

Building User Interfaces

Dialogflow 1

An Introduction

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What we will learn today?

- Introduction to Conversational Interface Technologies
- Introduction to Dialogflow
- Dialogflow Building Blocks, Part 1
- Let's Make an Agent
- Assignment Preview

Introduction to Conversational Interface Technologies

What is a conversational interface?

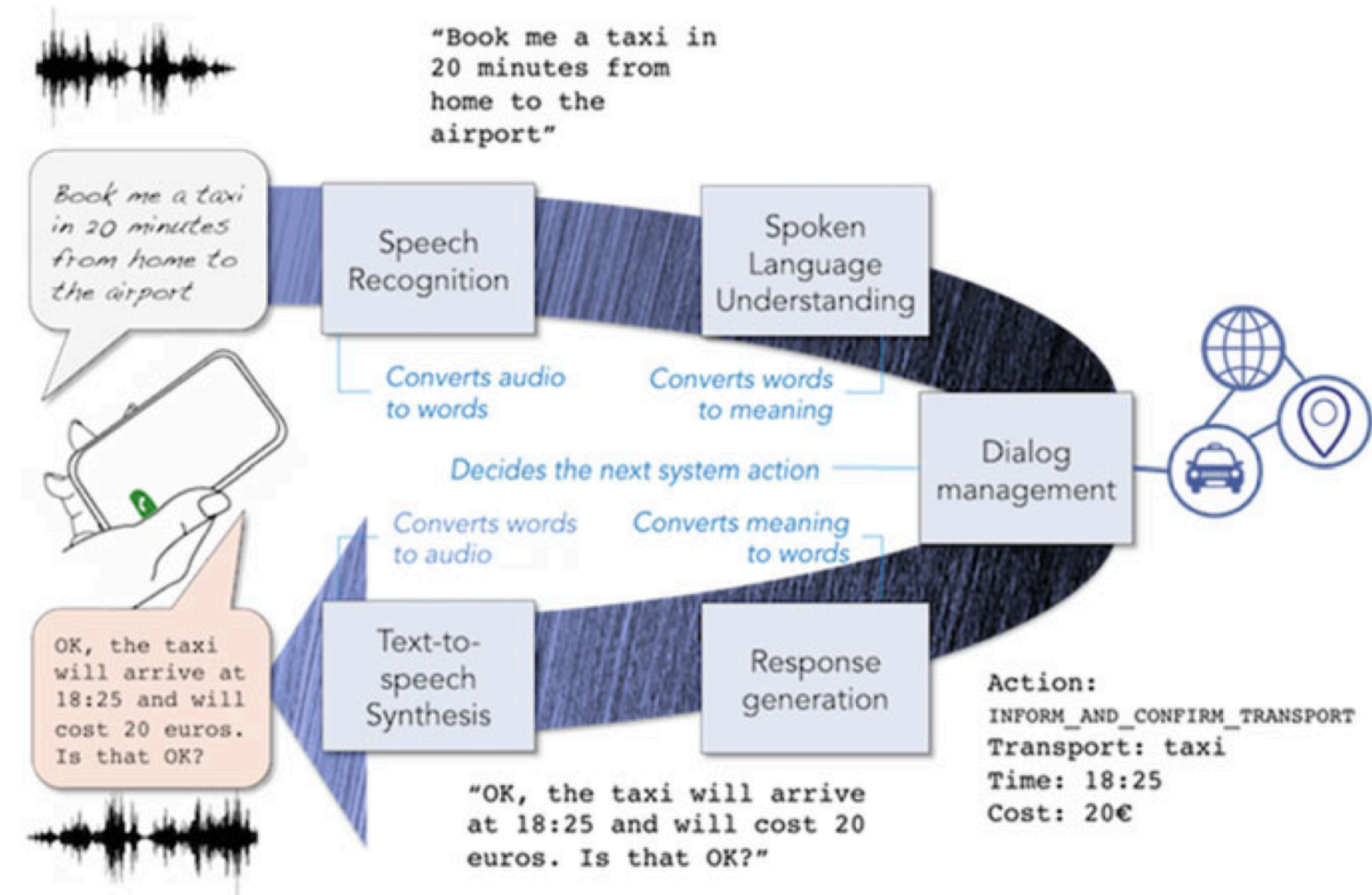
Definition: "Technology that supports conversational interaction with these VPAs [virtual personal assistants] by means of speech and other modalities."¹

¹McTear et al., 2016, *The Conversational Interface*

Components of Conversational Interfaces²

Conversational interfaces integrate a number of technologies:

- Speech recognition
- Spoken language understanding
- Dialog management
- Response generation
- Text-to-speech synthesis



²Image source: [McTear et al., 2016, *The Conversational Interface*](#)

The First Conversational Interface³

ELIZA was the first conversational interface developed by Joseph Weizenbaum at the MIT Artificial Intelligence Laboratory in 1964-1966.

```
Welcome to

          EEEEEEE LL      IIII ZZZZZZZZ  AAAAA
          EE      LL      II      ZZ  AA  AA
          EEEEE  LL      II      ZZZ  AAAAAAA
          EE      LL      II      ZZ  AA  AA
          EEEEE  LLLLLL IIII ZZZZZZZZ  AA  AA

Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.

ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:   He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:   It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:   █
```

³ Image source: [Wikipedia: ELIZA](#)

Types of Conversational Interfaces

- Spoken dialog systems
- Voice user interfaces
- Embodied conversational agents
- Social robots
- Chatbots

Platforms for Building Conversational Interfaces

In this course, we will be using Dialogflow by Google.

However, there are alternatives:

- Amazon Lex (Commercial)
- Mycroft (Open Source)
- CoreNLP (Academic)

Introduction to Dialogflow

What is Dialogflow?

Dialogflow is an end-to-end, build-once deploy-everywhere development suite for conversational interfaces for websites, mobile applications, and IoT devices (e.g., smart speakers).⁴



