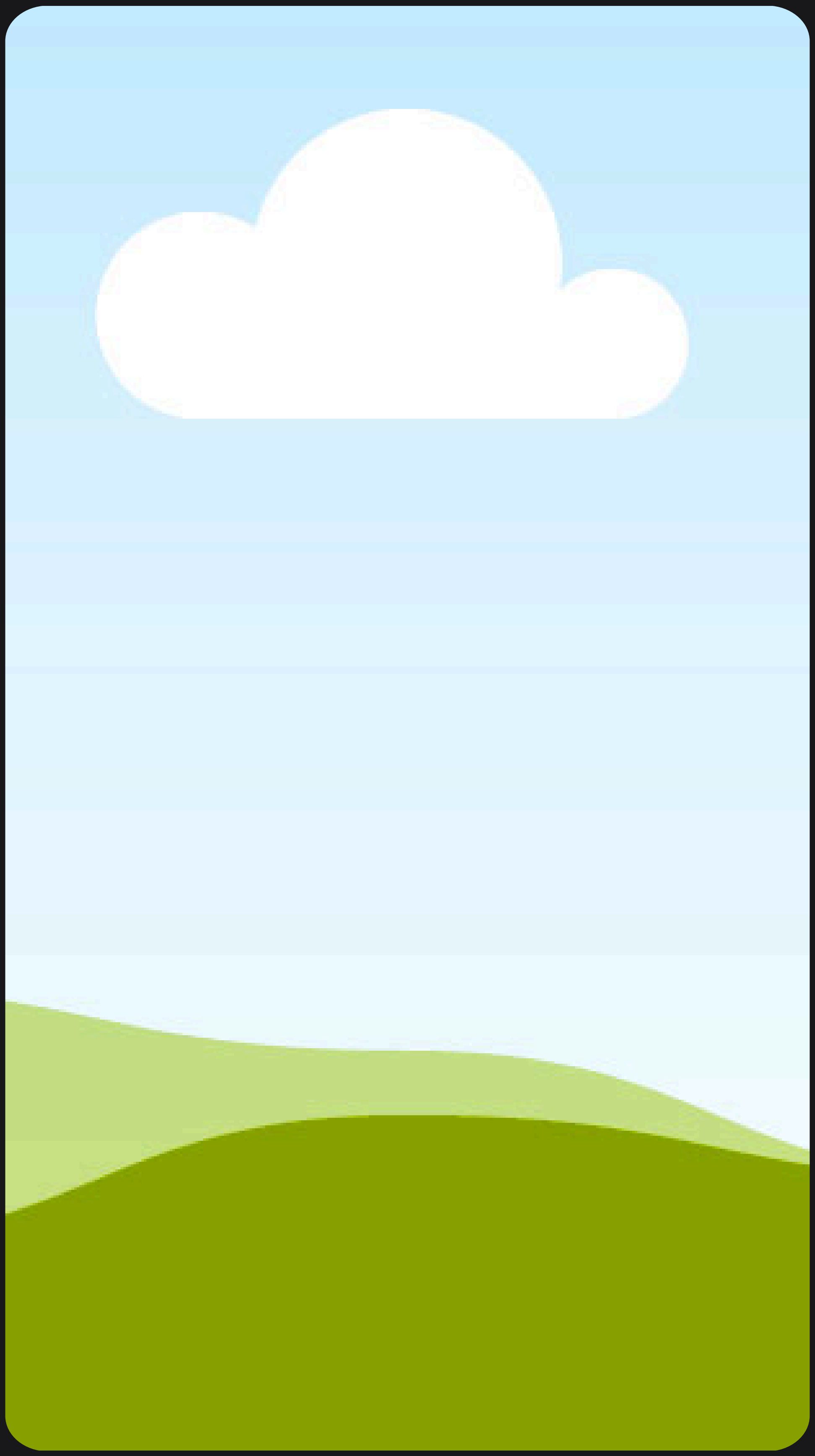
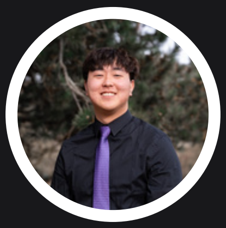
NEXTWORK

How I built a chatbot with Amazon Lex





Ethan Kwon
@ethan-kwon/bankerbot

What is Amazon Lex?

What it does:

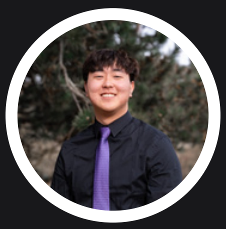
- Amazon Lex is a service offered by Amazon Web Services (AWS) that allows developers to build chatbots that can understand and respond to natural language, both spoken and typed.

Why it's useful:

- Amazon Lex allows developers to build chatbots that can have natural conversations with users, improving user experience and automating tasks.

How I'm using it in today's project:

- In this project I'm using Amazon Lex to create BankerBot, a ...



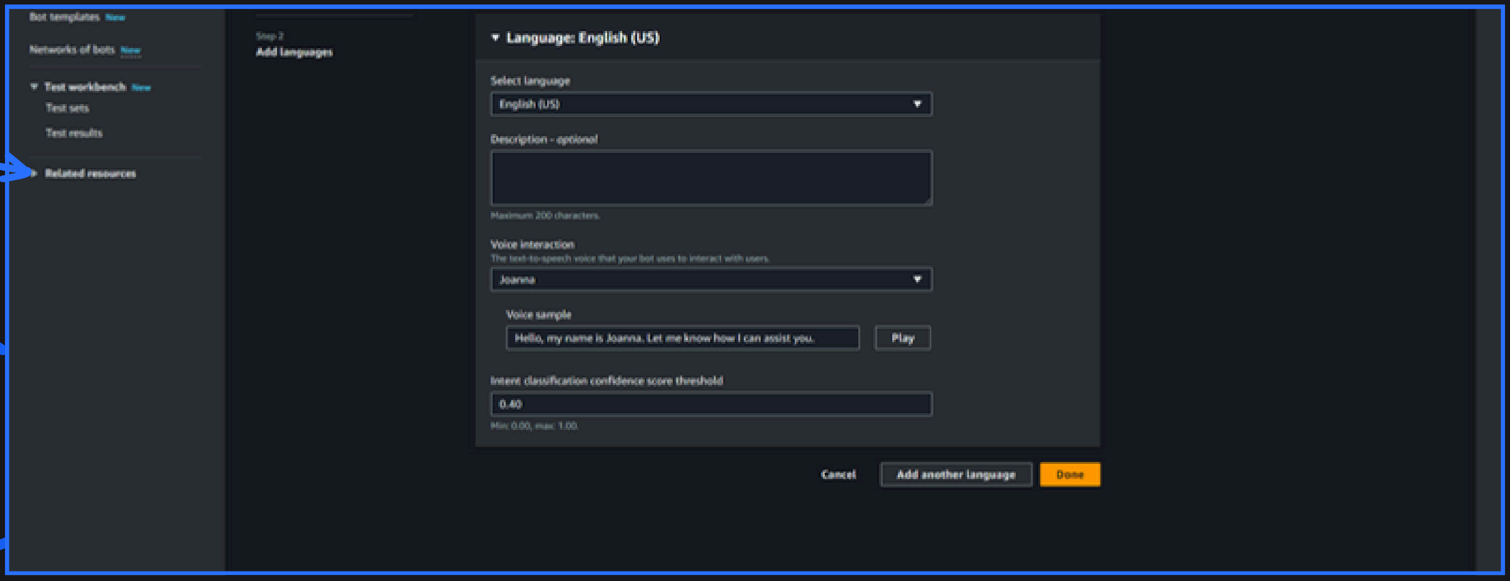
Ethan Kwon
@ethan-kwon/bankerbot

Set up a Lex chatbot

- I created BankerBot from scratch and used most default settings on Lex.

