

Building User Interfaces

Dialogflow 1

An Introduction

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Final

- Final exam will be remote
- Dec 23, 12:25-2:25 pm
- Alternative only for extreme cases - we will send out a poll
- 60% (after midterm) vs. 40% (before midterm)
- More bonus quizzes

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?

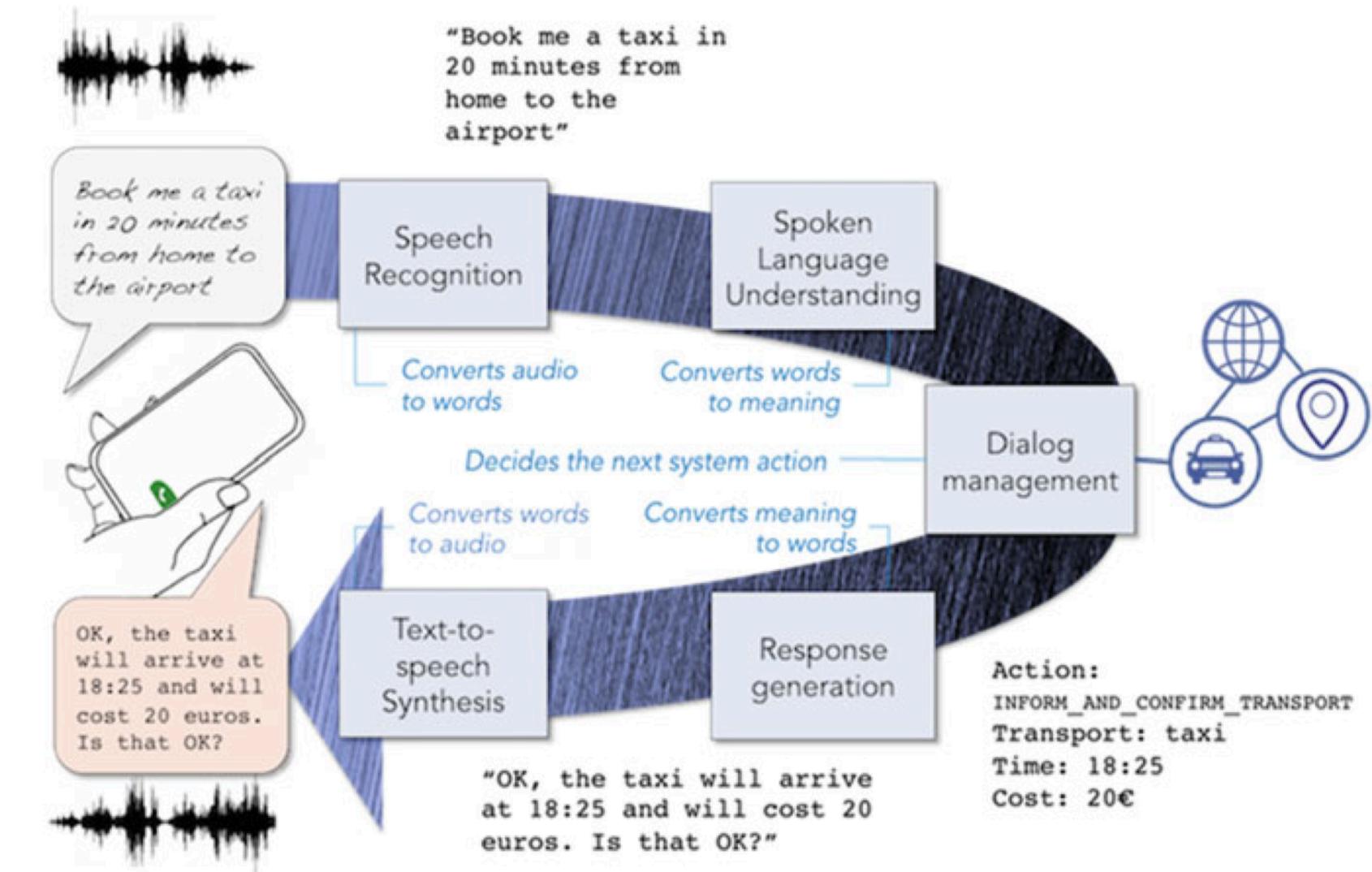
Definition: "Technology that supports conversational interaction with these VPAs [virtual personal assistants] by means of speech and other modalities."¹

¹ McTear 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



² Image 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  AAAAAA
      EE       LL   II    ZZ   AA   AA
      EEEEEEE  LL   II    ZZZ  AAAAAAAA
      EE       LL   II    ZZ  AA   AA
      EEEEEEE  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: |
```

³Image 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

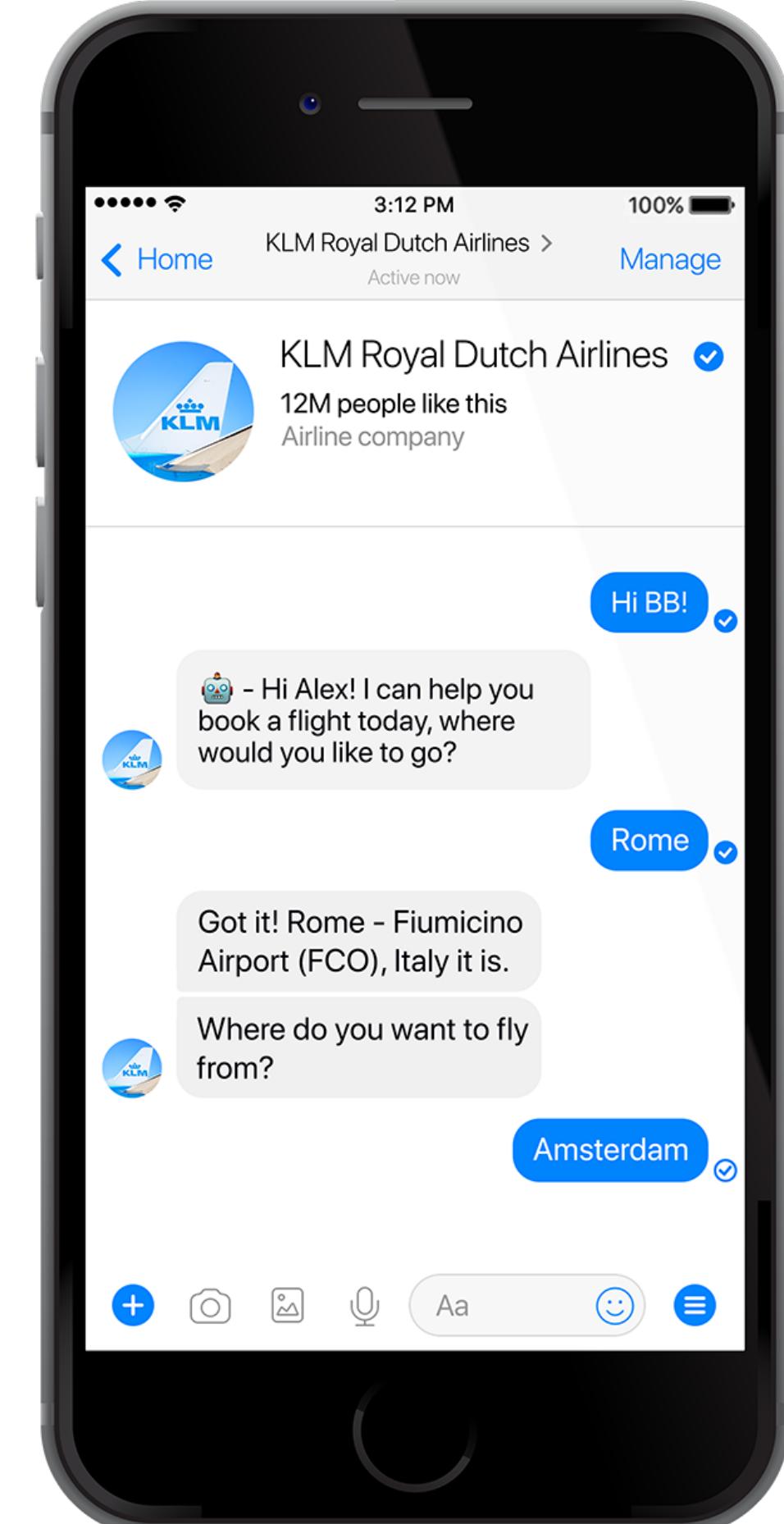


⁴ Video source [Youtube](#)

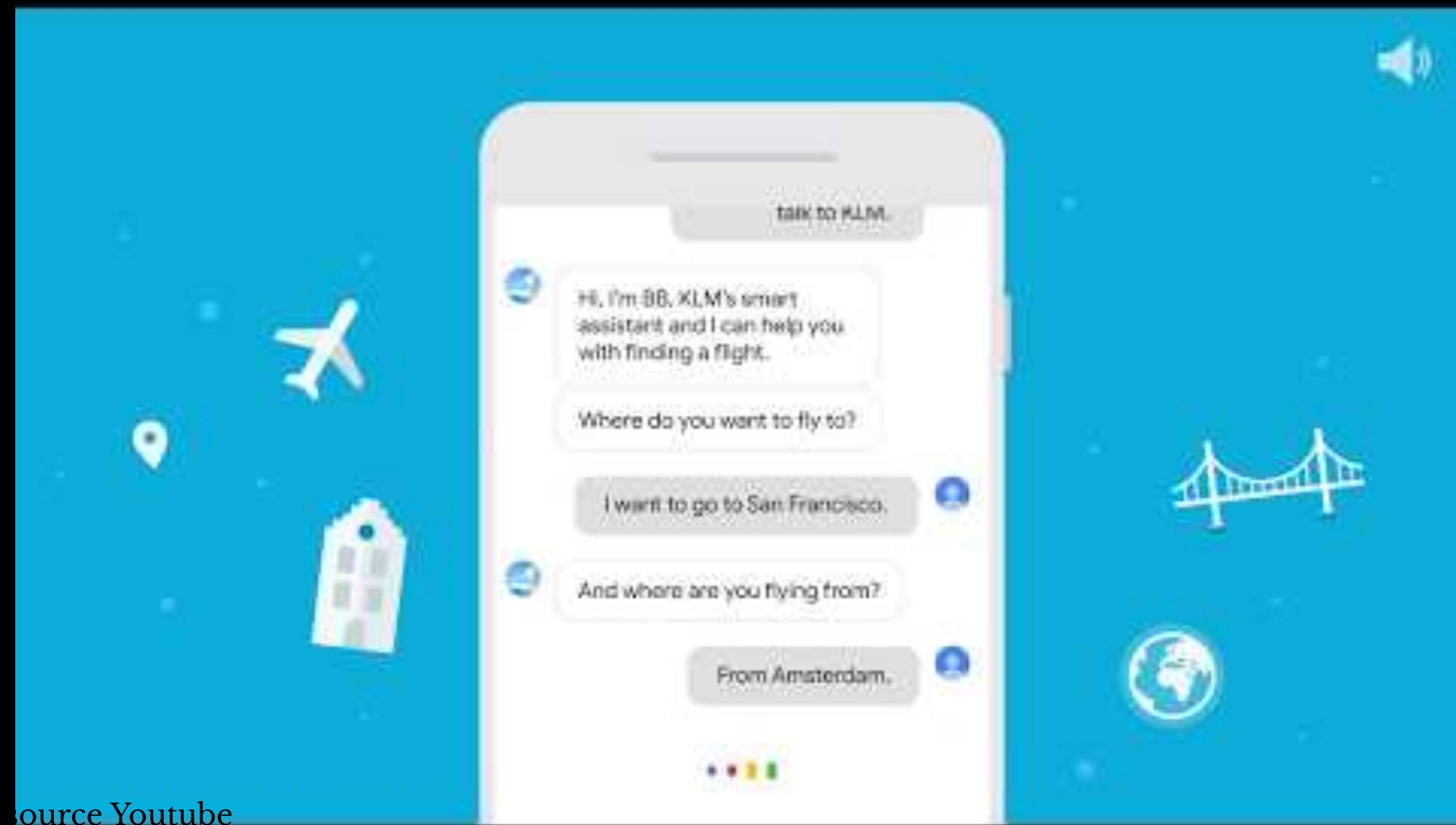
Case Study: KLM BB⁵

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



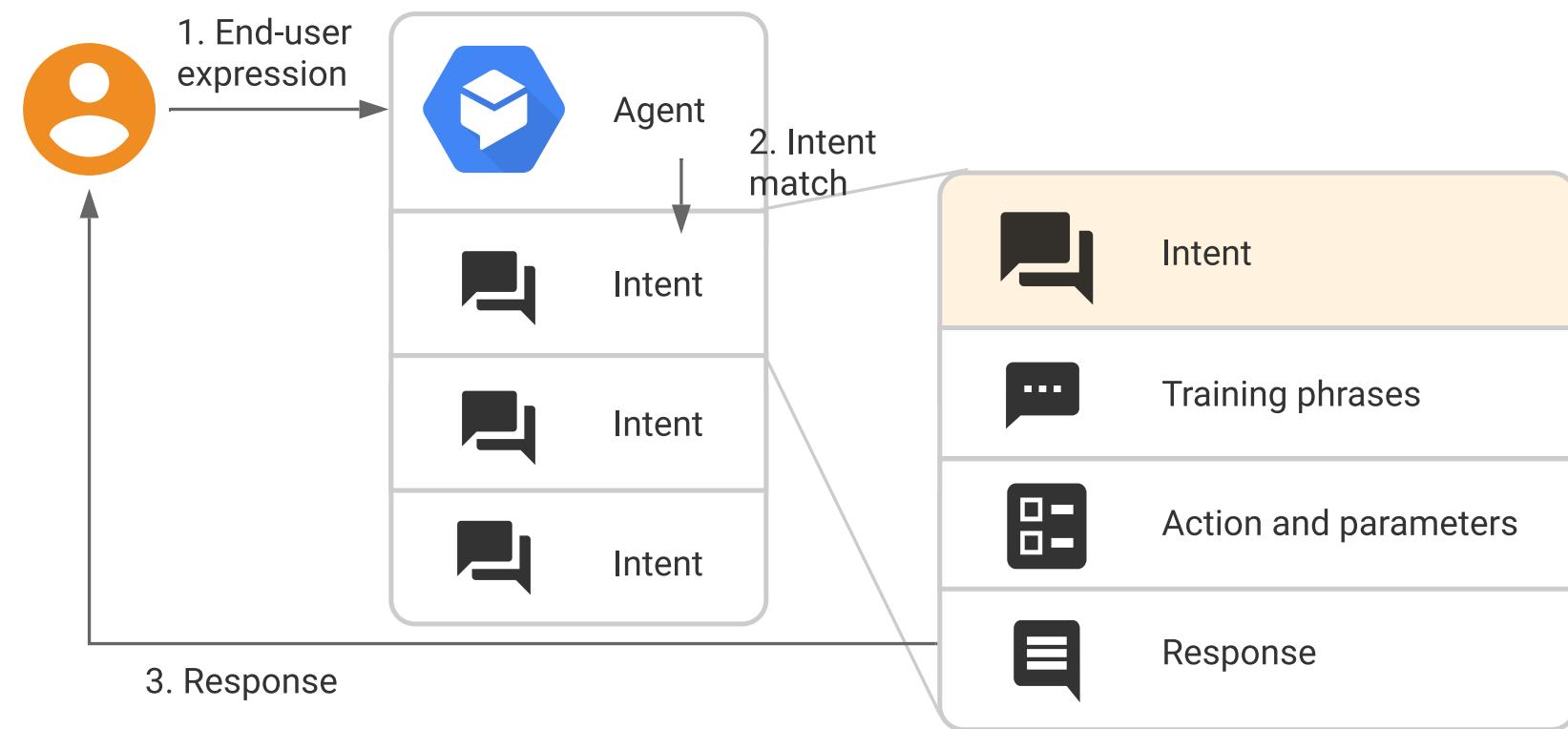
ource



How does Dialogflow work?⁸

The process within Dialogflow involves:

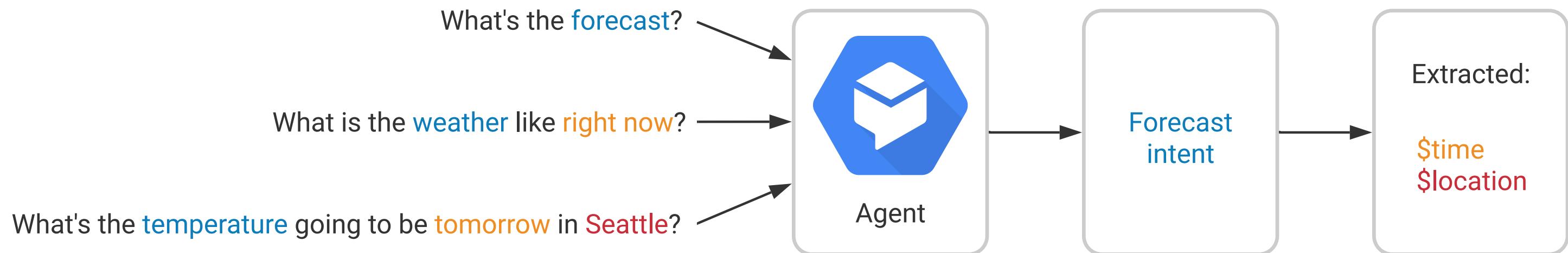
1. User expression
