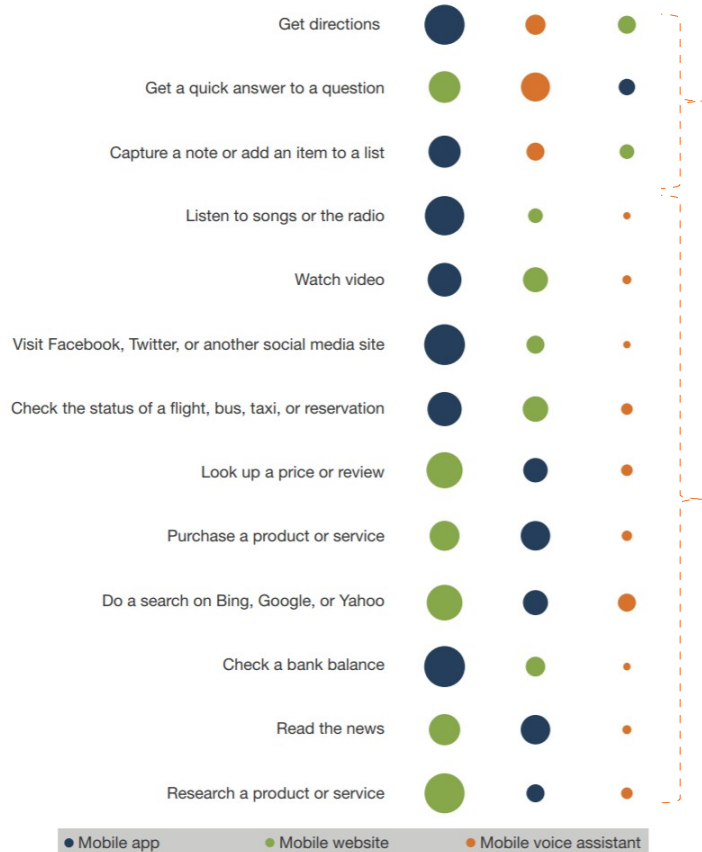


Conversational Interfaces and AI

7th of May, 2018

What are people using chatbots for?

“What are you most likely to use when doing the following?”

