

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?

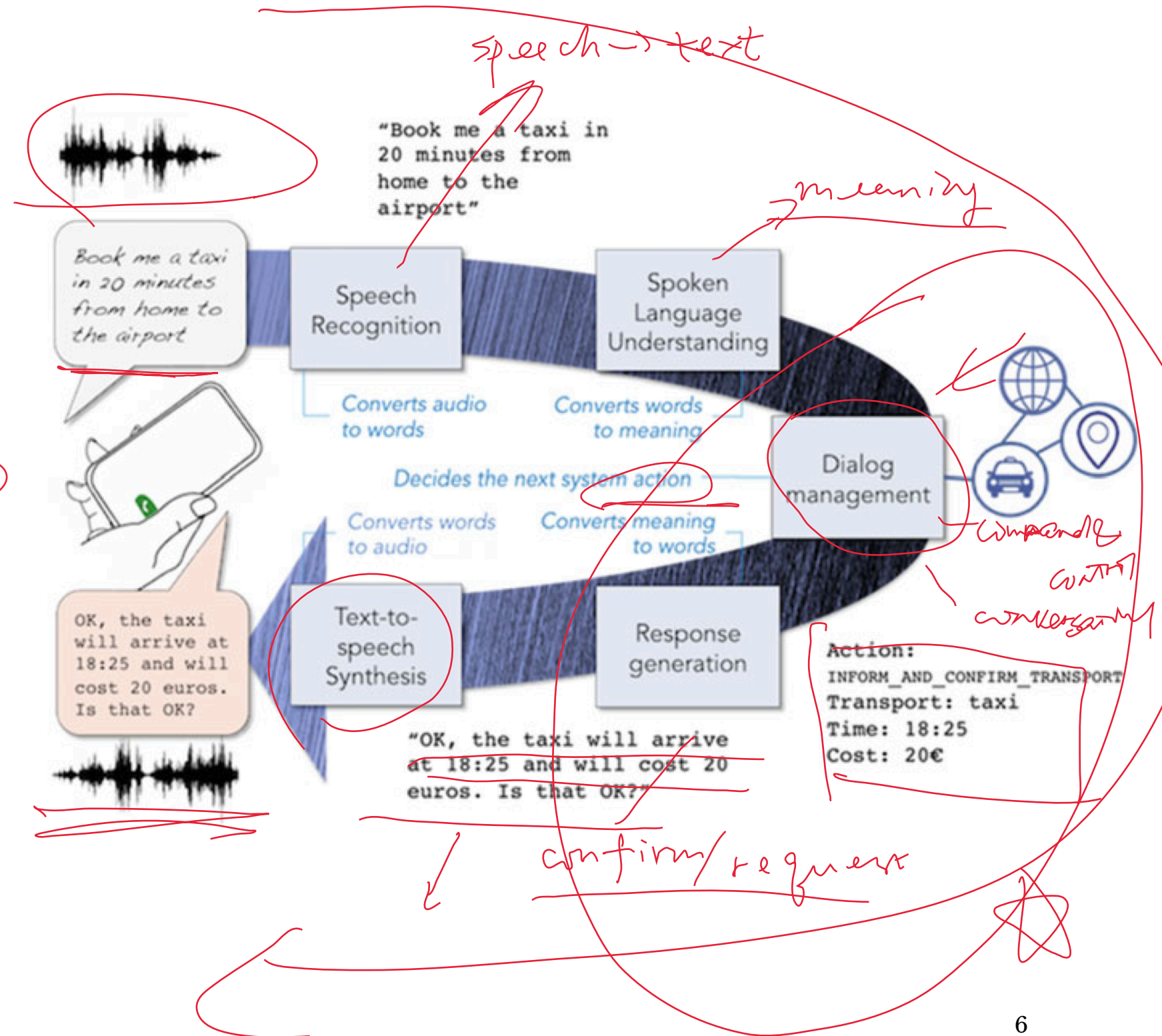
Definition: "Technology that supports conversational interaction with these VPAs [virtual personal assistants] by means of speech and other modalities."¹

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

EEEEEE LL      IIII ZZZZZZZZ  AAAAA
EE      LL      II      ZZ      AA  AA
EEEEEE LL      II      ZZZ      AAAAAA
EE      LL      II      ZZ      AA  AA
EEEEEE 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.