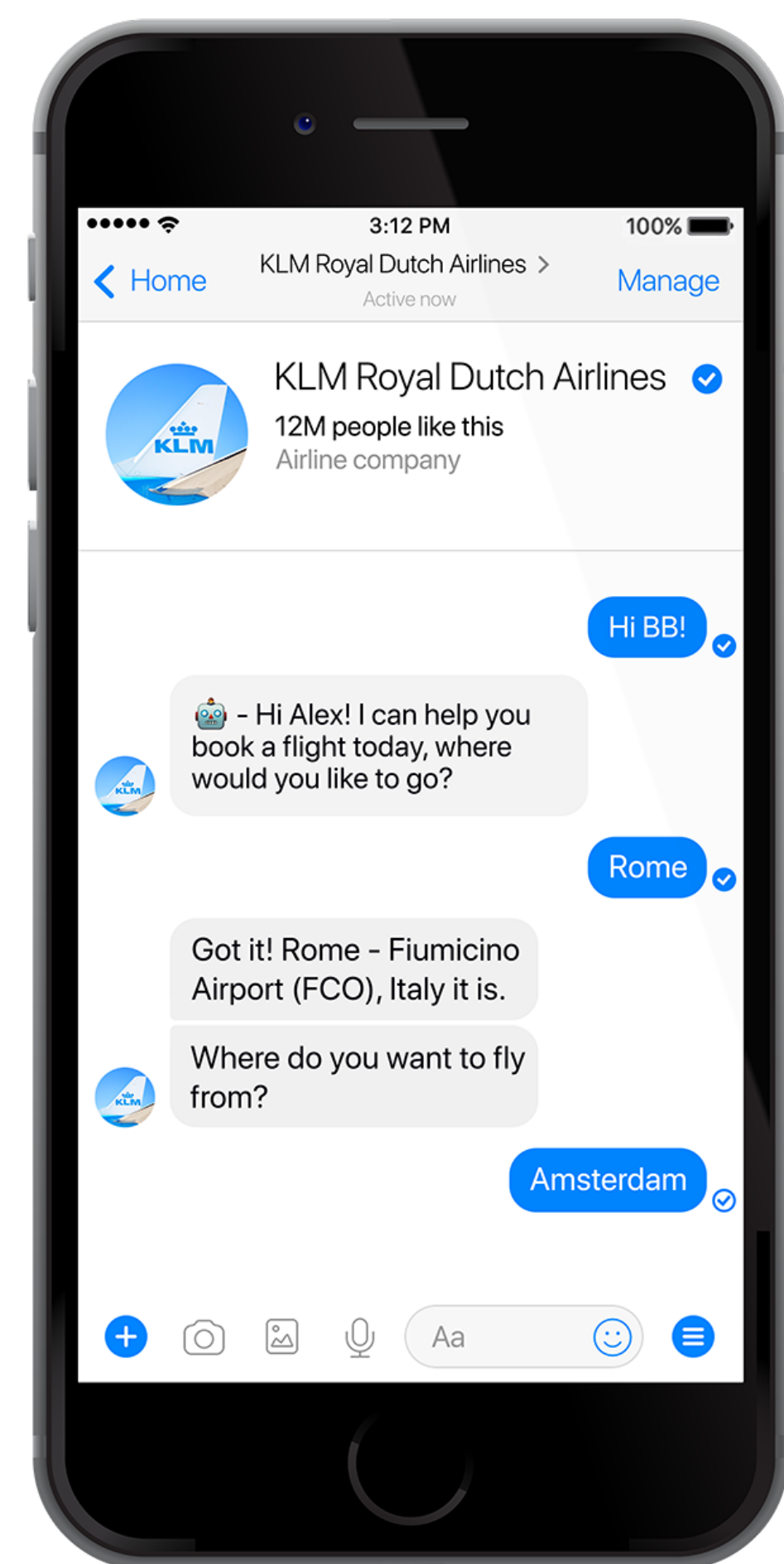
⁴ Video source [Youtube](#)

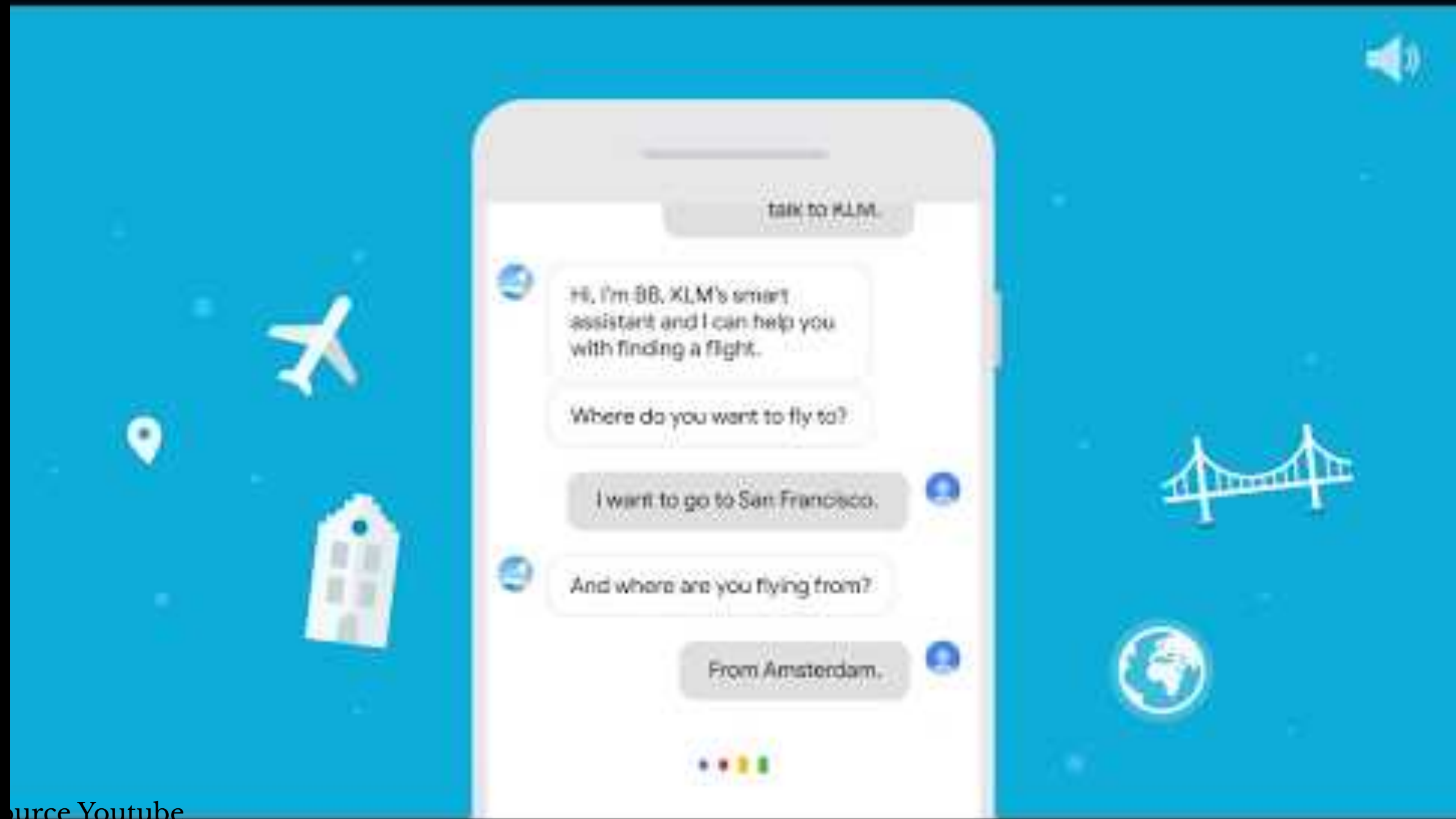
Case Study: KLM BB⁵

KLM used Dialogflow to create an agent to purchase travel as well as travel preparation.