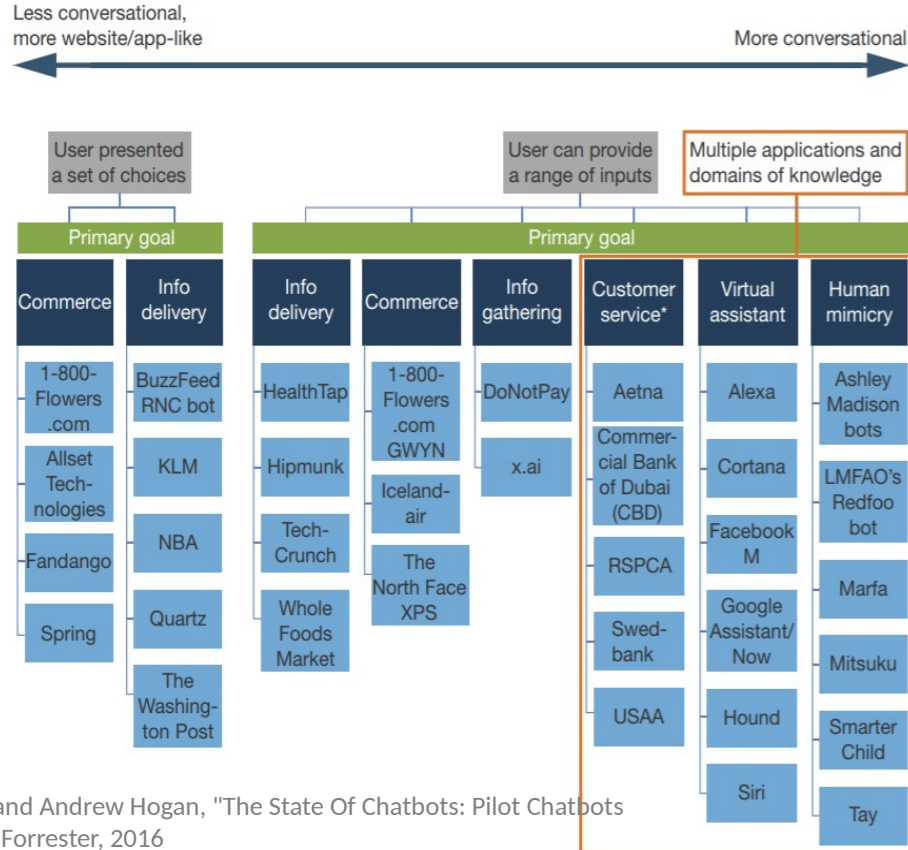


VOICE ASSISTANTS SEEM TO BE GAINING ACCEPTANCE IN AREAS SUCH AS GETTING A QUICK ANSWER, GETTING DIRECTIONS AND CAPTURING A NOTE....

...HOWEVER, OTHER AREAS OF ASSISTANCE INVOLVING MORE DEPTH AND SECURITY ARE STILL DOMINATED BY APP AND WEBSITE.

Source: Julie A. Ask, Michael Facemire, and Andrew Hogan, "The State Of Chatbots: Pilot Chatbots As Part Of Your App + Mobile Strategy", Forrester, 2016

Use of chatbots in commercial applications



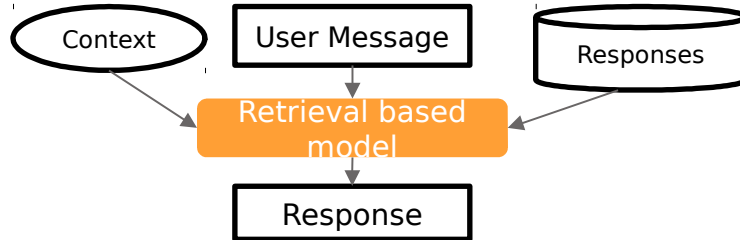
Source: Julie A. Ask, Michael Facemire, and Andrew Hogan, "The State Of Chatbots: Pilot Chatbots As Part Of Your App + Mobile Strategy", Forrester, 2016

Chatbots Introduction and Types

	Goal Based or Transactional	Information Retrieval	Conversational
PURPOSE	<ul style="list-style-type: none"> • Able to assist with complete a specific task like book a flight • Uses some form of a state machine to keep track of context and elicit the required information to complete the task • Can be connected to external interfaces to complete the task 	<ul style="list-style-type: none"> • Specifically used to query information • The information can be residing in a database, or multiple documents • Examples: retrieving the relevant portion of a long policy document that answers a question, or providing information regarding a bank account, etc. 	<ul style="list-style-type: none"> • Not designed for a specific goal or task but for mimic a human conversation • Can support open ended conversations • Can be used to support small talk or even be configured with personalities through specially designed transcripts