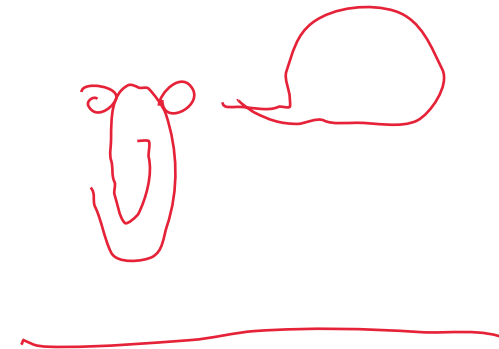
ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend 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](https://en.wikipedia.org/wiki/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



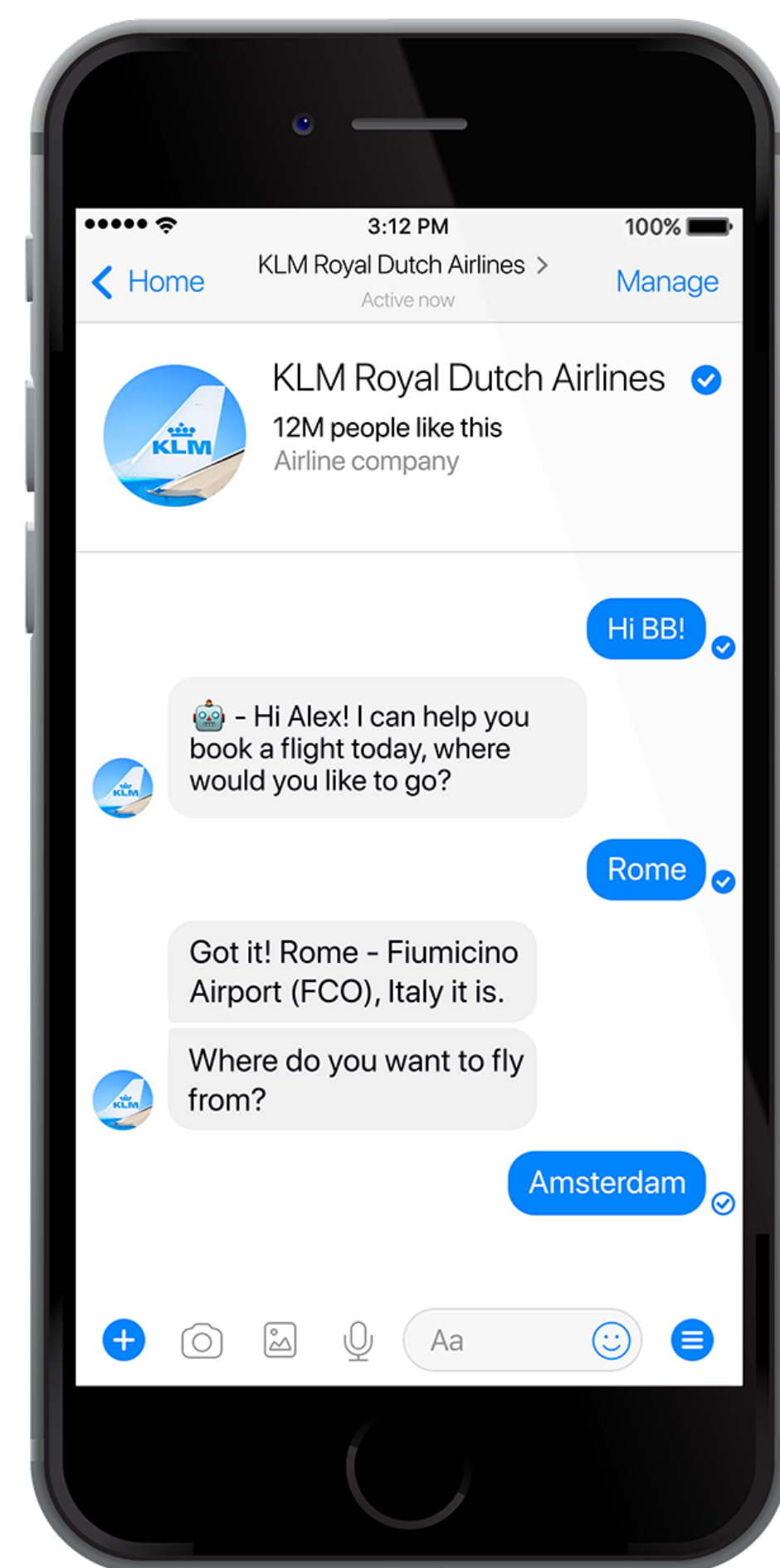
⁴Video source [Youtube](#)