Let's see how the KLM BB works...

⁵ Image source [Dialogflow](#)





Source Youtube



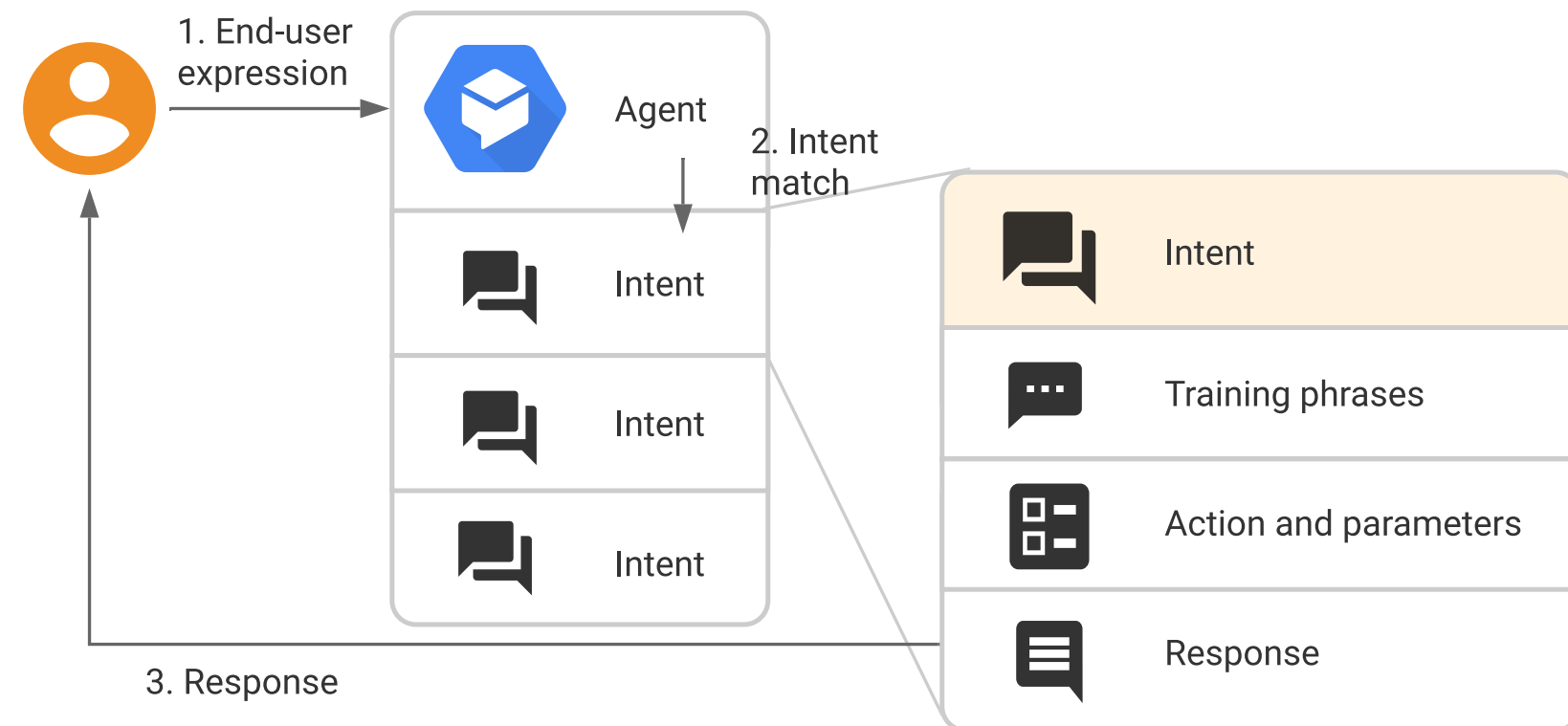
urce

KLM

How does Dialogflow work?⁸

The process within Dialogflow involves:

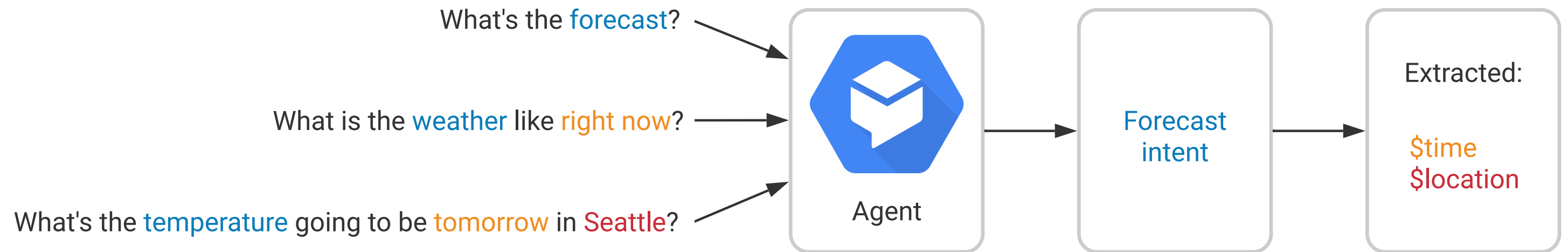
1. User expression
2. Intent matching
3. System response



⁸Image source

What is an *agent*?

Definition: A Dialogflow agent is a virtual agent that handles conversations with users (similar to a human call agent).⁹