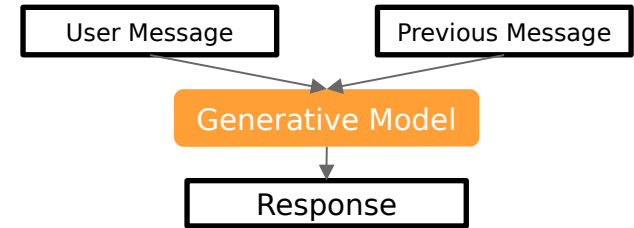
RESPONSE MECHANISM

Retrieval based



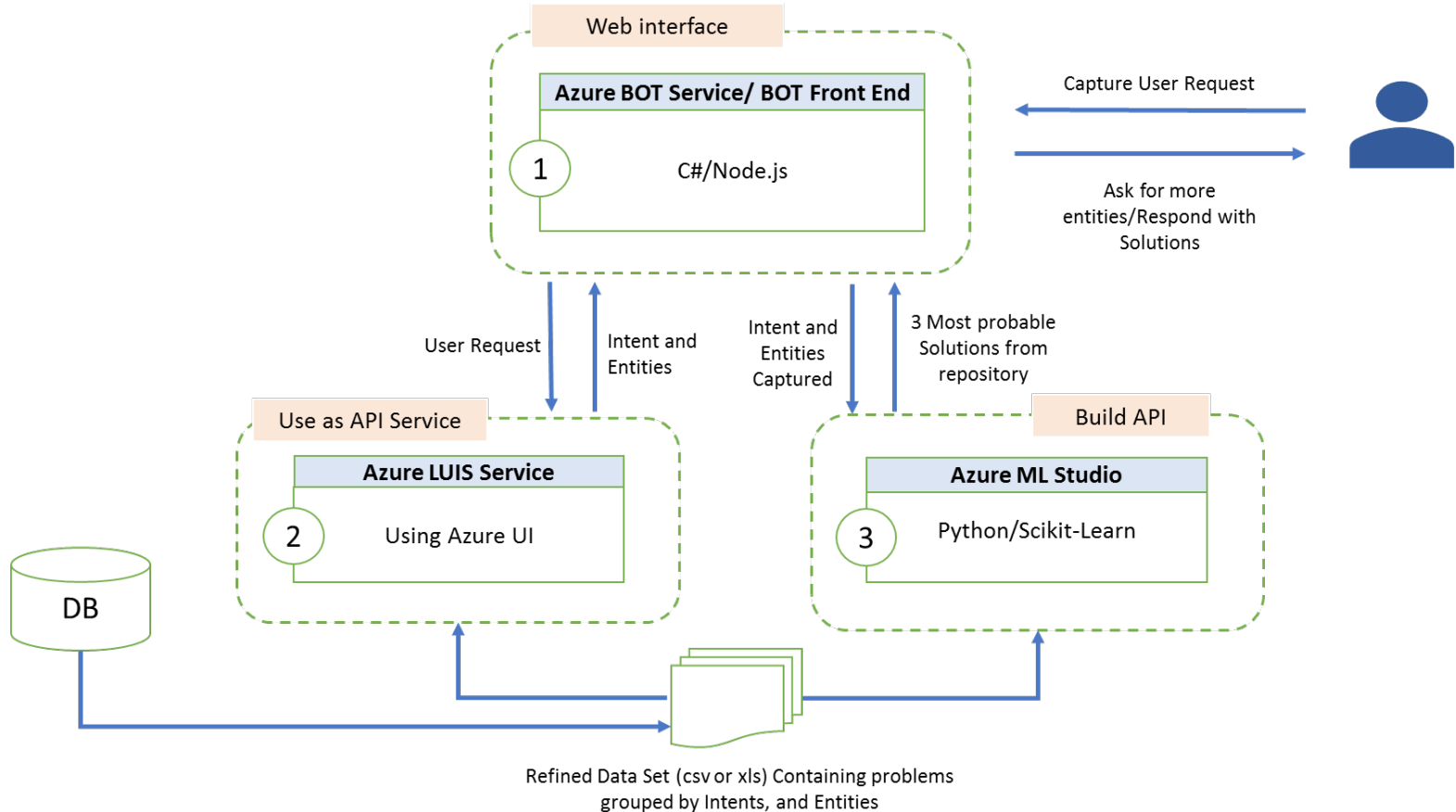
- Doesn't generate any new text, but picks a response from a predefined repository of responses
- Uses some heuristic or a machine learning classifier to pick an appropriate response based on the input and the context

Generative Models



- Doesn't rely on pre-defined responses, but generates new responses from scratch
- Commonly uses neural networks and machine translation techniques to mimic human conversations

