists of a conversation flow which is a template for how a typical conversation between a bot and a user would look like for a specific intent. An intent requires parameters to be processed. These parameters are called **Slots**. Slot values are configured in such a way that, when the bot prompts the User for specific slot values, the user must provide values for all **required** slots to navigate through the conversation flow. Confirmation prompts exist, to handle alternate courses wherein Users "decline" or respond with a "No" to a prompt and display a corresponding 'Exit Message'. Closing responses indicate the typical message to be displayed upon successful fulfillment of an Intent.



## Citations

- [1] "Amazon Lex – Build Conversation Bots." *Amazon Web Services, Inc.*, 2019, [aws.amazon.com/lex/](https://aws.amazon.com/lex/).
- [2] "What Is Amazon Lex V2? - Amazon Lex." *Docs.aws.amazon.com*, 2 Sept. 2018, [docs.aws.amazon.com/lexv2/latest/dg/what-is.html](https://docs.aws.amazon.com/lexv2/latest/dg/what-is.html). Accessed 6 June 2022.
- [3] "AMAZON.FallbackIntent - Amazon Lex." *Docs.aws.amazon.com*, 15 May 2014, [docs.aws.amazon.com/lex/latest/dg/built-in-intent-fallback.html](https://docs.aws.amazon.com/lex/latest/dg/built-in-intent-fallback.html). Accessed 4 June 2022.