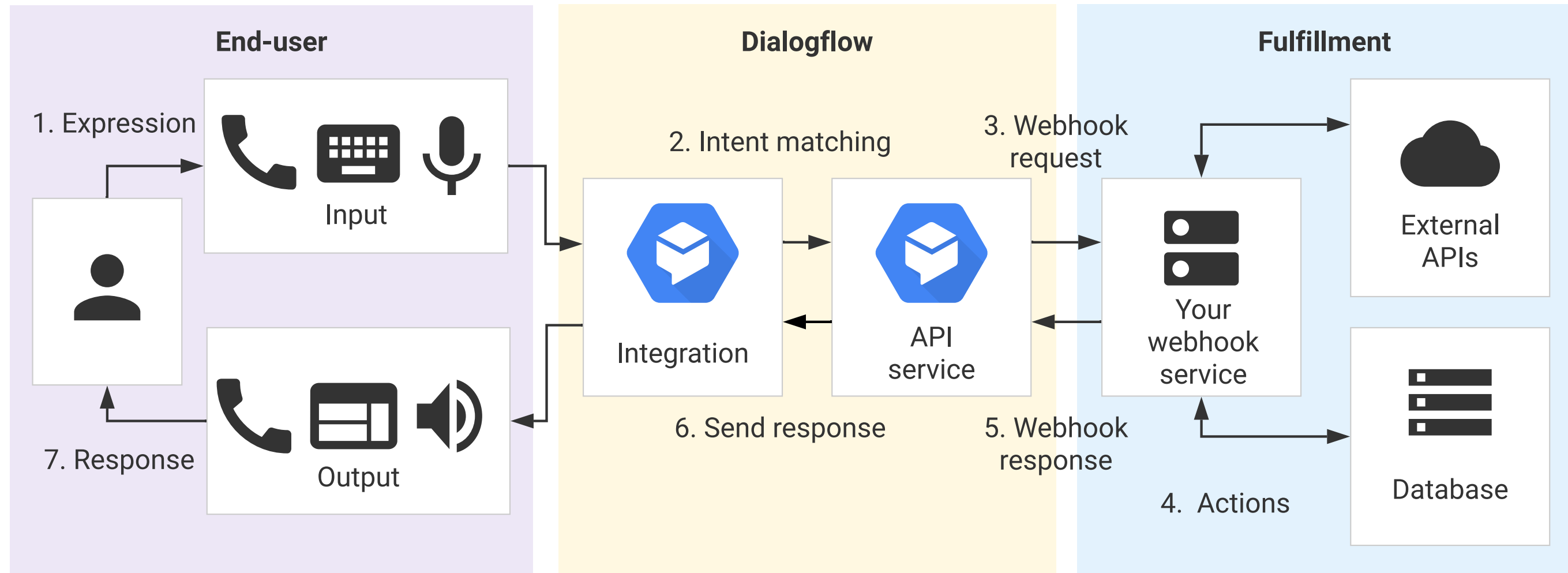


⁹ Image source

Agents are high-level containers for a number of building blocks:

- Agent settings
- Intents
- Entities
- Knowledge
- Integrations
- Fulfillment

The End-to-end Dialogflow Workflow¹⁰



¹⁰Image source

Quiz 1

Complete the Canvas quiz.



Dialogflow Building Blocks, Part 1

We will cover Part 2 in the next class.

Getting Started with Dialogflow

1. Login to the Dialogflow
2. Go to the Dialogflow console
3. Create a new *agent*

Agent Settings

Get familiar with agent settings.

CS639DemoAgent

SAVE

General

Languages

ML Settings

Export and Import

Speech

Share

Advanced

DESCRIPTION

Describe your agent

DEFAULT TIME ZONE

(GMT-6:00) America/Chicago

Date and time requests are resolved using this timezone.

GOOGLE PROJECT

Project ID	cs639demoagent-jmmvnw
Service Account <div></div>	dialogflow-cpgcaj@cs639demoagent-jmmvnw.iam.gserviceaccount.com <div></div>

API VERSION

V2 API

Use Cloud API as default for the agent. Your webhook will receive and return V2 format messages.

BETA FEATURES

Enable beta features and APIs

Be the first to get access to the newest features and latest APIs. [\(Full V2-beta API reference\)](#)

API KEYS (V1)

Client access token	85c321bebf844e1bbe1732b6d1419b8	<div></div> <div></div>
Developer access token	4aa35bdac21b402fab22caef2f675662	<div></div>

LOG SETTINGS

Log interactions to Dialogflow

Collect and store user queries. Logging must be enabled in order to use Training, History and Analytics.

Log interactions to Google Cloud

Write user queries and debugging information to [Google Stackdriver](#).

DANGER ZONE

Delete Agent

Are you sure you want to delete agent CS639DemoAgent? This will destroy the agent with all corresponding data and cannot be undone!


DELETE THIS AGENT



Try it now


Please use test console above to try a sentence.



See how it works in [Google Assistant](#). [↗](#)



Agent Exporting


 Dialogflow


RobotPlanner  


en 


 Intents 


 Entities 


 Knowledge ^[beta]


 Fulfillment


 Integrations

 Training

 Validation ^[beta]


 History

 Analytics

 Prebuilt Agents

RobotPlanner

SAVE



General Languages ML Settings Export and Import Speech Share Advanced

EXPORT AS ZIP


Create a backup of the agent


RESTORE FROM ZIP



Replace the current agent version with a new one. All the intents and entities in the older version will be deleted.

IMPORT FROM ZIP


Upload new intents and entities without deleting the current ones. Intents and entities with the same name will be replaced with the newer version.

Try it now 

 Please use test console above to try a sentence.

 See how it works in [Google Assistant](#). 

Agent Speech

 Dialogflow

RobotPlanner

en

Intents

Entities

Knowledge ^[beta]

Fulfillment

Integrations

Training

Validation ^[beta]

History

Analytics

Prebuilt Agents

Small Talk

RobotPlanner

GeneralLanguagesML SettingsExport and ImportSpeechShareAdvanced

IMPROVE SPEECH RECOGNITION QUALITY

Enable Enhanced Speech Models and Data Logging (available for Enterprise Edition)

By enabling data logging, you agree to the [terms and conditions](#) of the data logging agreement (which amends the agreement governing Customer's use of Google Cloud Platform services). I represent and warrant that I have authority to bind Customer to this data logging agreement. Please note that this setting will affect all data from this point onwards and does not impact prior logged data.

Enable Auto Speech Adaptation ^[beta]

Use Dialogflow agent information (e.g. intents, entities) to automatically improve speech recognition quality.

TEXT TO SPEECH

Enable Automatic Text to Speech

Automatically convert default text responses to speech in all conversations. The output audio will be included in [DetectIntentResponse](#) and [StreamingDetectIntentResponse](#).

Output Audio Encoding

16 bit linear PCM (signed, little-end... ▾

VOICE CONFIGURATION

Configure your agent's synthesized voice in the V2 API and Telephony integration.


Agent Language

en (English) ▾

Voice

Try it now

Please use test console above to try a sentence.

 See how it works in [Google Assistant](#). [↗](#)

Intents

What are intents?

Consider the following user requests:

- What is the weather like today?
- Will it rain sometime today?

What is the intent of these requests?

What are intents?

Definition: Intents are the goals of the user that are expressed to the agent.

In the previous examples, despite their different framing, the user was expressing a desire to know what the weather will be.

That is their *intent*.