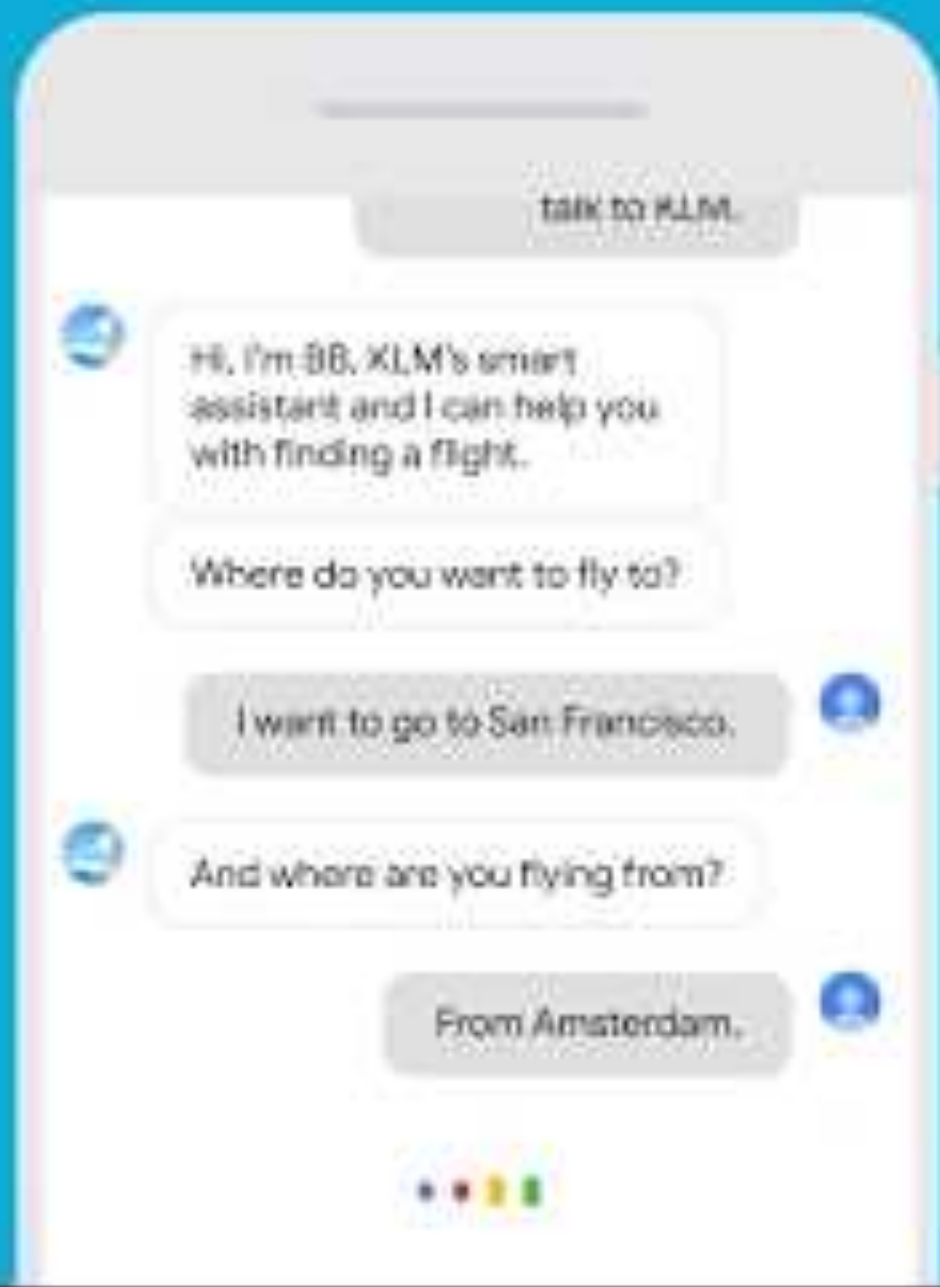
Case Study: KLM BB⁵

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

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

⁵Image source [Dialogflow](#)