2. Intent matching
3. System response



⁸[Image 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

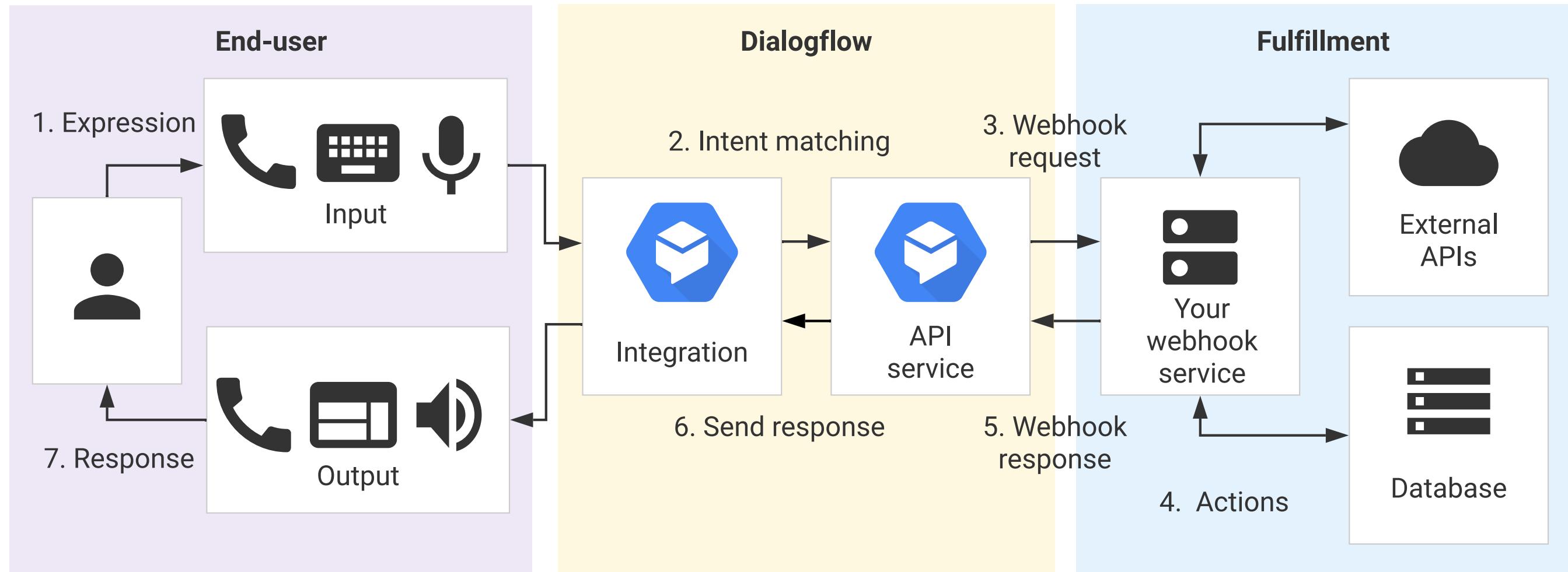


⁹ [Image source](#)

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

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

The End-to-end Dialogflow Workflow¹⁰



¹⁰ [Image source](#)

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

Try it now

General Languages ML Settings Export and Import Speech Share Advanced

DESCRIPTION
Describe your agent

DEFAULT TIME ZONE
(GMT-6:00) America/Chicago

GOOGLE PROJECT

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

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
Developer access token	4aa35bdac21b402fab22caef2f675662

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

Agent Exporting

The screenshot shows the Dialogflow web interface for managing the "RobotPlanner" agent. The left sidebar lists various sections: RobotPlanner (selected), Intents, Entities, Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta], History, Analytics, and Prebuilt Agents. The main content area is titled "RobotPlanner" and shows the "Export and Import" tab selected. It contains three buttons: "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.), and "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.). A "SAVE" button is located at the top right. On the far right, there is a "Try it now" button and a microphone icon. A note says "Please use test console above to try a sentence." Below that, a link says "See how it works in Google Assistant."

Agent Speech

The screenshot shows the Dialogflow web interface for managing the speech settings of the 'RobotPlanner' agent. The left sidebar lists various agent components: Intents, Entities, Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta] (which is checked), History, Analytics, Prebuilt Agents, and Small Talk. The main content area is titled 'RobotPlanner' and has tabs for General, Languages, ML Settings, Export and Import, Speech (which is selected), Share, and Advanced. The 'Speech' tab contains sections for 'IMPROVE SPEECH RECOGNITION QUALITY' and 'TEXT TO SPEECH'. Under 'IMPROVE SPEECH RECOGNITION QUALITY', there are two toggle switches: 'Enable Enhanced Speech Models and Data Logging (available for Enterprise Edition)' (disabled) and 'Enable Auto Speech Adaptation [beta]' (disabled). A note explains that enabling data logging requires accepting terms and conditions. Under 'TEXT TO SPEECH', there is a toggle switch for 'Enable Automatic Text to Speech' (disabled), which converts text responses to speech. The output audio encoding is set to '16 bit linear PCM (signed, little-end...)'. In the 'VOICE CONFIGURATION' section, the agent language is set to 'en (English)'. On the right side, there is a 'Try it now' button with a microphone icon and a note: 'Please use test console above to try a sentence.' Below that, there is a link to '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 interface for managing intents. On the left, a sidebar lists various components: RobotPlanner (selected), en, Intents (selected), Entities, Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta] (with a checked checkbox), History, and Analytics. The main area is titled "Intents" and contains a "CREATE INTENT" button. Below it is a search bar and a list of intents: "Default Fallback Intent" (green bookmark icon) and "Default Welcome Intent" (blue circle icon). A large informational message in the center says "No regular intents yet. [Create the first one.](#)". It explains that intents are mappings between user queries and actions. At the bottom, it suggests checking out "Prebuilt Agents". On the right, there's a "Try it now" section with a note about using the test console and a "Set-up Google Assistant integration" link.

RobotPlanner en

Intents

CREATE INTENT

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.