More Intent Examples

Let's look at some more requests and identify their intents:

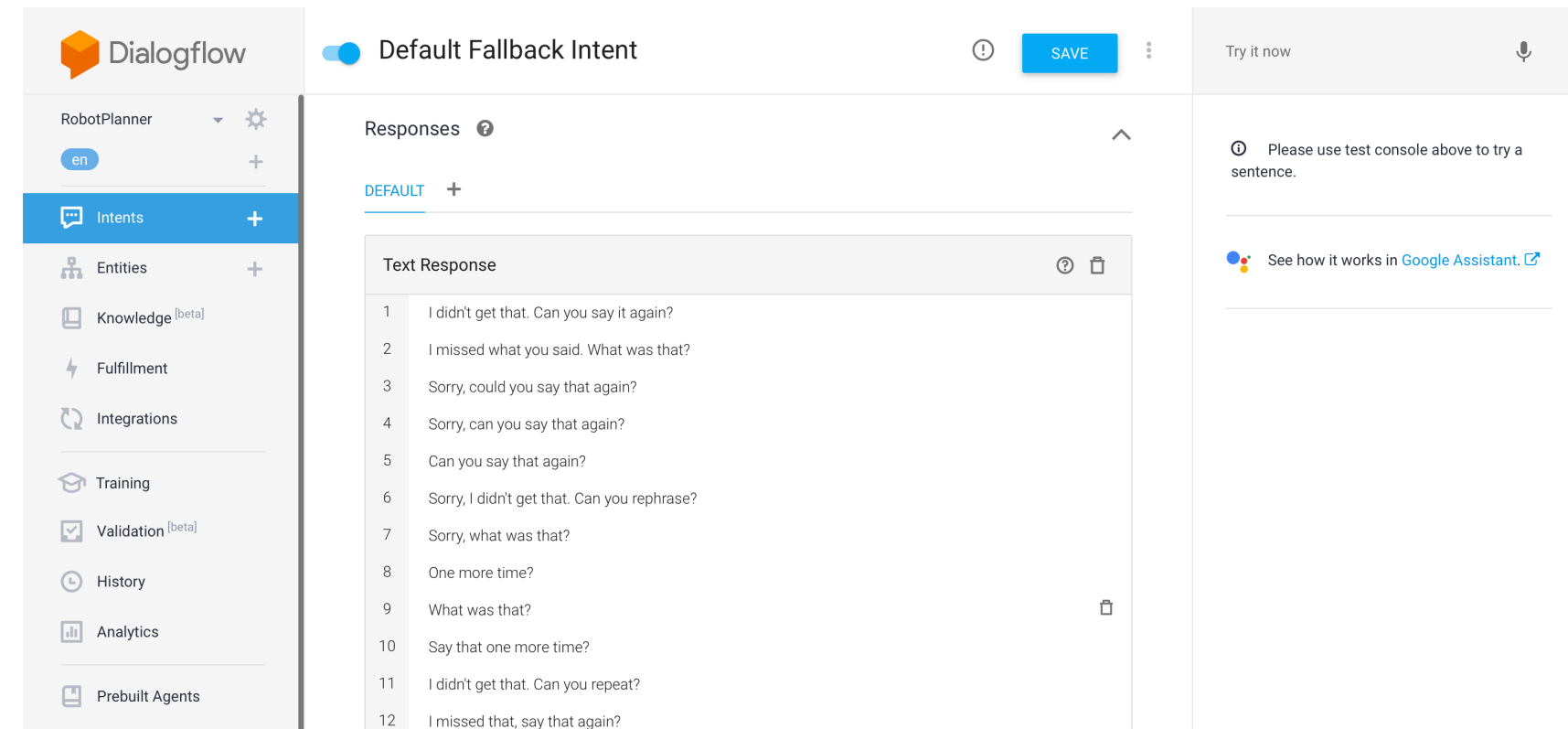
- How are you?
- How do I get to Middleton?
- What is the price of a basketball?
- Buy one box of tissues from Amazon.

Intents In Dialogflow

The screenshot shows the Dialogflow web interface. On the left is a sidebar with the Dialogflow logo and navigation links: RobotPlanner, Intents (selected), Entities, Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta], History, and Analytics. The main area is titled 'Intents' and contains a 'CREATE INTENT' button. Below the button is a search bar and a list of intents: 'Default Fallback Intent' and 'Default Welcome Intent'. A message states: 'No regular intents yet. [Create the first one.](#)' followed by an explanation: 'Intents are mappings between a user's queries and actions fulfilled by your software. [Read more here.](#)' and a recommendation: 'Before you start, check out [Prebuilt Agents](#), a collection of agents developed by the Dialogflow team.' On the right, there is a 'Try it now' button and a message: 'Please use test console above to try a sentence.' with a link to 'Set-up Google Assistant integration.'