Basic Chatbot Architecture



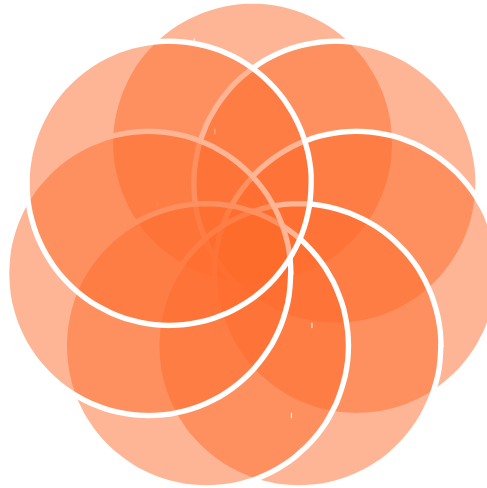
Entity Extraction

N-Grams - Character N-Grams. Maximum Limit can be specified.

Lemma - Converting all forms of a word be it participle form, past form, Gerund or continuous form to a single word.

Word Shapes - For Numeric dddd..., For Alphabets xxxxxx or Xxxxxx etc.

Sequence of Words - The order in which the words appear in text.



Current Word - The value of current word

Previous Words - By Default 4 previous words would be taken in to account. No weightage to their position from current word.

Next Words - By Default 4 Next words would be taken in to account. No weightage to their position from current word.

Modelling Entity Extraction

Entity Name	Label	Features				
		Disjunctive-Previous	Previous-Class-Next Type	Disjunctive-Next	Type of Word	Type of Next Word
TERMS	O	Currency-DISJP C	Xxxxx...Xxxxxk...Xxxxx-PCNTYPE C	Date-DISJN C	Xxxxxk-TYPE C	Xxxxx-NATYPE C
1.955 (Contract Rate)	RATE	New-DISJP C	...d.ddd...Xxx-PCNTYPE C	Date-DISJN C	d.ddd-TYPE C	Xxx-NATYPE C

New	O	#<N# C	#<Ne# C	#<New# C	#<New># C	#New># C	#ew># C	#w># C	1,000.00- C	1,000.00-F	1,000.00...	1.955-DISJN C	:-DISJN C	:-DISJP C
Contract	O	#<C# C	#<Co# C	#<Con# C	#<Cont# C	#<Contr# C	#act># C	#ct># C	#ract># C	#t># C	#tract># C	1,000.00-DISJP C	1.955-DISJ	:-DISJN C
Rate	O	#<R# C	#<Ra# C	#<Rat# C	#<Rate# C	#<Rate># C	#Rate># C	#ate># C	#e># C	#te># C	1,000.00- C	1.955-DISJN C	:-DISJN C	:-NTYPE C
:	O	#># C	#<:# C	#<:># C	1,000.00-DIS	1.955-DISJ	1.955-NW	:-1.955-W	:-Rate-W	:-TYPE C	:-WORD C	...1.955-NW_CT	...d.ddd-	Contract-DISJP C
1.955	RATE	#.955># C	#1.955># C	#55># C	#5># C	#955># C	#<1# C	#<1.# C	#<1.9# C	#<1.95# C	#<1.955# C	1.955-:-W-PW C	1.955-NeV	1.955-WORD C
New	O	#<N# C	#<Ne# C	#<New# C	#<New># C	#New># C	#ew># C	#w># C	02-FEB-20	1.955-DISJ	1.955-PW	1.955...Xxx-PW	:-DISJN C	:-DISJP C
Settlement	O	#<S# C	#<Se# C	#<Set# C	#<Set# C	#<Sett# C	#ement># C	#ent># C	#ment># C	#nt># C	#t># C	02-FEB-2029-DIS	1.955-DISJ	:-DISJN C
Date	O	#<D# C	#<Da# C	#<Dat# C	#<Date# C	#<Date># C	#Date># C	#ate># C	#e># C	#te># C	02-FEB-20	1.955-DISJP C	:-DISJN C	:-DISJP C
:	O	#># C	#<:# C	#<:># C	02-FEB-2029	02-FEB-20	1.955-DISJ	:-02-FEB-2	:-Date-W	:-TYPE C	:-WORD C	...02-FEB-2029-I	...dd-Xdd	Date-DISJP C
2-Feb-29	DATE	#-2029># C	#029># C	#2029># C	#29># C	#9># C	#<0# C	#<02# C	#<02-# C	#<02-F# C	#<02-FE# C	02-FEB-2029-:-V	02-FEB-20	02-FEB-2029-WORD C
Existing	O	#<E# C	#<Ex# C	#<Exi# C	#<Exis# C	#<Exist# C	#g># C	#ing># C	#ng># C	#stng># C	#thg># C	02-FEB-2029-DIS	02-FEB-20	02-FEB-2029...Xxxxx-P
Forward	O	#<F# C	#<Fo# C	#<For# C	#<Forw# C	#<Forwa# C	#ard># C	#d># C	#rd># C	#rward># C	#ward># C	02-FEB-2029-DIS	1.955-DISJ	:-DISJN C
rate	O	#<r# C	#<ra# C	#<rat# C	#<rate# C	#<rate># C	#ate># C	#e># C	#rate># C	#te># C	02-FEB-20	1.955-DISJN C	:-DISJN C	:-DISJP C