- In terms of the **intent classification confidence score,** I kept the default value of 0.40. What this means for my chatbot is that it needs to be at least 40% confident in what the user is asking before it can give a response. If a user's response is ambiguous and below the threshold of 0.4, it will throw an error message.

Setting up my Lex chatbot...



Language: English (US)

Select language: English (US)

Description - optional

Maximum 200 characters.

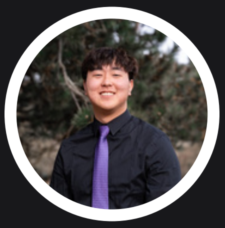
Voice interaction: Joanna

The text-to-speech voice that your bot uses to interact with users.

Voice sample: Hello, my name is Joanna. Let me know how I can assist you.

Intent classification confidence score threshold: 0.40

Min: 0.00, max: 1.00.

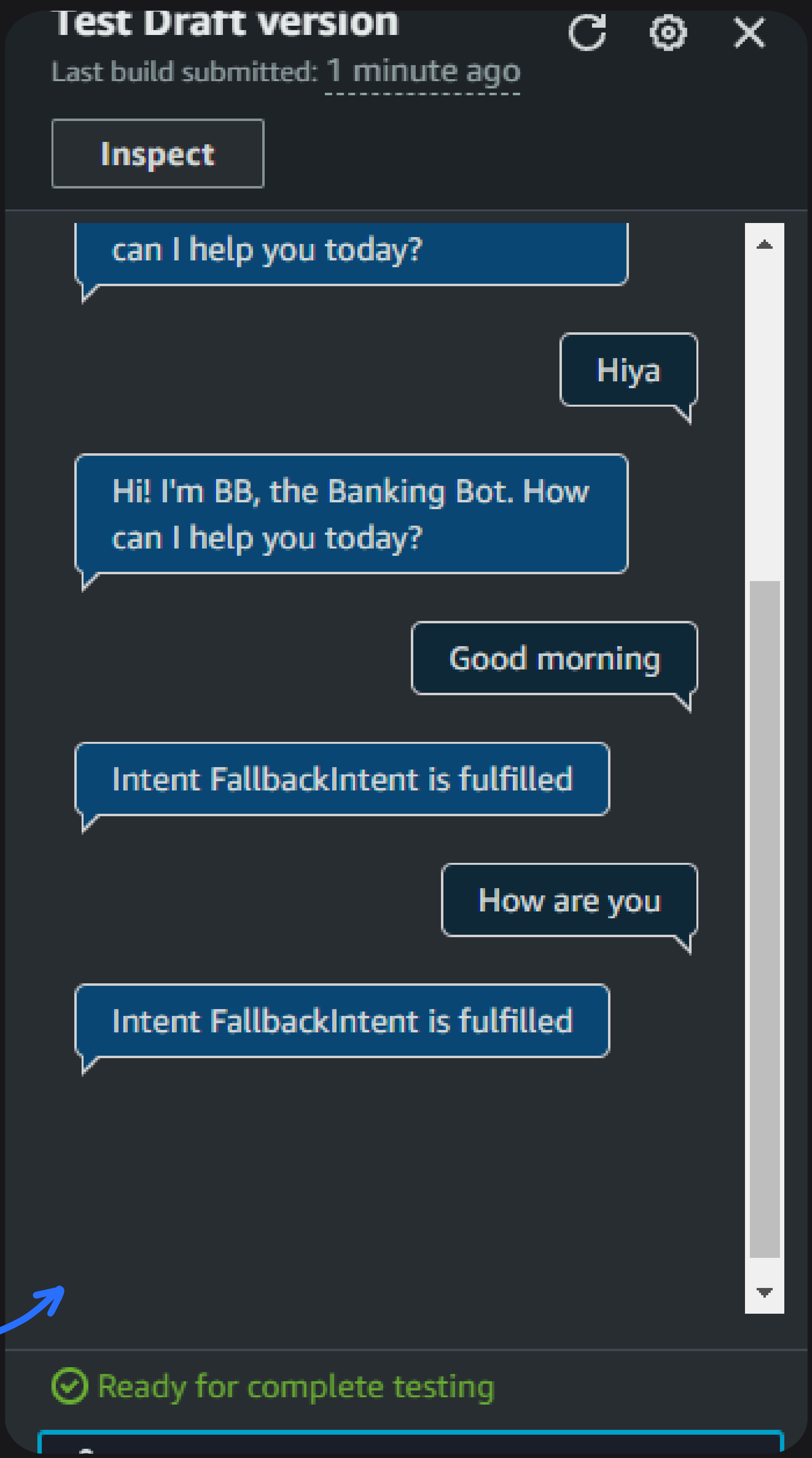


Ethan Kwon

@ethan-kwon/bankerbot

Create an intent in Lex

- Intents are what the user is trying to achieve in their conversation with the chatbot. For example, checking a bank account balance; booking a flight; ordering food.
- My first intent, WelcomeIntent, was created to welcome the user to the chat
- To set up this intent, I added sample utterances and closing responses
- I launched and tested the chatbot, which could still respond if I enter "Hi", "Hey", or similar phrases
- However, the chatbot returned the error message "Intent FallbackIntent is fulfilled" when I entered "Good morning" and "How are you"
- This error message occurred because the chatbot is unable to recognize this utterance



Test Draft version

Last build submitted: 1 minute ago

can I help you today?

Hiya

Hi! I'm BB, the Banking Bot. How can I help you today?