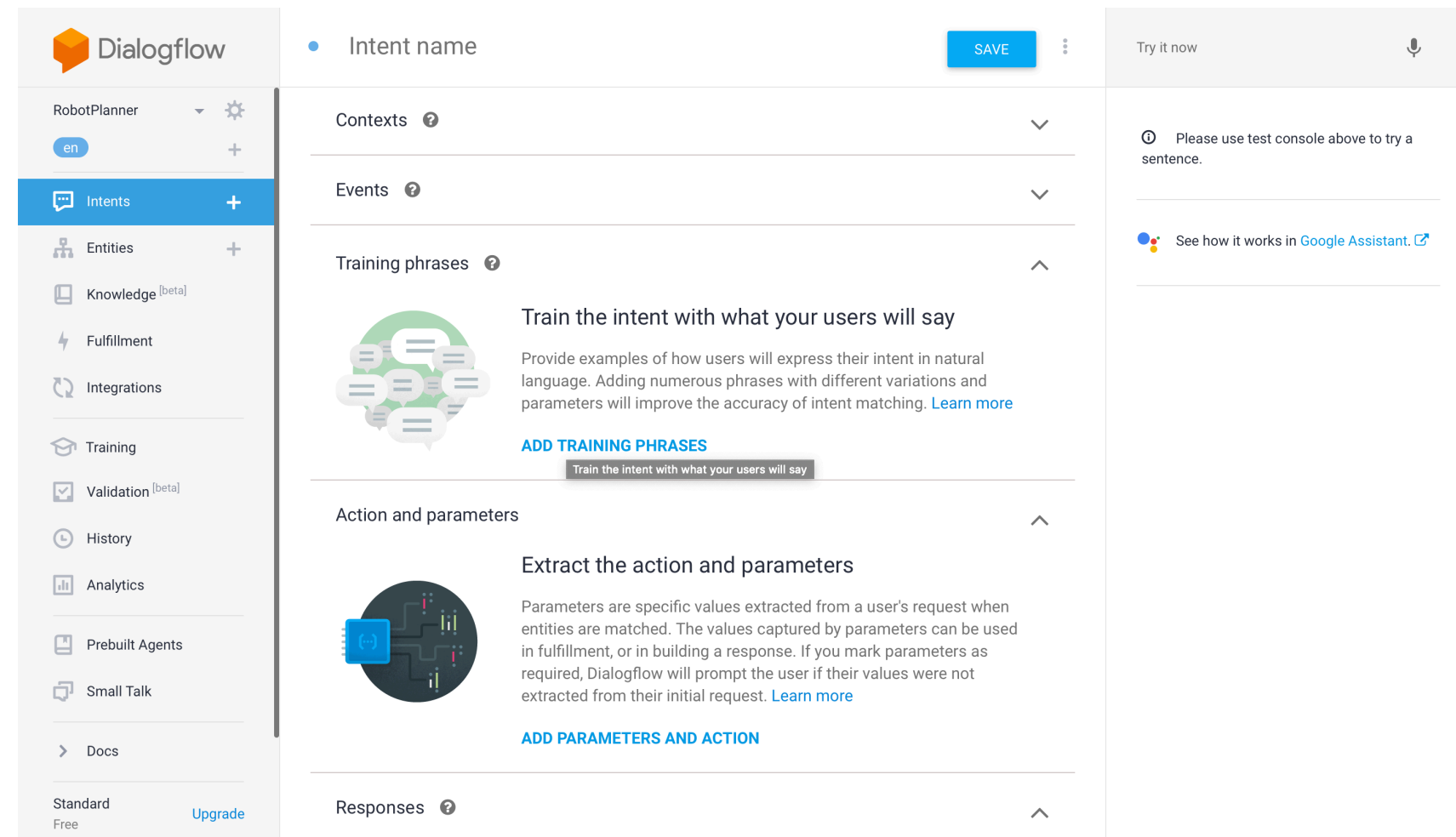
Default Fallback Intents

- Engaged if no other intents are recognized.
- Could be a result of not being able to "hear" the user, or unable to parse what they said.
- Can provide training examples of things that will serve as negative examples for your desired intents.



Creating Intents

- Allow the user to say that they want a robot to pick something up.
- We will start with training phrases.
- Should try to create at least 10.



Creating Intents

- Can you get the screwdriver for me?
- Please get the green ball.
- Pick up that red cube.
- etc.

Notice how the color is highlighted? More on that next.

- Pickup Command

SAVE




Training phrases ?

Search training phrases 🔍 ^

” Add user expression	
” Take that.	
” Grab this from me.	
” Take this wrench	
” Pick up the hammer over there.	
” How about getting that box of screws for me?	
” Can you get the screwdriver for me?	
” Please get the green ball	🗑
” Get the green ball	
” Grab the toy	
” Pick up that red cube	

Test

Test your agent using the *Default Welcome Intent*

Dialogflow

CS639DemoAgent

en

Intents

Entities

Knowledge [beta]

Fulfillment

Integrations

Training

Validation [beta]

History

Analytics

Prebuilt Agents

Small Talk

Docs

Standard Free

Support

Account

Logout

Upgrade

Intents

Search intents

Default Fallback Intent

Default Welcome Intent

No regular intents yet. [Create the first one.](#)

Intents are mappings between a user's queries and actions fulfilled by your software. [Read more here.](#)

Before you start, check out [Prebuilt Agents](#), a collection of agents developed by the Dialogflow team.

Try it now

See how it works in [Google Assistant](#).

Agent

USER SAYS

Hello!

DEFAULT RESPONSE

Hi! How are you doing?

INTENT

Default Welcome Intent

ACTION

input.welcome

DIAGNOSTIC INFO

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Quiz 2

Complete the Canvas quiz.



canvas

Entities

What are entities?

Let's consider those requests again.

- How do I get to *Middleton*?
- What is the price of a *basketball*?
- Buy *one* box of *tissues* from *Amazon*.

What are entities?

Sometimes, users' intents are more specific, and have an intent based around a certain item or *entity*.

Definition: Entities allow for more specificity of requests, without exploding the intent space.

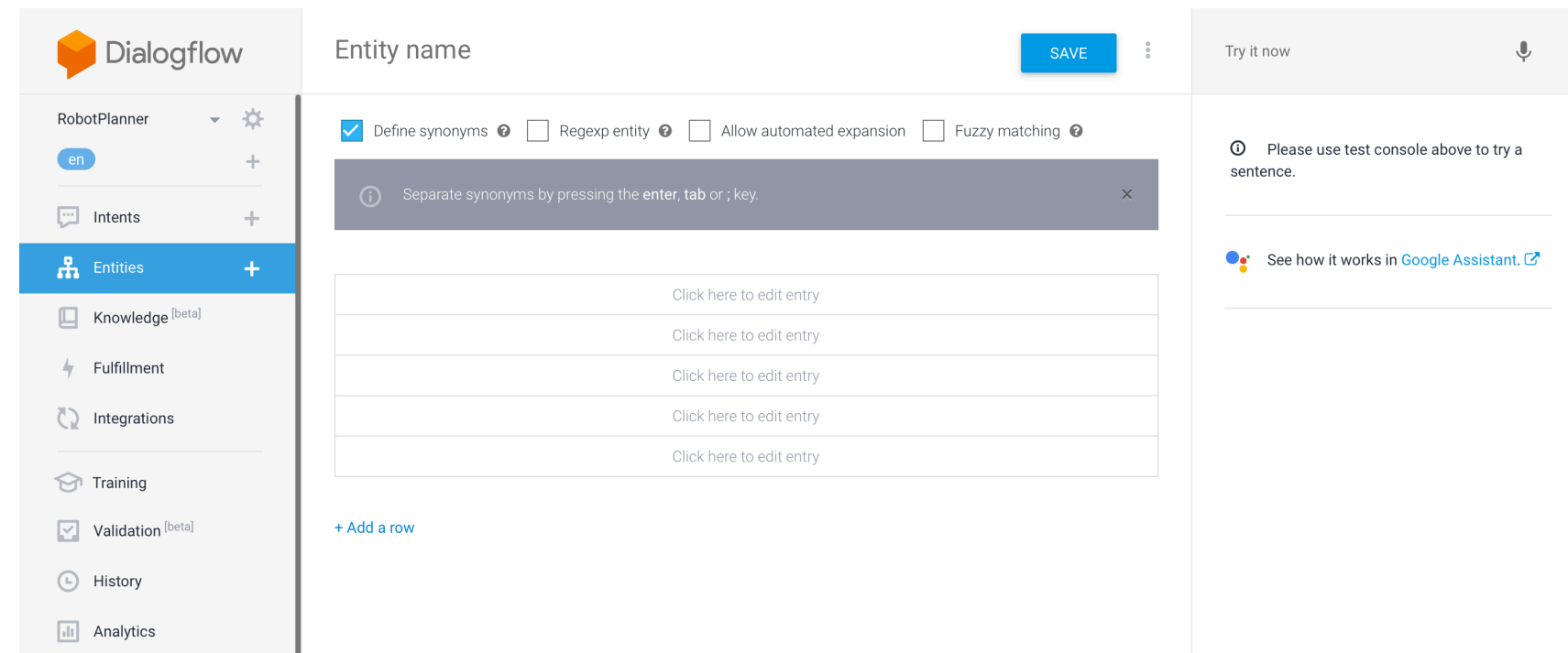
Thus, if the request was:

What is the weather like today in Seattle?