Designing Goal Based Chatbots

Intents are purposes or goals expressed in a customer's input, such booking a flight, or getting information about an account

An **Entity** or **parameter** is a term in the user's input that provides clarifying information about the intent, e.g. the origin or destination city when booking a flight

Slot Filling is directing the conversation flow to collect all the required parameters before the requested action can be taken

An **Action** is an internal or external task like generating the next message, or querying an external API, to complete the interaction successfully

Hello, I'm a flight booking bot. How can I help you?

I'd like to book a flight **Intent**: Book a flight

Ok, where do you want to fly from?

Sydney **Entity**: Origin (Sydney)

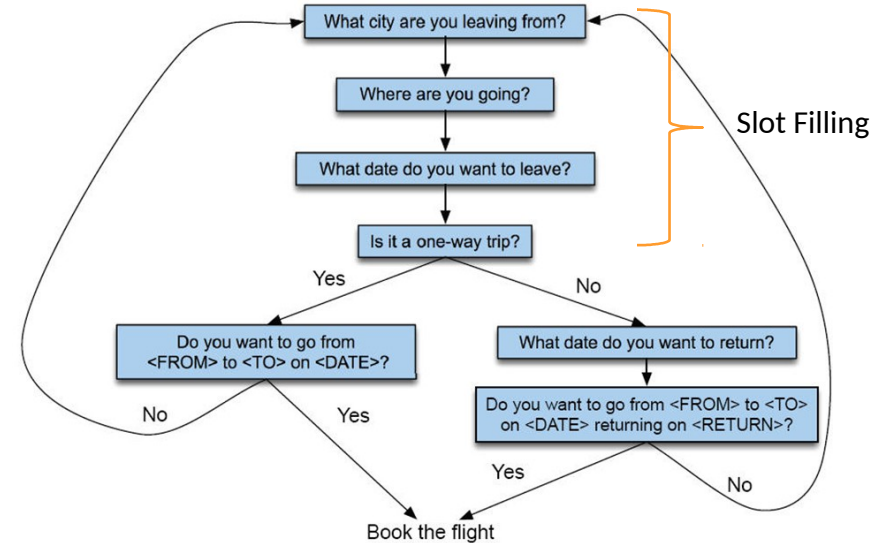
Great! And what's the destination?

Melbourne **Entity**: Destination (Melbourne)

Alright, when do you want to fly?

Saturday, March 10 **Entity**: Flight Date (March 10)

Fantastic! Here are a couple of flight options....