Good morning

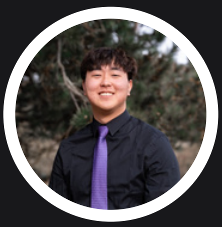
Intent FallbackIntent is fulfilled

How are you

Intent FallbackIntent is fulfilled

Ready for complete testing

My first test of the chatbot

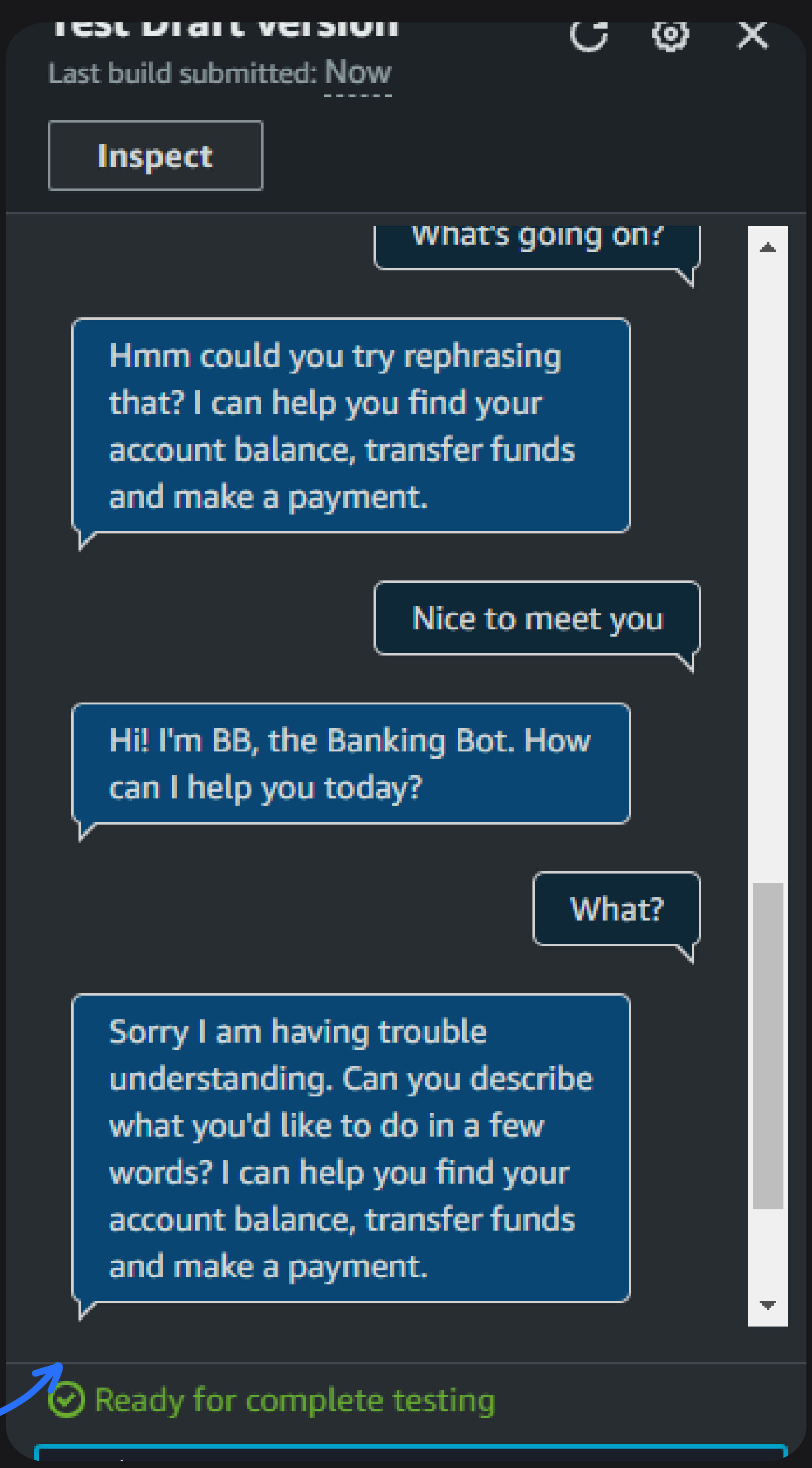


Ethan Kwon

@ethan-kwon/bankerbot

Manage FallbackIntent

- FallbackIntent is a default intent in every chatbot that gets triggered when no other intent has a confidence score above the set threshold.
- I wanted to configure FallbackIntent because the chatbot would become more descriptive in which prompts it would respond to.
- To configure FallbackIntent, I had to edit the closing response's message.
- I also added variations! What this means for an end user is they will have a more conversational experience with a dynamic range of responses.



What's going on?

Hmm could you try rephrasing that? I can help you find your account balance, transfer funds and make a payment.

Nice to meet you

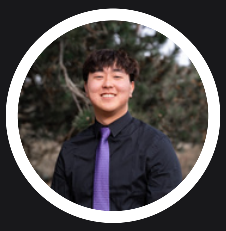
Hi! I'm BB, the Banking Bot. How can I help you today?

What?

Sorry I am having trouble understanding. Can you describe what you'd like to do in a few words? I can help you find your account balance, transfer funds and make a payment.

Ready for complete testing

Perfect! The error message is now much clearer, and there are variations too



Ethan Kwon

@ethan-kwon/bankerbot

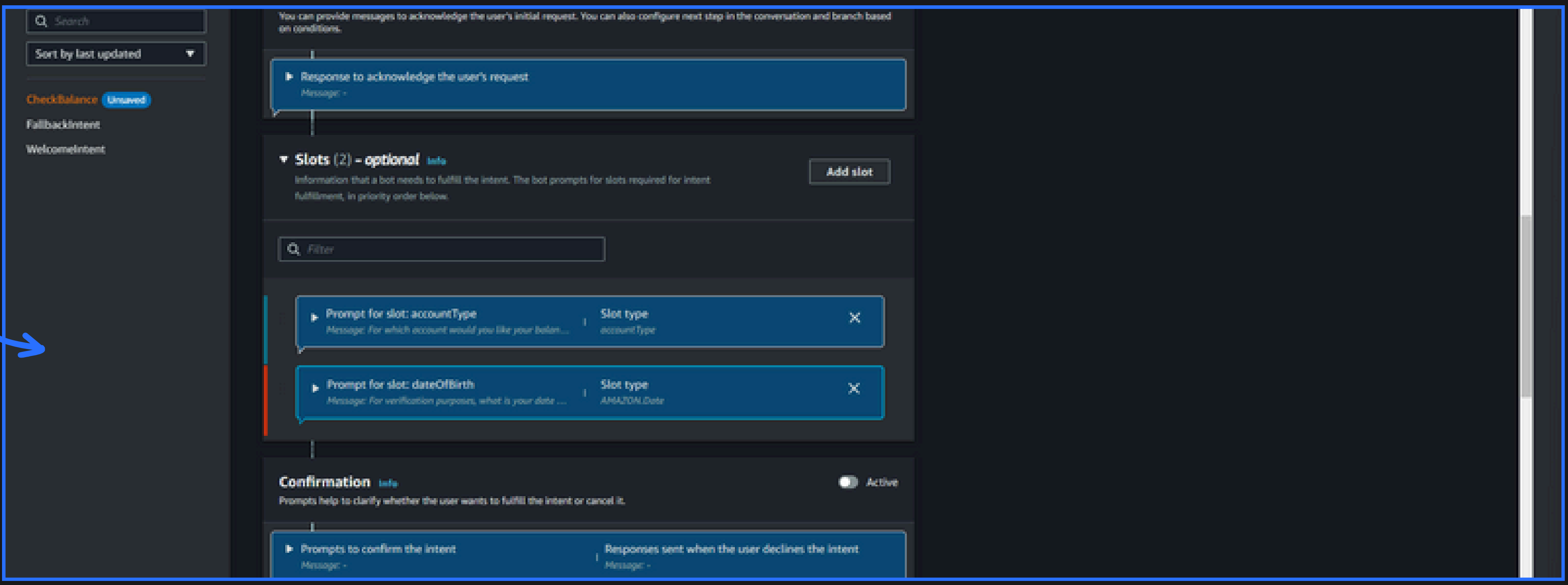
Create custom slots

- **Slots** are pieces of information that a chatbot needs to complete a user's request. Think of them as blanks that need to be filled in a form. For example, if the intent is to book a table at a restaurant, the chatbot needs specific details like: restaurant name, date, time, number of people.