The *intent*: weather inquiry; *entity*: Seattle

Entities in Dialogflow

Let's define some things that the robot can pick up.



The screenshot shows the Dialogflow console interface for configuring entities. On the left is a sidebar with navigation options: RobotPlanner, en, Intents, Entities (highlighted), Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta], History, and Analytics. The main area is titled 'Entity name' and includes a 'SAVE' button. Below the title are four checkboxes: 'Define synonyms' (checked), 'Regexp entity', 'Allow automated expansion', and 'Fuzzy matching'. A grey informational box states: 'Separate synonyms by pressing the enter, tab or ; key.' Below this is a table with five rows, each containing a text input field and a 'Click here to edit entry' link. At the bottom left of the main area is a '+ Add a row' link. On the right side of the interface is a 'Try it now' section with a microphone icon and a message: 'Please use test console above to try a sentence.' Below this is a link: 'See how it works in Google Assistant.'

Entities in Dialogflow

Remember I mentioned some objects when creating my intents.
Let's add those here.

- Cube
- Sphere
- Screwdriver
- etc.

Entity Entries and Synonyms

- Cube (Box)
- Container (Box, Bin)
- Sphere (Ball)
- Screwdriver

object

SAVE

☒ Define synonyms ?

☐ Regexp entity ?

☐ Allow automated expansion

☐ Fuzzy matching ?

cube	cube
container	container, box, bin
sphere	sphere, ball
screwdriver	screwdriver
hammer	hammer, mallet
wrench	<div>wrench</div> Enter synonym
Click here to edit entry	

+ Add a row

Tagging Entities in Intents

Entities can be explicitly tagged in intents, if they are not automatically detected.

” Pick up that red cube

PARAMETER NAME	ENTITY	RESOLVED VALUE	
color	@sys.color	red	×
object	@object	cube	×

Automated expansion

Allows dialogflow to extrapolate to new objects

object

SAVE

☒ Define synonyms ?

☐ Regexp entity ?

☒ Allow automated expansion

☐ Fuzzy matching ?

cube	cube
container	container, box, bin
sphere	sphere, ball
screwdriver	screwdriver
hammer	hammer, mallet
wrench	wrench
Click here to edit entry	

+ Add a row

Required Entities

Suppose you want to require the user provide some entity. You can make it required, and specify how you want the agent to respond if it isn't provided.

Action and parameters ^

Enter action name

REQUIRED ?	PARAMETER NAME ?	ENTITY ?	VALUE	IS LIST ?	PROMPTS ?
<input type="checkbox"/>	color	@sys.color	\$color	<input type="checkbox"/>	—
<input checked="" type="checkbox"/>	object	@object	\$object	<input type="checkbox"/>	Define prompt s...
<input type="checkbox"/>	Enter name	Enter entity	Enter value	<input type="checkbox"/>	—

+ New parameter

Specifying prompts

Specify in the modal what prompts to use to query the required entity.

Prompts for "object"

NAME	ENTITY	VALUE
object	@object	\$object

PROMPTS

1

What object do you want me to pick up?

2

Which one?

3

Enter a prompt variant

CLOSE

Responses ?

Tweaking your intents for required entities

Remove the entity from the prompt if it was too general. Then the agent will inquire if it gets that prompt.

Note: This could also be handled by context, which will be discussed next build class.

Training phrases ?

Search training phrases 🔍 ^

” Add user expression

” Take that.

” Grab this from me.

” Take this wrench

” Pick up the hammer over there.

” How about getting that box of screws for me?

” Can you get the screwdriver for me?

” Please get the green ball

” Get the green ball

” Grab the toy

” Pick up that red cube

Dialogflow Documentation

Full Documentation

Let's Build An Agent

Quiz 3

Complete the Canvas quiz.



canvas

Assignment Preview

Assignment Overview

We will create a voice assistant for a fictional online clothing retail store, called *WiscShop*.

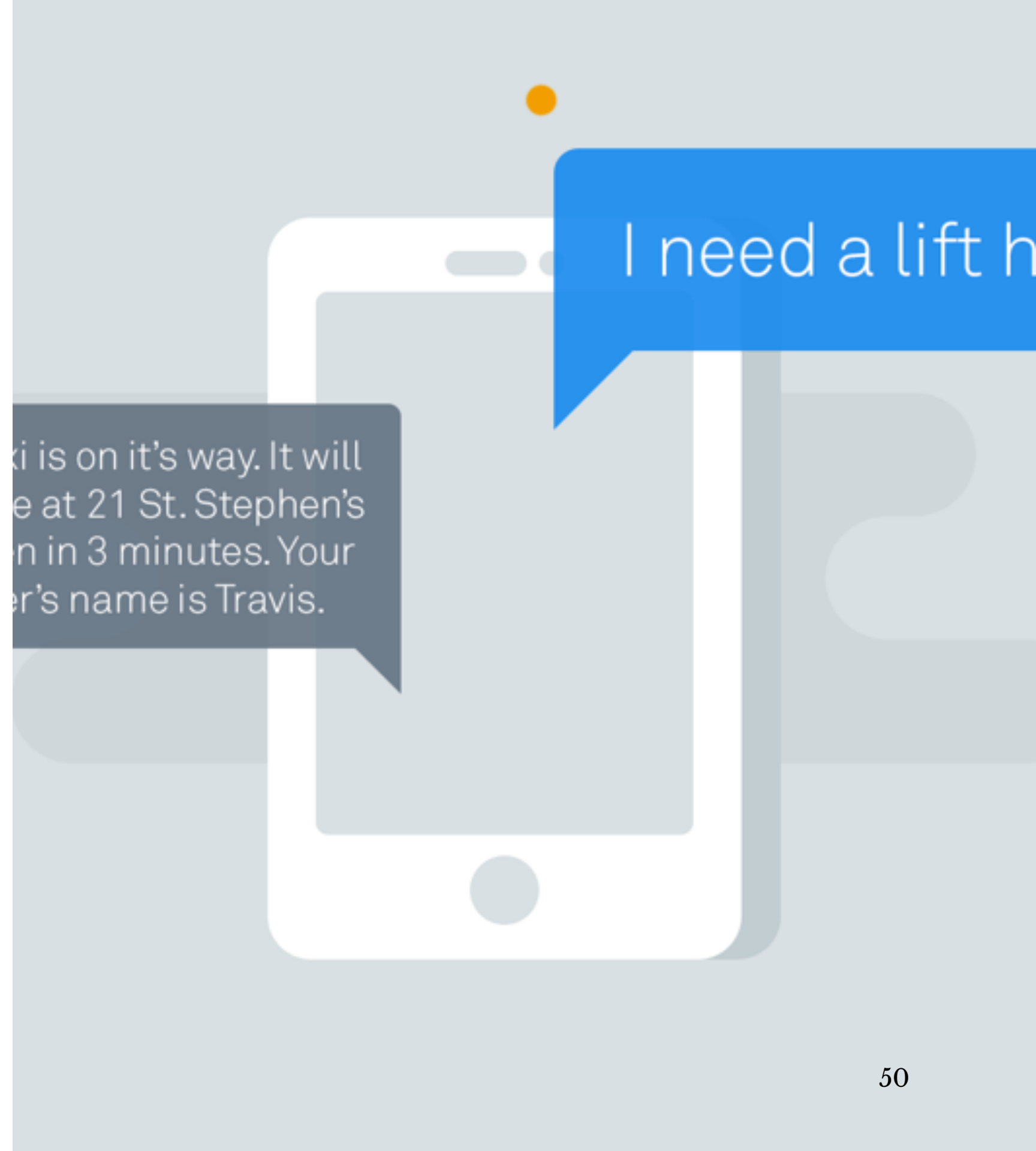
- Dialogflow α — Develop specifications
- Dialogflow β — Implementation
- Dialogflow γ — User evaluation