Some APIs and Frameworks for Implementing Conversational Interfaces

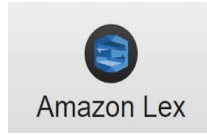


LUIS

- Offers API for implementing goal based chatbots through intents and entities
- Offers pre-built models from Bing and speech synthesis through Cortana
- Integration with most popular social media platforms and support for multiple languages
- Easy to use interface for creating dialogues, training transcripts, and the end-to-end design of the chatbot



- REST based interface
- Offers a premium plan for with higher levels of security and isolation to help customers with sensitive data requirements
- Supports any messaging platform that supports speech, images, and text and for multiple languages
- Support for intents, entities, and dialogue management, along with dialogue creation interfaces



- REST based interface
- Integrates well with other AWS services like Amazon Cognito for user management
- Currently, only US English is supported and this offering is somewhat behind the other major players



- Offers integration with multiple platforms like mobile apps, wearable devices, and IoT devices
- Support for all the goal based chatbot concepts like intents, entities, actions, etc.
- Interface for creating training chat transcripts and dialogs
- Free to use with no limitation on request rates
- Speech recognition module available

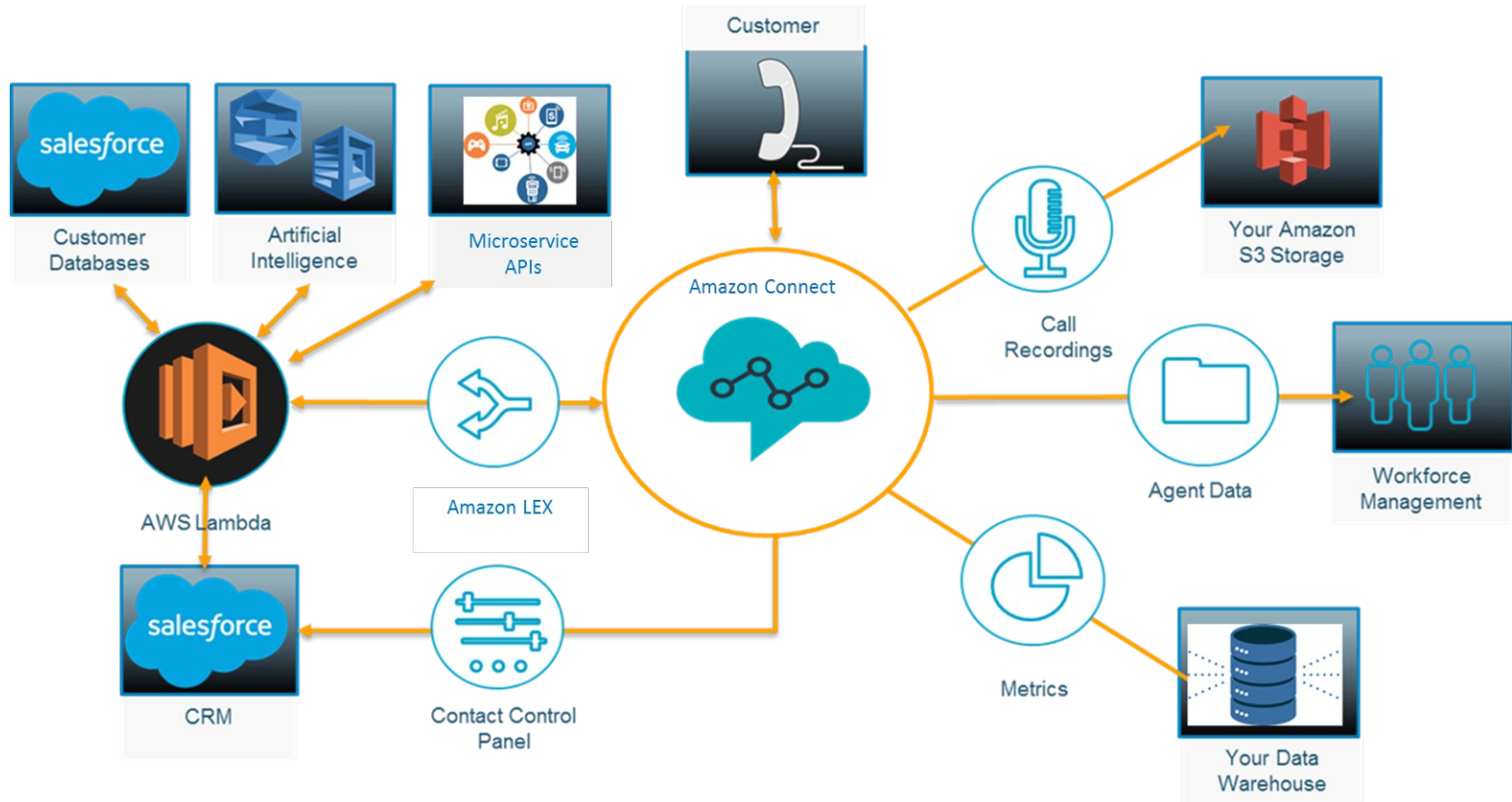


- Well regarded REST based API with high adoption rates
- Support for intents, entities, and custom actions