- In this project, I created a **custom slot** to get the user's account type

- I then associated the custom slot with a new intent, CheckBalance, which will check the balance of the user's selected account

My custom slots



You can provide messages to acknowledge the user's initial request. You can also configure next step in the conversation and branch based on conditions.

Response to acknowledge the user's request
Message: -

Slots (2) - optional
Information that a bot needs to fulfill the intent. The bot prompts for slots required for intent fulfillment, in priority order below.

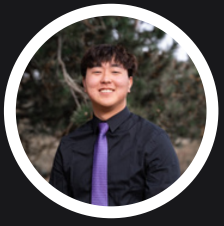
Prompt for slot: accountType
Message: For which account would you like your balan...
Slot type: accountType

Prompt for slot: dateOfBirth
Message: For verification purposes, what is your date ...
Slot type: AMAZON.Date

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

Prompts to confirm the intent
Message: -

Responses sent when the user declines the intent
Message: -



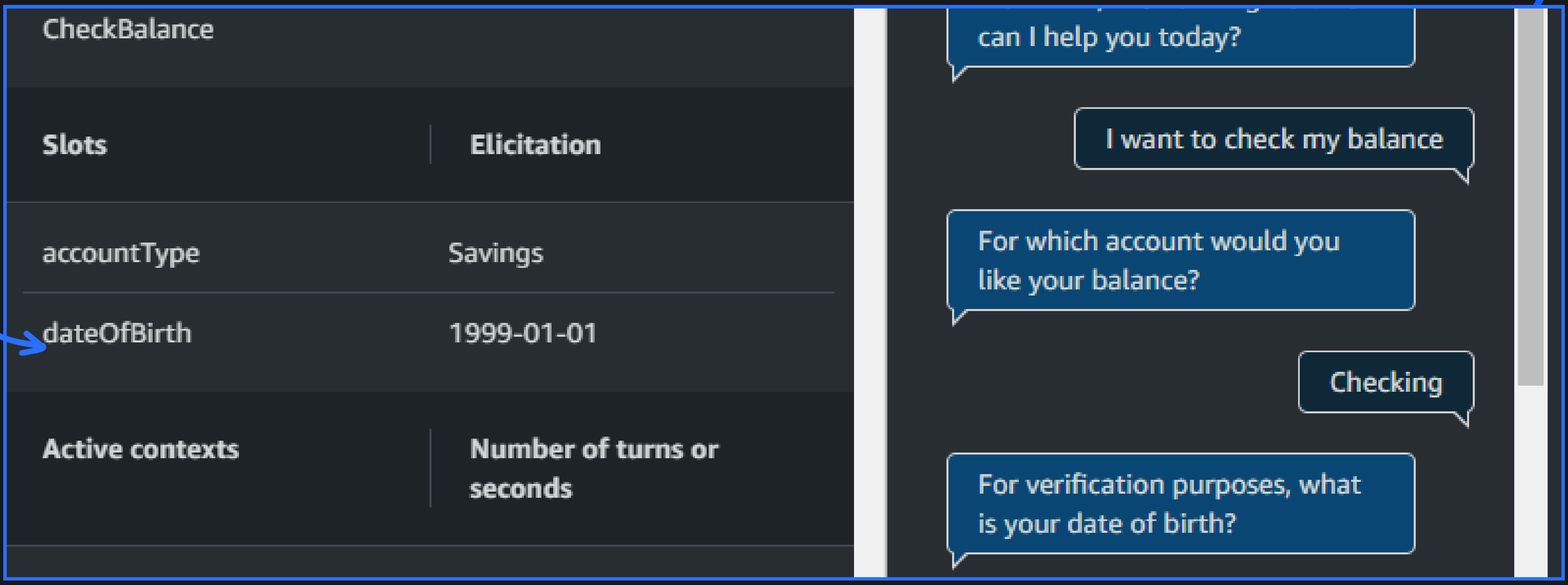
Ethan Kwon

@ethan-kwon/bankerbot

Simplifying the user experience

- I included slot values in some of the utterances (i.e. user inputs) for this intent too. For example, I added the accountType to several utterances.
- By adding custom slots in the utterance it saves the user time from additionally reinputting their accountType when they have already mentioned it previously. Furthermore, it creates a more conversational experience

Slot values getting recognised in a conversation



CheckBalance

Slots	Elicitation
accountType	Savings
dateOfBirth	1999-01-01

Active contexts	Number of turns or seconds

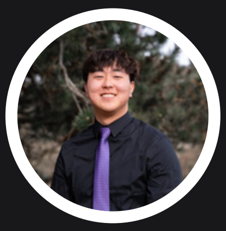
can I help you today?

I want to check my balance

For which account would you like your balance?

Checking

For verification purposes, what is your date of birth?



Ethan Kwon

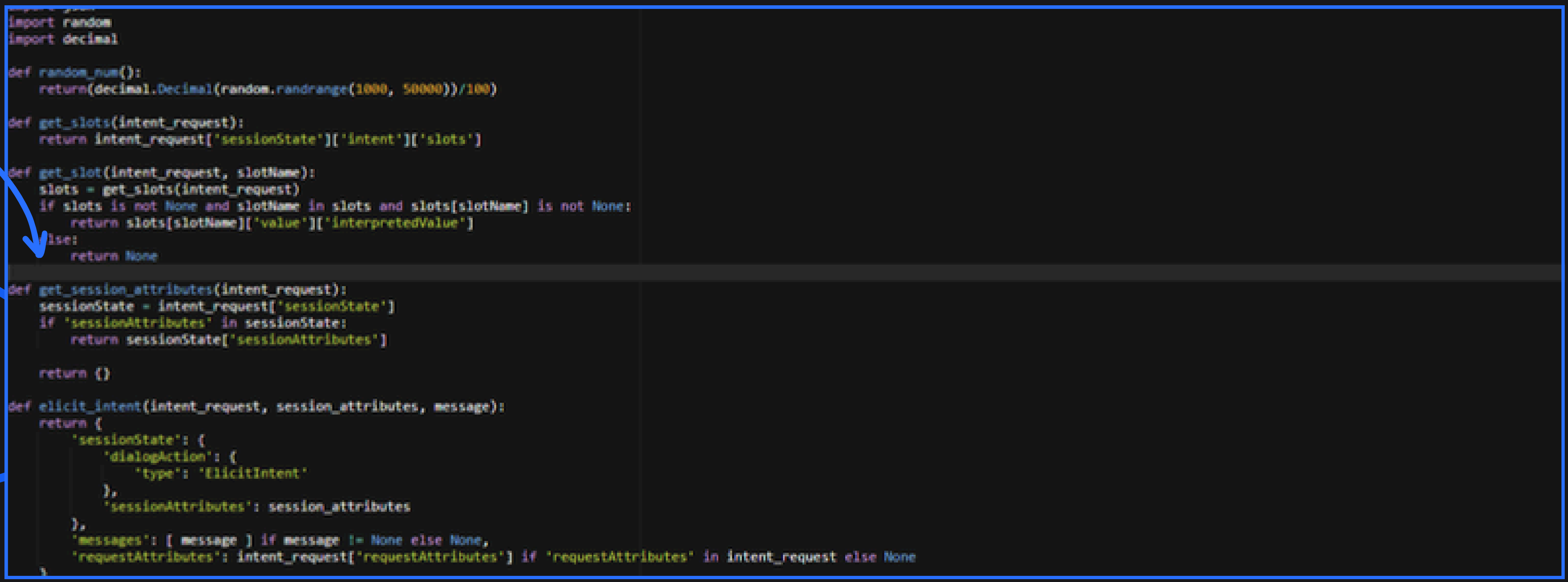
@ethan-kwon/bankerbot

Using AWS Lamba

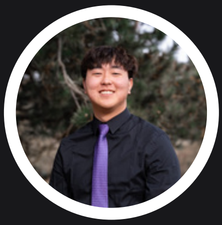
- **AWS Lambda** is an AWS service that lets you run code without provisioning or managing servers. Lambda runs your code only when needed and scales automatically, from a few requests per day to thousands per second so all you need to do is supply your code in one of the languages that Lambda supports.