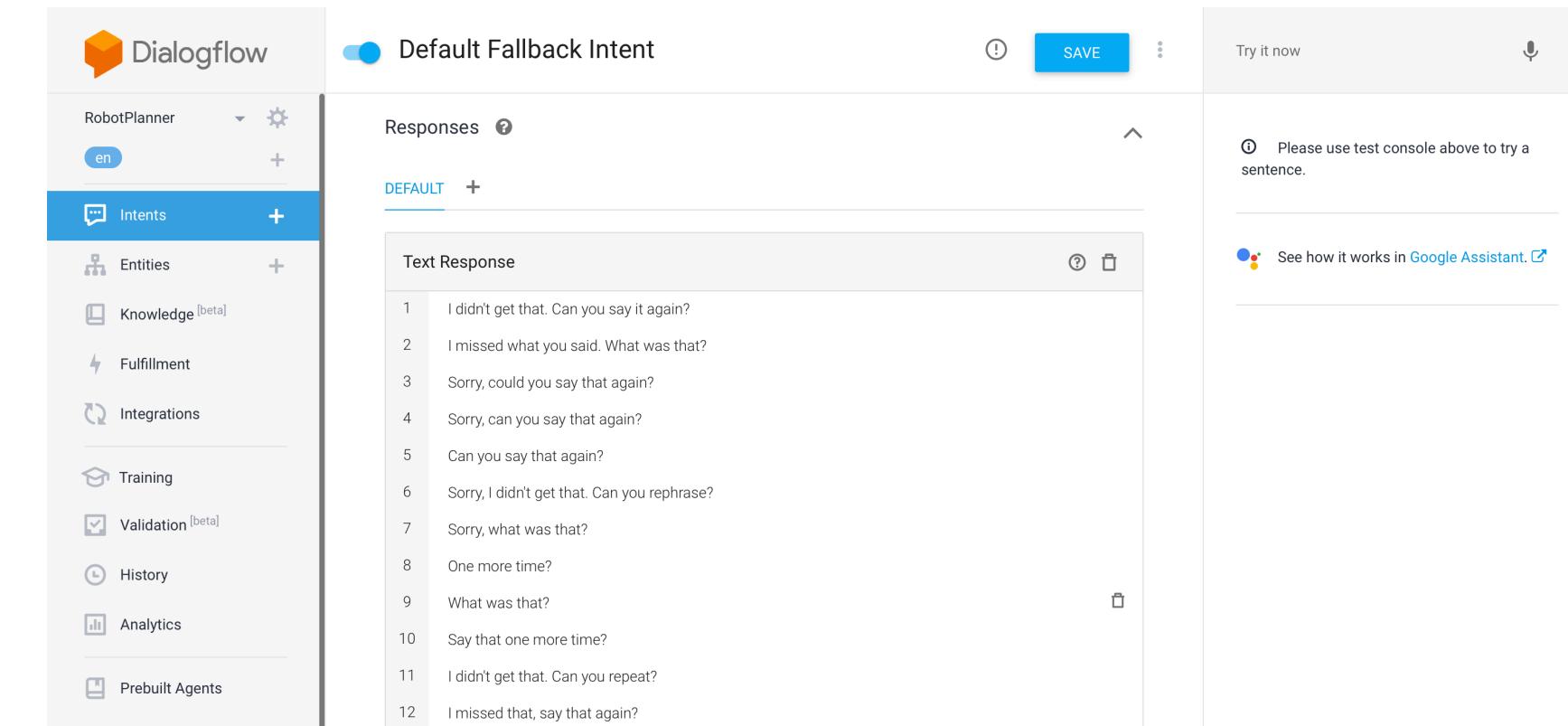
Try it now

Please use test console above to try a sentence.

Set-up [Google Assistant integration](#).

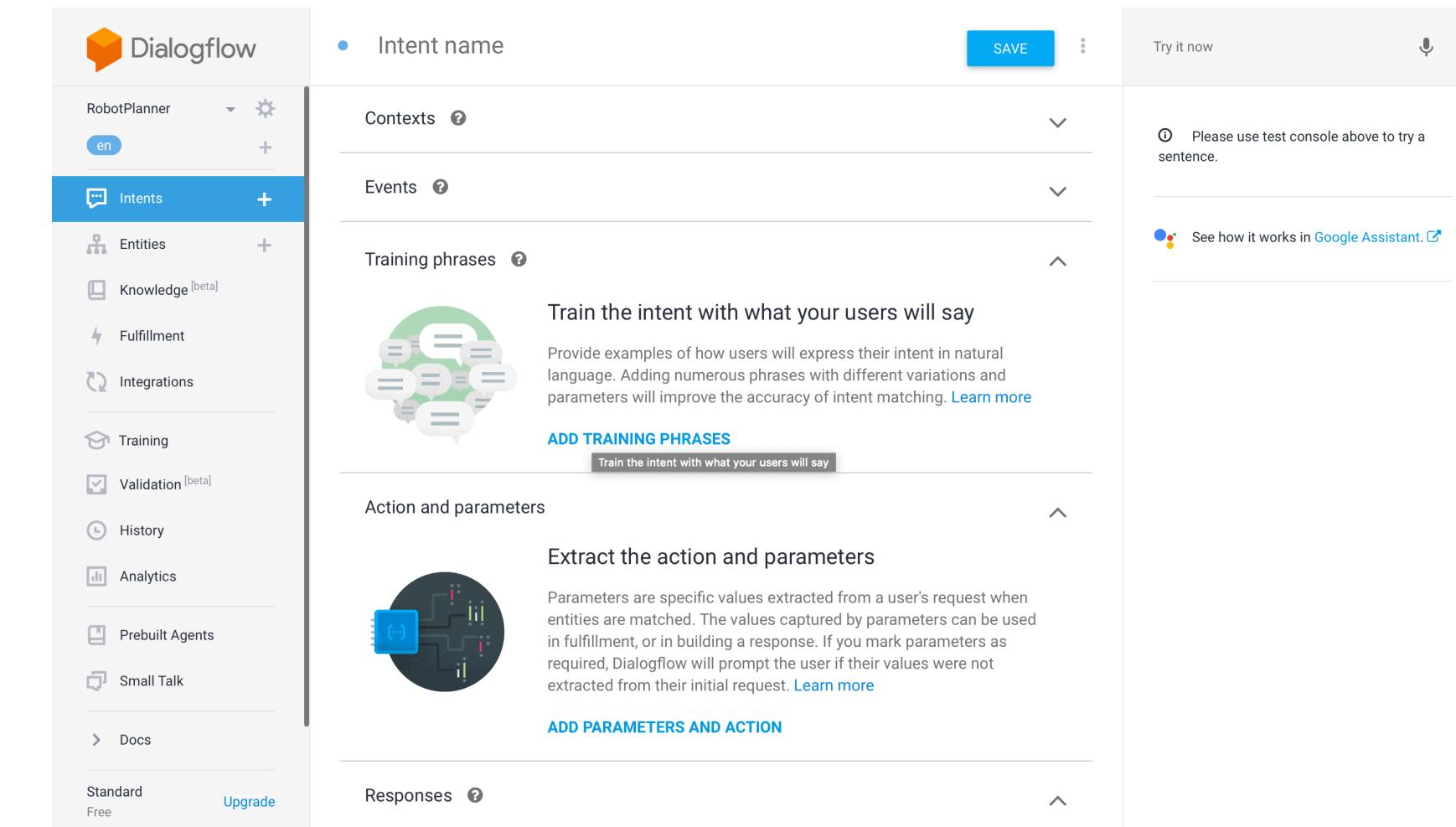
Default Fallback Intents

- 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*

The screenshot shows the Dialogflow web interface. On the left, a sidebar menu includes options like CS639DemoAgent, en, Intents (which is selected and highlighted in blue), Entities, Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta], History, Analytics, Prebuilt Agents, Small Talk, Docs, Standard (Free), Upgrade, Support, Account, and Logout. The main content area is titled "Intents" and features a "CREATE INTENT" button. Below it is a search bar labeled "Search intents". Two intents are listed: "Default Fallback Intent" (green icon) and "Default Welcome Intent" (blue icon). A message box on the right says "No regular intents yet. [Create the first one.](#)". It also contains information about intents, a link to prebuilt agents, and a "Try it now" section showing a user saying "Hello!" and the agent responding "Hi! How are you doing?". Other sections include "Agent", "USER SAYS Hello!", "COPY CURL", "DEFAULT RESPONSE Hi! How are you doing?", "INTENT Default Welcome Intent", "ACTION input.welcome", and "DIAGNOSTIC INFO".