- Offers module for handling small talk and interfaces for creating training transcripts
- Speech-to-text and text-to-speech capabilities

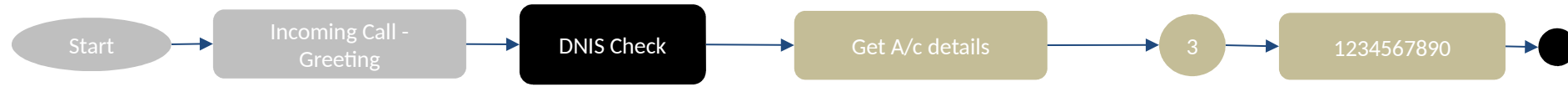


- Open source Python based framework for intent detection and entity extraction as well as a module for dialogue management
- Offers integration with a limited number of popular platforms like Facebook and Slack
- Currently, support available for only a limited number of languages
- Offers more control and tunability for every aspect of the interface

New Age Contact Center



Traditional Call Happy Path (Credit Card Bill Pay)



Welcome to Your Bank, to ensure quality of service your call will be monitored and recorded.

So we can identify you, please tell me which of the following you would like to use. You can say ATM or Debit Card or Press 1; Social Security Number or Individual tax payer ID number or Press 2; Or Account Number or Press 3

Please tell me your account number one digit at a time or say log in a different way

Please wait a moment while I fetch your information.



Hello Aditya, please let me know how can I help you today?

You can say,
Account information or Press 1
Account Balance or Press 2
Or Bill Pay or Press 3

You have an outstanding balance of \$1000;
How would you like to make the payment?

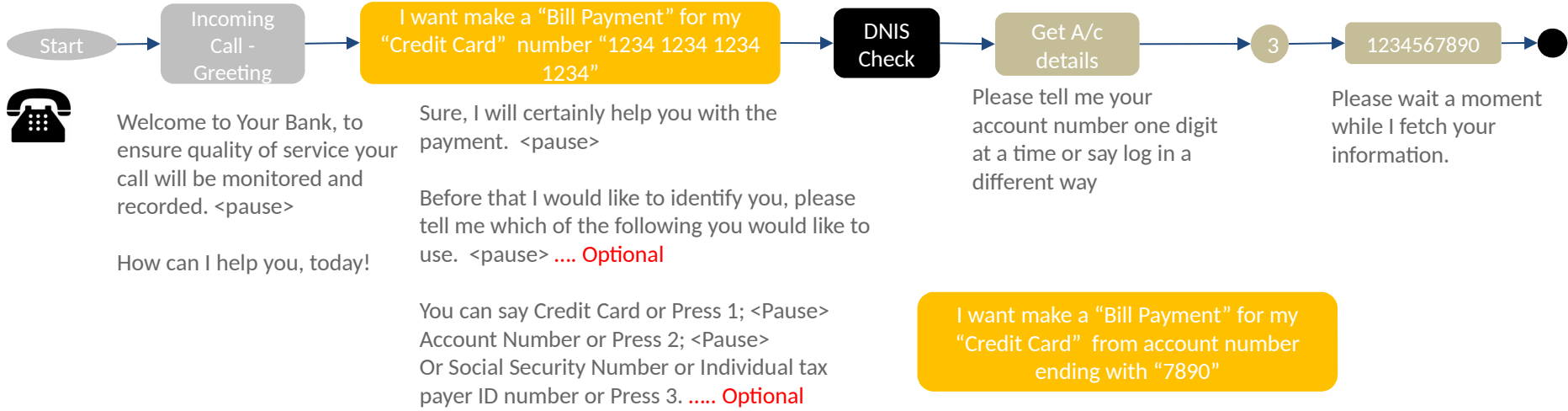
You can say,
Citi bank Account or Press 1
Or Debit Card or Press 2

Please share your Account Number from which you would like to make a payment.