- In this project, a Lambda function was created to return a user's balance figure. In a real-world scenario, this would involve connecting the chatbot to a system that maps every user and their balance. In this project we'll return a random number.

A peek into the Python code I uploaded into AWS Lambda!



```python
import random
import decimal

def random_num():
    return(decimal.Decimal(random.randrange(1000, 50000))/100)

def get_slots(intent_request):
    return intent_request['sessionState']['intent']['slots']

def get_slot(intent_request, slotName):
    slots = get_slots(intent_request)
    if slots is not None and slotName in slots and slots[slotName] is not None:
        return slots[slotName]['value']['interpretedValue']
    else:
        return None

def get_session_attributes(intent_request):
    sessionState = intent_request['sessionState']
    if 'sessionAttributes' in sessionState:
        return sessionState['sessionAttributes']

    return {}

def elicit_intent(intent_request, session_attributes, message):
    return {
        'sessionState': {
            'dialogAction': {
                'type': 'ElicitIntent'
            },
            'sessionAttributes': session_attributes
        },
        'messages': [ message ] if message != None else None,
        'requestAttributes': intent_request['requestAttributes'] if 'requestAttributes' in intent_request else None
    }
```



Ethan Kwon

@ethan-kwon/bankerbot

Connecting Lambda with Lex

WOW

There were two steps to connecting the Lambda function with my chatbot:

Step 1️⃣

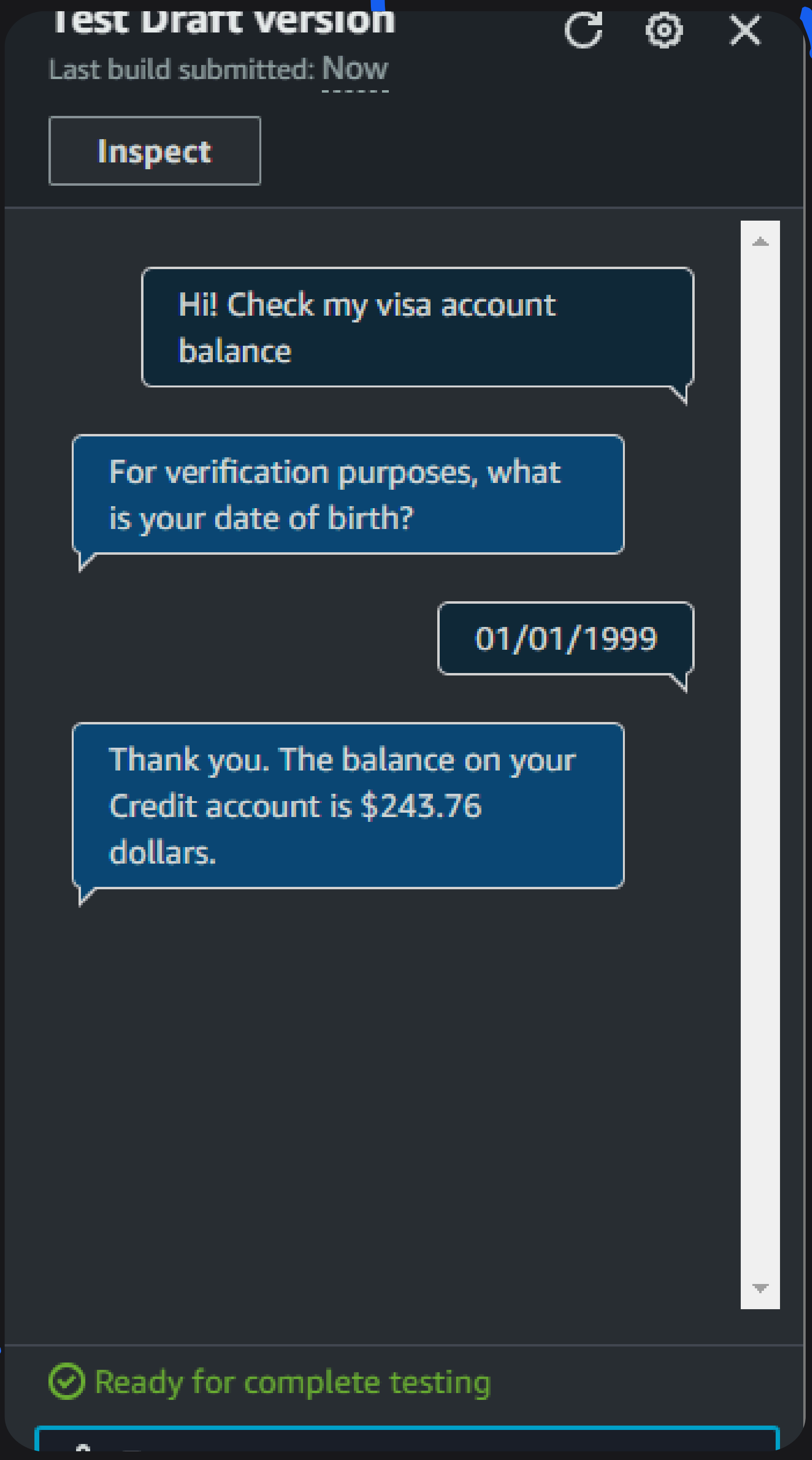
- To connect Lambda with my chatbot alias, I edited my fulfillment options to include the Lambda function

Step 2️⃣

- Another intent setting to configure is **code hooks**.

- A code hook is a way for developers to insert their own custom code into specific points within an existing program.

- In this project, I had to use code hooks because they can handle more complex actions that a basic chatbot cannot handle like checking data from a database



Hi! Check my visa account balance

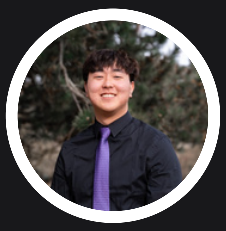
For verification purposes, what is your date of birth?

01/01/1999

Thank you. The balance on your Credit account is $243.76 dollars.

After connecting Lambda with my Lex bot, ... return the user their account balance

My chatbot now returns a bank balance number thanks to Lambda!