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 Entities management interface. On the left, a sidebar lists various project components: RobotPlanner (selected), en, Intents, Entities (highlighted in blue), Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta] (checked), History, and Analytics. The main area is titled "Entity name" with a "SAVE" button. It includes checkboxes for "Define synonyms" (checked), "Regexp entity", "Allow automated expansion", and "Fuzzy matching". A note says "Separate synonyms by pressing the enter, tab or ; key." Below this is a table with six rows, each with a "Click here to edit entry" link. A "Add a row" button is at the bottom. To the right, there's a "Try it now" button, a microphone icon, and a note: "Please use test console above to try a sentence." At the bottom right, there's a "See how it works in Google Assistant" link.

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

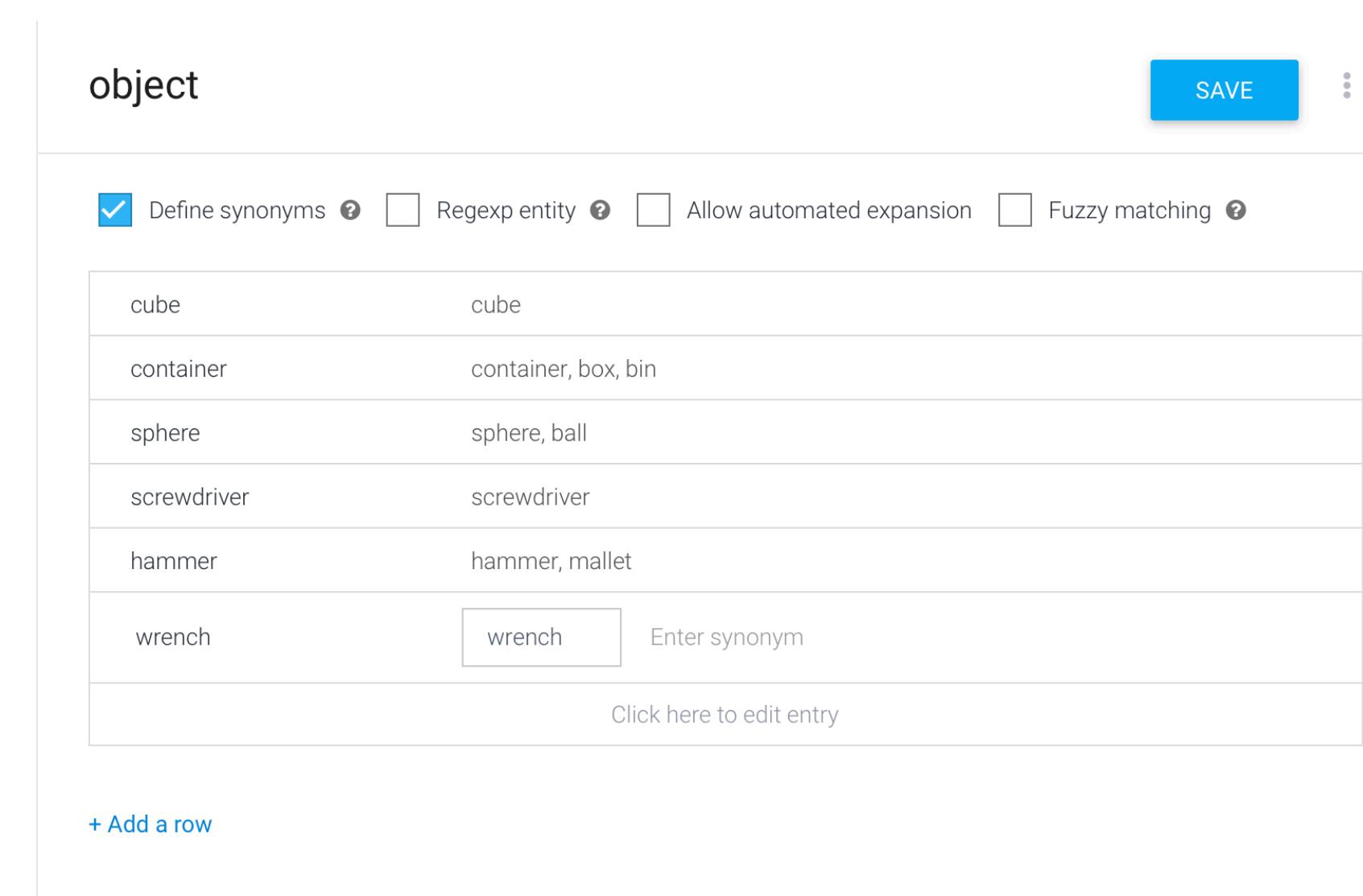
Define synonyms ? Regexp entity ? Allow automated expansion Fuzzy matching ?