Your payment has been confirmed.
Would you like to make any other transaction today?

Thank you for doing business with us.
Have a wonderful day!

Intelligent IVR Call Flow (Bill Pay)



Thank you, your current outstanding balance is \$1500 and your Statement Balance is \$1000. Please confirm the amount you would like to pay.

Please share your last 4 digits Account Number from which you would like to make a payment.

Your payment has been confirmed. Would you like to make any other transaction today?

Thank you for doing business with us. Have a wonderful day!

Alexa / Siri Call Happy Path (Bill Pay)

Greetings

Pre-Screen Criteria

Verification

Main Menu

Personalized
upfront Balance

Payment Request

Start

Login to Alexa App

Alexa, Ask Your Bank to make my "Credit Card" payment ending with "1234"

Get A/c details using Customer ID

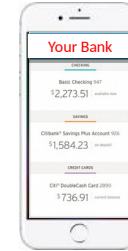


Siri connecting to mobile app

Creating Alexa Skills to train it

Hey Siri, open Your Bank Online App and make the credit card payment.

Alexa, ask Your Bank to make my credit card bill payment.



Your current outstanding balance is \$1500 and your Statement Balance is \$1000. Please confirm the amount you would like to pay.

\$1000

"3210"

No

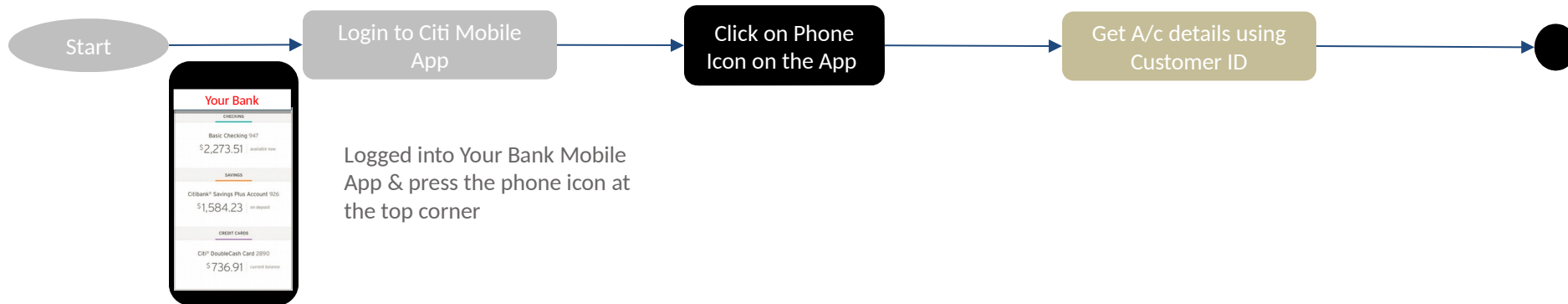
Stop

Please share your last 4 digits Account Number from which you would like to make a payment.

Your payment has been confirmed.
Would you like to make any other transaction today?

Thank you for doing business with us.
Have a wonderful day!

Mobile App Happy Path (Bill Pay)



Hello Aditya, Welcome to Your Bank, please let me know how can I help you today?

Thank you, your current outstanding balance is \$1500 and your Statement Balance is \$1000. Please confirm the amount you would like to pay.

Please share your last 4 digits Account Number from which you would like to make a payment.

Your payment has been confirmed.
Would you like to make any other transaction today?

Thank you for doing business with us. Have a wonderful day!