Dialogflow Alpha — Develop specifications¹¹

Experience prototyping to develop specifications for the voice assistant.

- Study the *WiscShop* store system
- Bodystorm how the voice assistant can support a set of capabilities
- Extract Dialogflow intents, entities, etc.

¹¹Image source

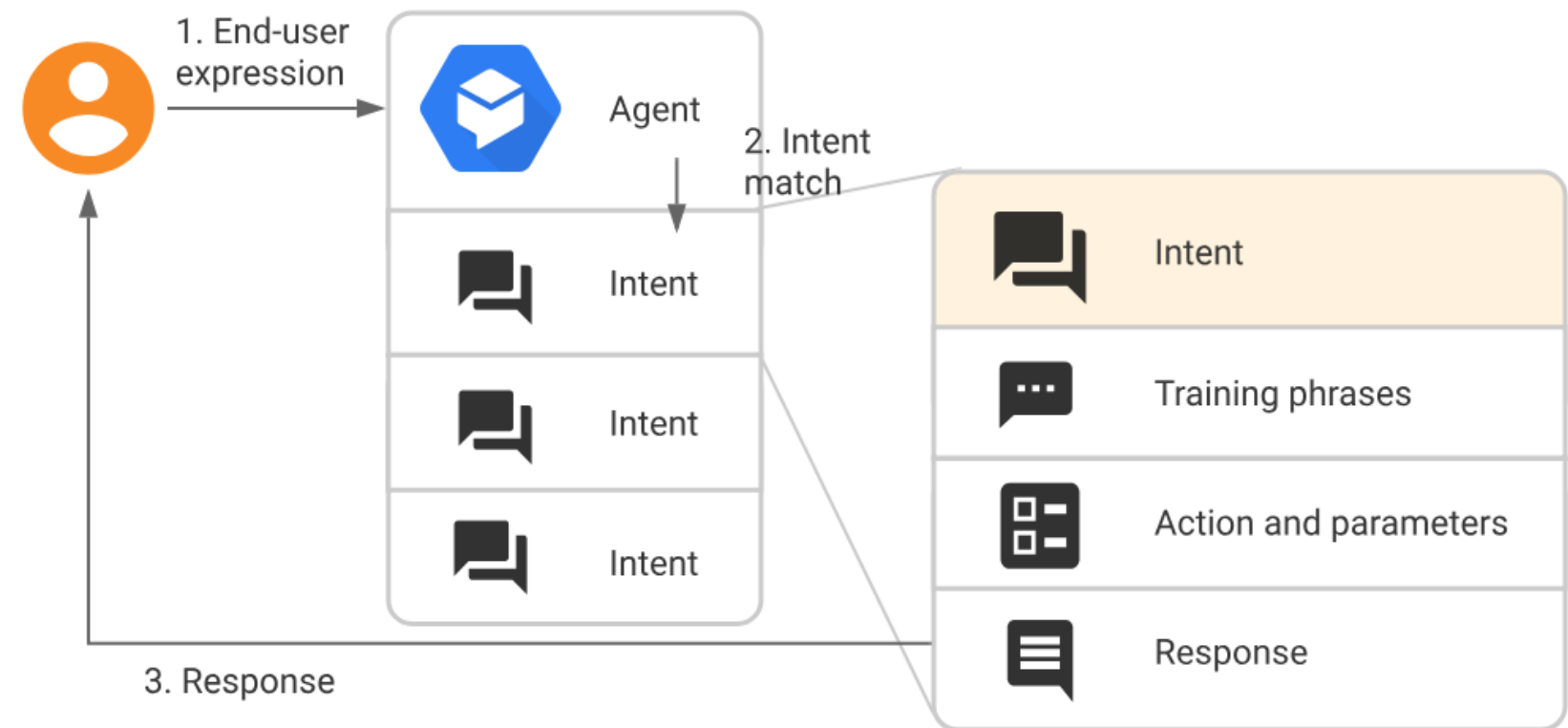


Capabilities

- Create a voice agent that allows a user to navigate a visual shopping interface.
- Allow the user to navigate from anywhere back to home, or to their cart.
- Allow the user to return to the previous page.
- Allow the user to specify the category of items they want to look at.
- Allow the user to specify attributes/tags to search in.
- Allow the user to navigate to product pages.
- Allow the user to add items (when on that product page) to their cart.
- Allow the user to go to checkout and complete the process.

Dialogflow *Beta* — Implementation⁸

Implement the voice assistant agent using the specifications extracted in Dialogflow α .



⁸Image source

Server API

Route	Auth Required	Token Required	Get	Post	Put	Delete
/login	✓		✓			
/users				✓		
/users/ <username>		✓	✓	✓	✓	✓
/tags			✓			
/categories			✓			
/products			✓			
/products/ <product_id>			✓			
/products/ <product_id> /tags			✓			
/products/ <product_id> /reviews			✓			
/products/ <product_id> /reviews/ <review_id>			✓			
/application		✓	✓		✓	
/application/tags		✓	✓			✓
/application/tags/ <tag_value>		✓		✓		✓
/application/messages		✓	✓	✓		✓
/application/messages/ <message_id>		✓	✓		✓	✓
/application/products		✓	✓			✓
/application/products/ <product_id>		✓		✓		✓

Pages

home

category:<category>

product:<product>

cart-current

cart-review

cart-confirmed

Dialogflow *Gamma* — User evaluation¹²

Design and perform a mini usability test over Zoom.

- Develop user study protocol.
- Recruit two volunteers.
- Administer the protocol.
- Analyze and report your findings.

¹²Image source



What have we learned today?

- Introduction to Conversational Interface Technologies
- Introduction to Dialogflow
- Dialogflow Building Blocks, Part 1
- Let's Make an Agent
- Assignment Preview