cube	cube
container	container, box, bin
sphere	sphere, ball
screwdriver	screwdriver
hammer	hammer, mallet
wrench	wrench

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.

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

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

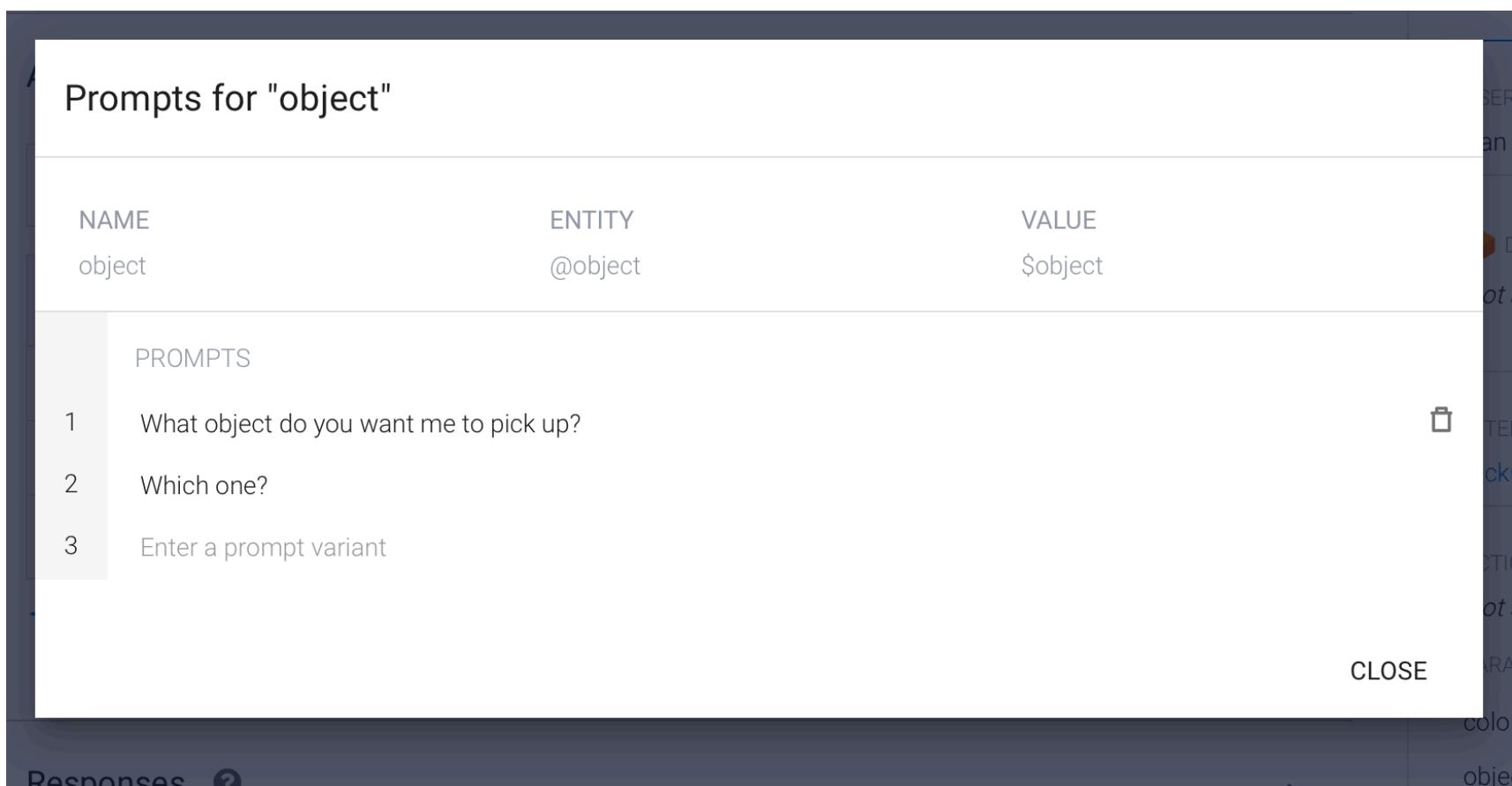
Enter action name

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.