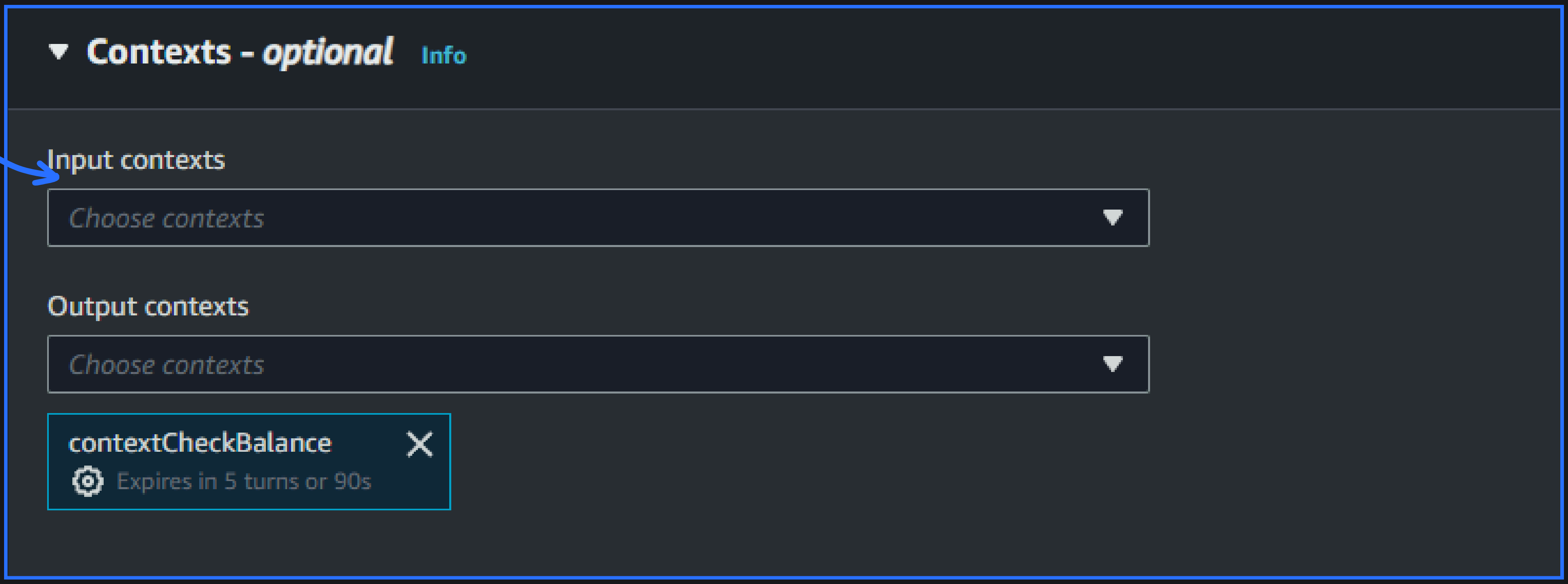
Ethan Kwon

@ethan-kwon/bankerbot

Context Tags

- Context tags are used to store and check for specific information across different parts of a conversation. They help save the user from having to repeat certain information.
- There are two types of context tags, they are input and output. An input context tag checks if specific details are already available before an intent activates. An output context tag tells the chatbot to remember certain details after an intent is finished, so other parts of the conversation can use this stored information later.
- I created an output context tag called contextCheckBalance in the CheckBalance intent

A look at output contexts



Contexts - *optional* Info

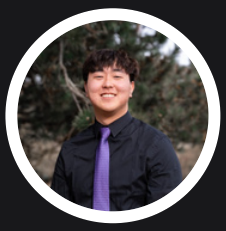
Input contexts

Choose contexts ▼

Output contexts

Choose contexts ▼

contextCheckBalance ✕
Expires in 5 turns or 90s



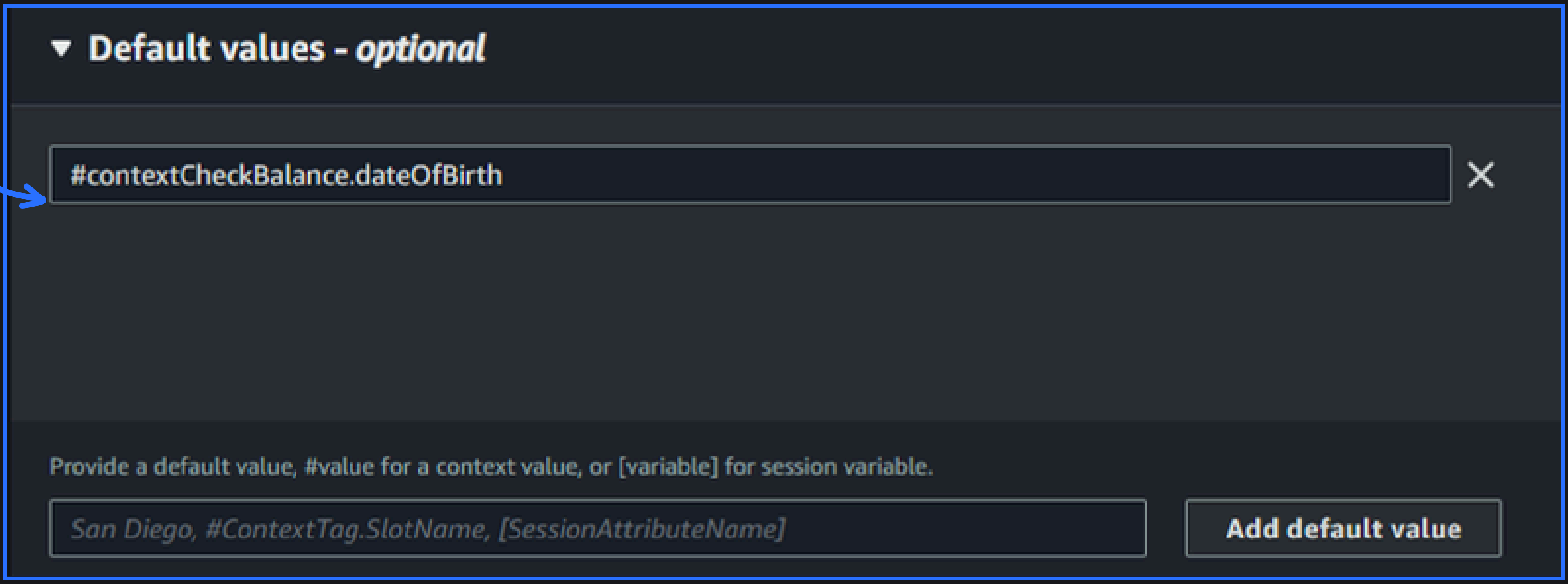
Ethan Kwon

@ethan-kwon/bankerbot

A Follow-Up Intent

- I created a new intent called **FollowupCheckBalance.** The purpose of this intent is to check the balances of other accounts without having to verify again.
- This intent is related to the previous intent I made, **CheckBalance**, because it will get triggered when the user asks to check a different account than the one they have already asked for and it has the needed context.
- I created an input context, **contextCheckBalance**, that takes in the date of birth given by the CheckBalance intent so we do not have to re-verify.

A look at input contexts

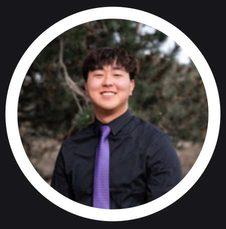


▼ Default values - *optional*

#contextCheckBalance.dateOfBirth ✕

Provide a default value, #value for a context value, or [variable] for session variable.

San Diego, #ContextTag.SlotName, [SessionAttributeName]

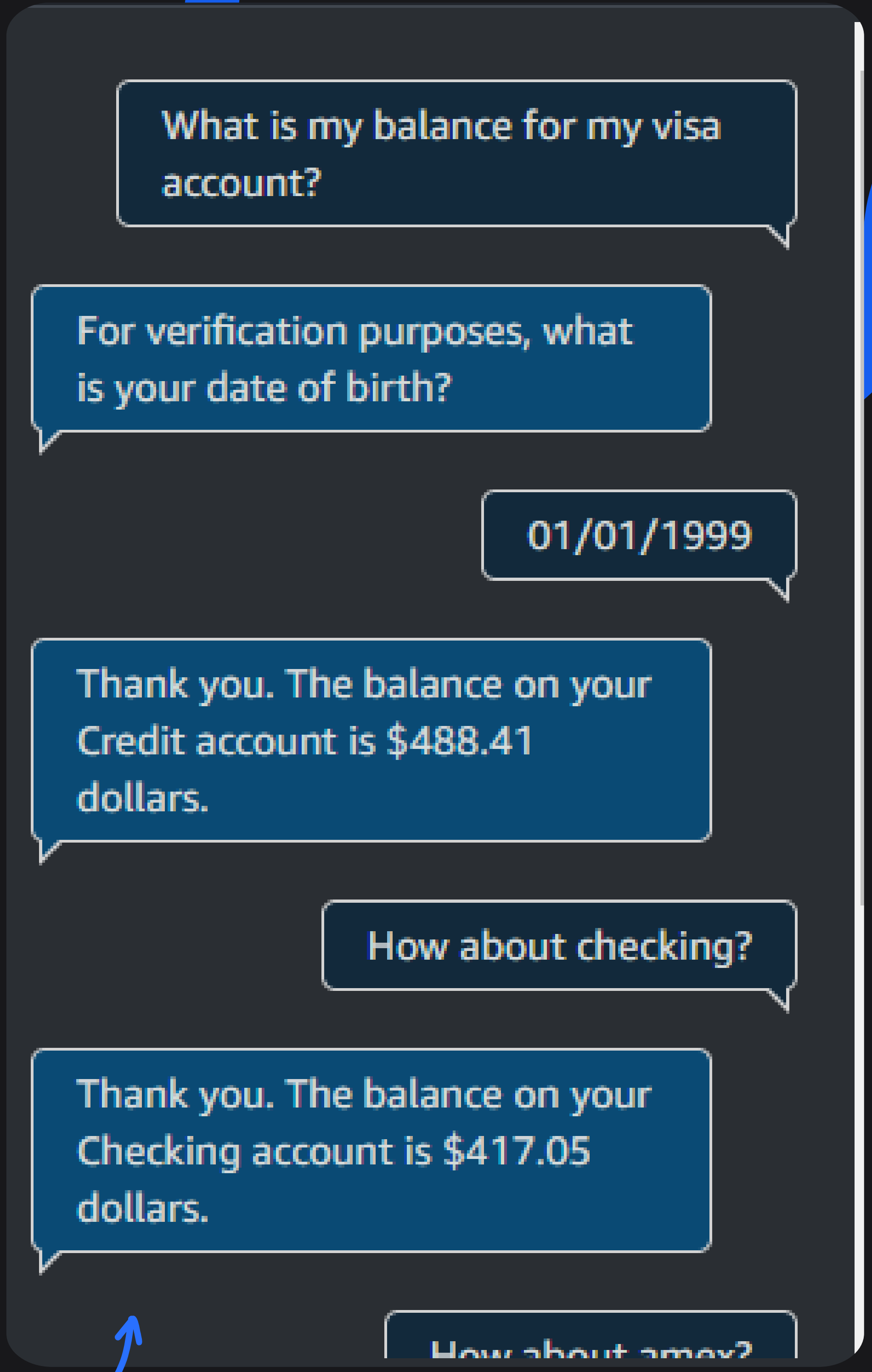


Ethan Kwon

@ethan-kwon/bankerbot

Context Tags in Action

- Conversation time! I built and tested my bot after creating the context tags and new intent.
- To see the context tags and the follow up in intent in action, I first asked for my visa balance. Then, after giving my date of birth, I asked for the balance of my checking account. The chatbot gave my balance without having to verify again.
- If I had gone straight to trying to trigger FollowUpCheckBalance without setting up any context it would return from the FallbackIntent.



What is my balance for my visa account?

For verification purposes, what is your date of birth?

01/01/1999

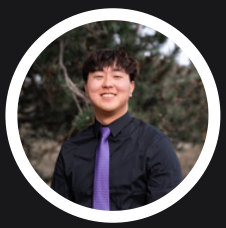
Thank you. The balance on your Credit account is $488.41 dollars.

How about checking?

Thank you. The balance on your Checking account is $417.05 dollars.

How about amex?

My chatbot now carries over the user's date of birth to the next intent!