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

Assignment Preview

Assignment Overview

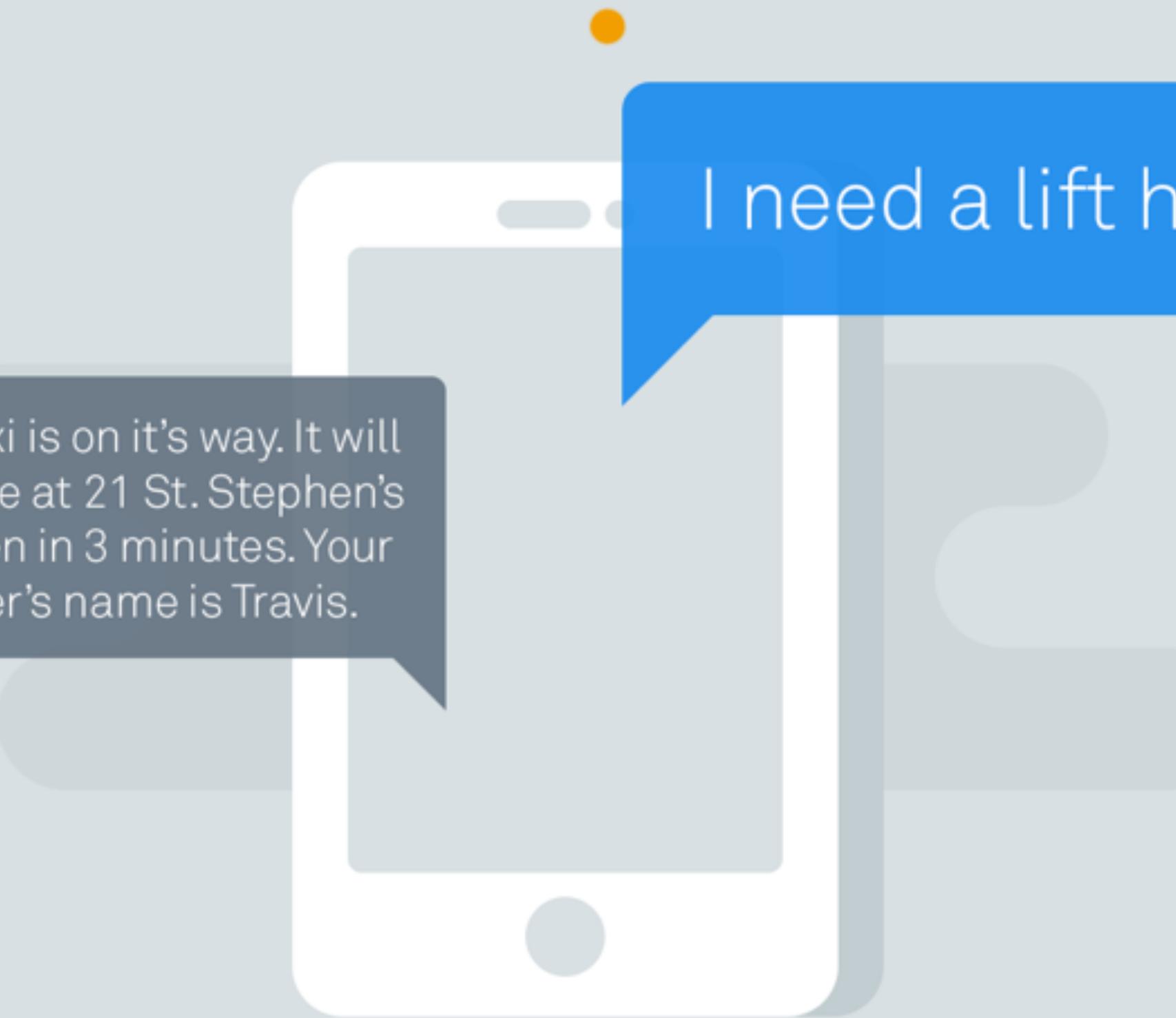
We will create a voice assistant for a fictional online clothing retail store, called *WiscShop*.

- 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.



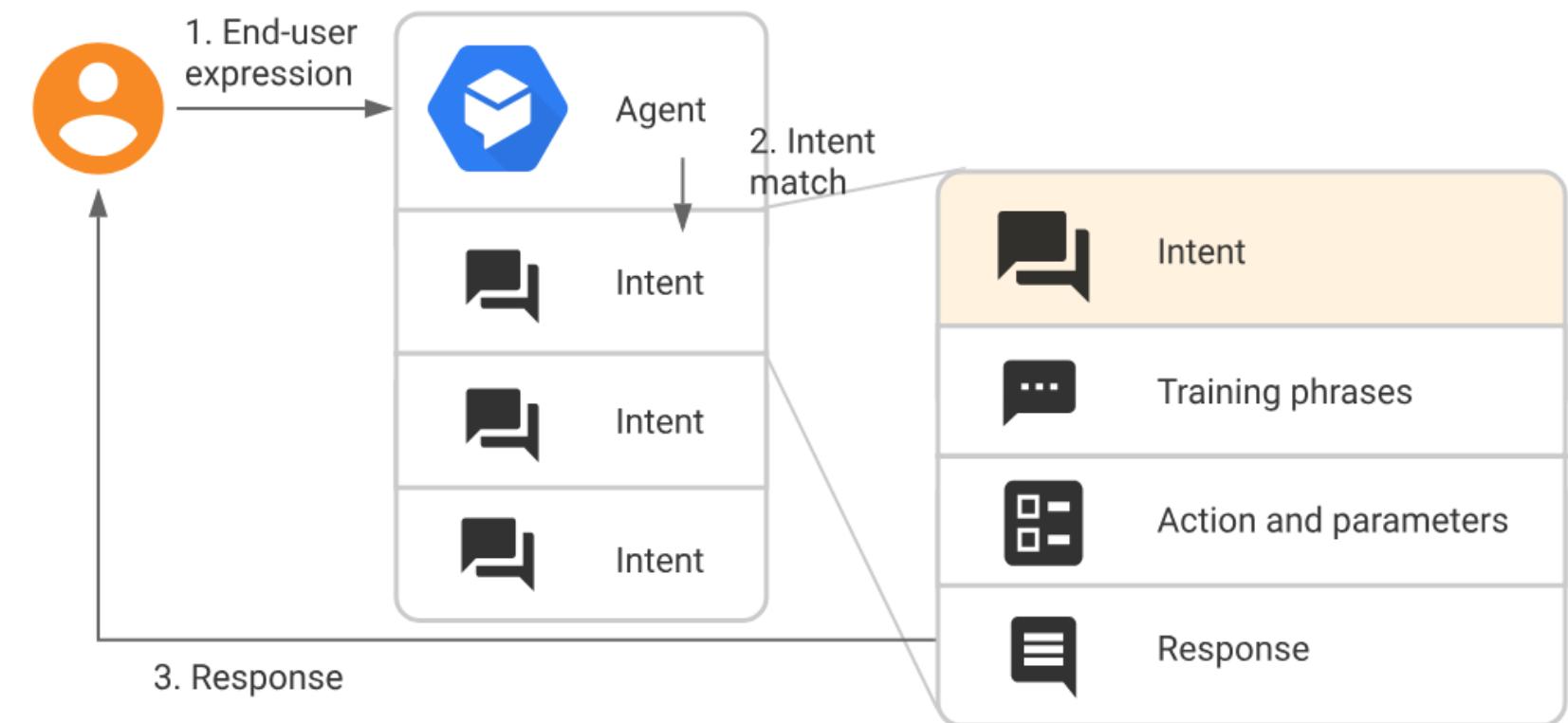
¹¹[Image source](#)

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 .



⁸[Image 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.



¹² [Image 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