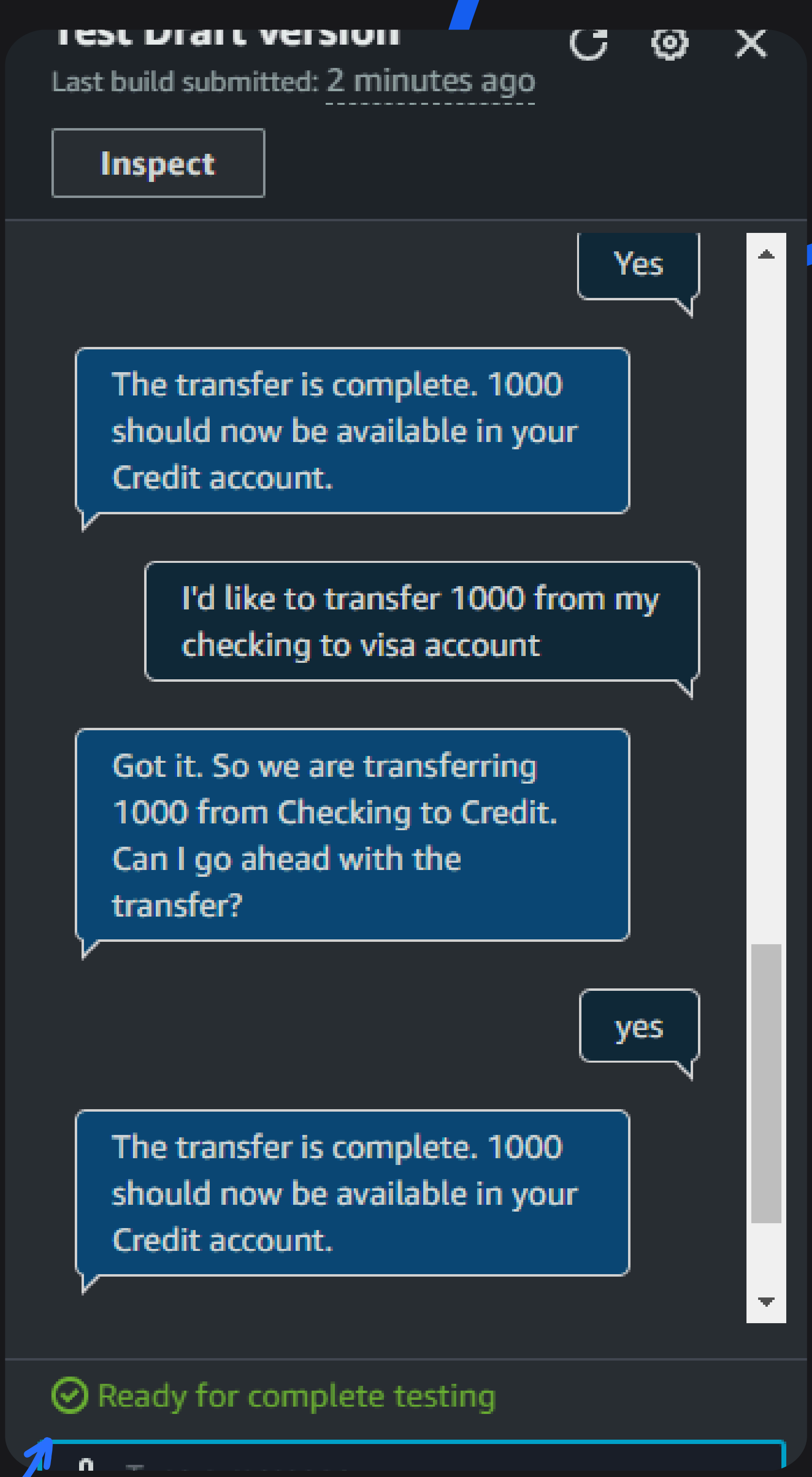


Ethan Kwon

@ethan-kwon/bankerbot

More slots!

- The final intent for my chatbot was TransferFunds, which will transfer funds from one account to another.
- For this intent, I had to use the same slot type twice. This is because we had to determine the account being transferred from and the account being transferred to.
- I also learnt how to create confirmation prompts, which typically repeats back information for the user to confirm. If the user confirms the intent, the bot fulfills the intent. If the user declines, then the bot responds with a decline response that you set up.


Last build submitted: 2 minutes ago
Inspect
Ready for complete testing

Yes

The transfer is complete. 1000 should now be available in your Credit account.

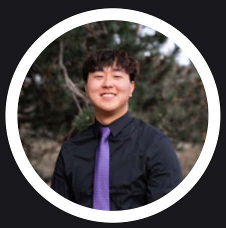
I'd like to transfer 1000 from my checking to visa account

Got it. So we are transferring 1000 from Checking to Credit. Can I go ahead with the transfer?

yes

The transfer is complete. 1000 should now be available in your Credit account.

A conversation demonstrating the two slots and the confirmation prompts in action!



Ethan Kwon

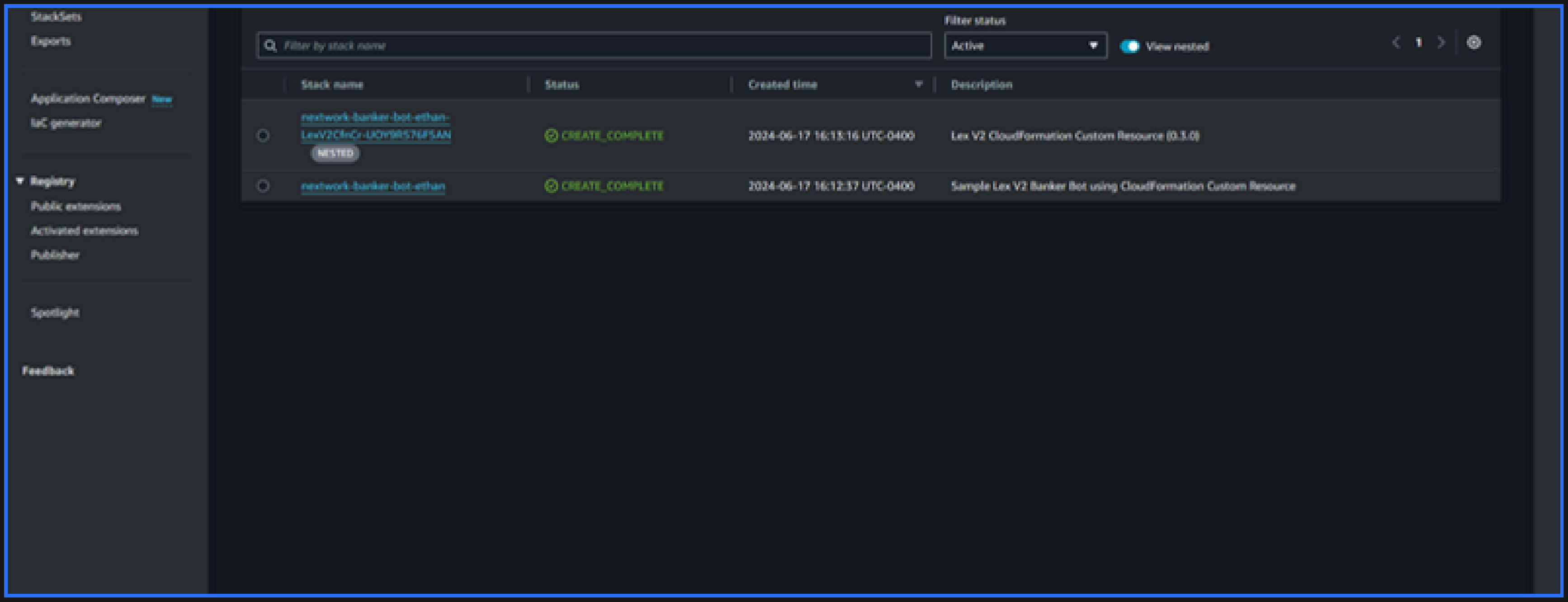
@ethan-kwon/bankerbot

A LITTLE EXTRA...

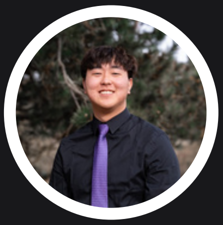
Deploying with CloudFormation

- AWS CloudFormation is service that that gives you an easy way to create and set up AWS resources. It is an infrastructure as code service meaning you will create a CloudFormation template that describes all the resources you want to create and their dependencies as code.
- As an extension to this project, I learnt how to deploy the entire BankerBot using a single CloudFormation stack.

CloudFront deployed this for me!



	Stack name	Status	Created time	Description
○	nextwork-banker-bot-ethan-LexV2CfnCr-UOY9R576F5AN NESTED	CREATE_COMPLETE	2024-06-17 16:13:16 UTC-0400	Lex V2 CloudFormation Custom Resource (0.3.0)
○	nextwork-banker-bot-ethan	CREATE_COMPLETE	2024-06-17 16:12:37 UTC-0400	Sample Lex V2 Banker Bot using CloudFormation Custom Resource



Ethan Kwon

@ethan-kwon/bankerbot