Source Youtube

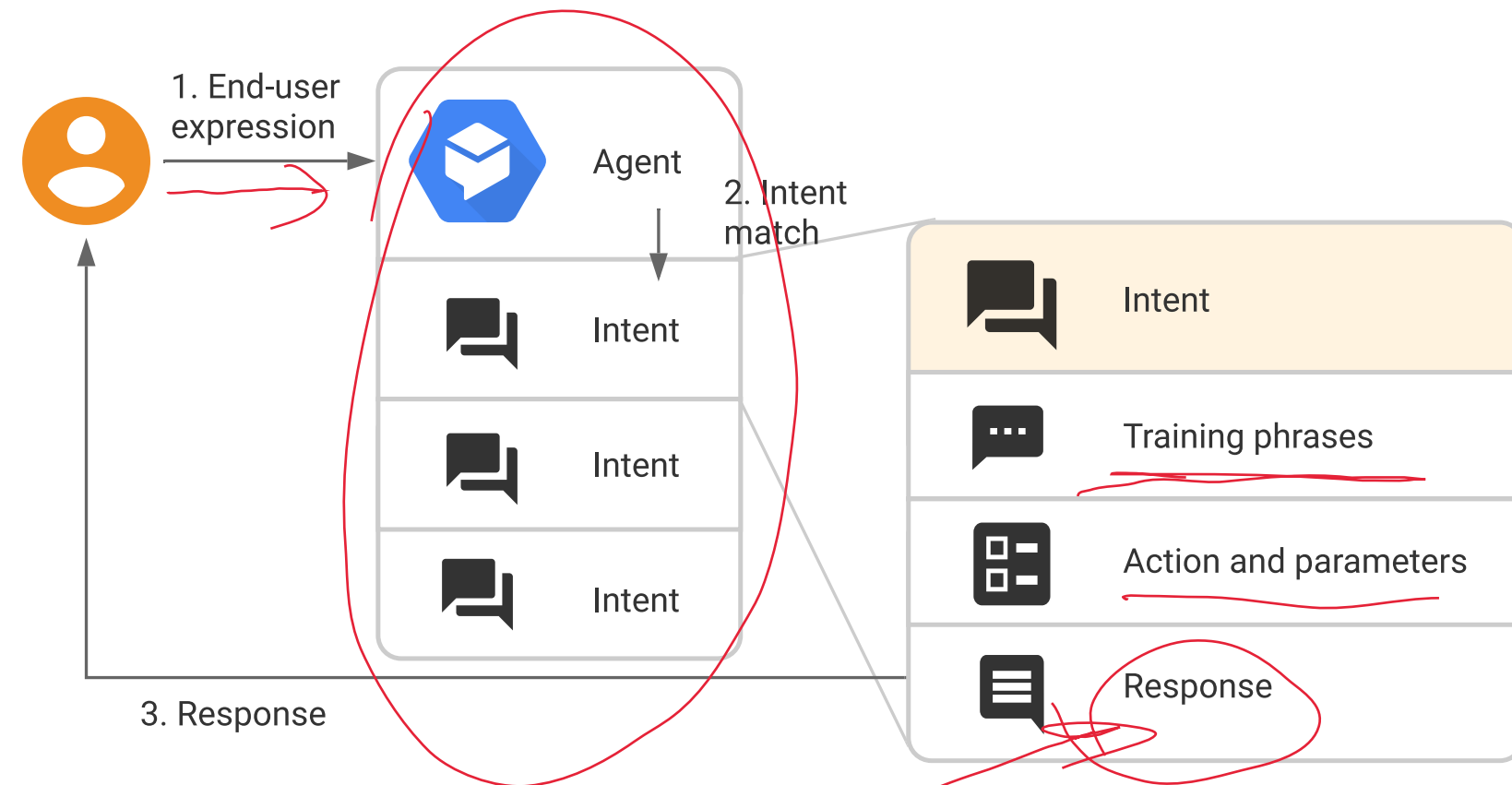


ource

How does Dialogflow work?⁸

The process within Dialogflow involves:

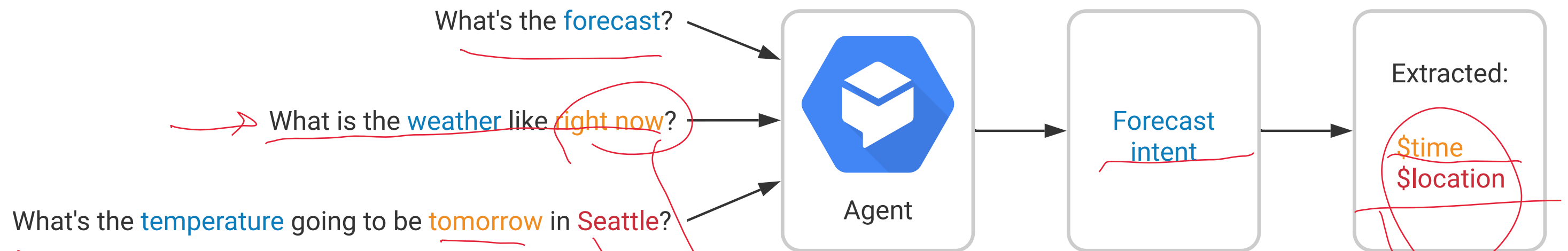
1. User expression
2. Intent matching
3. System response



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

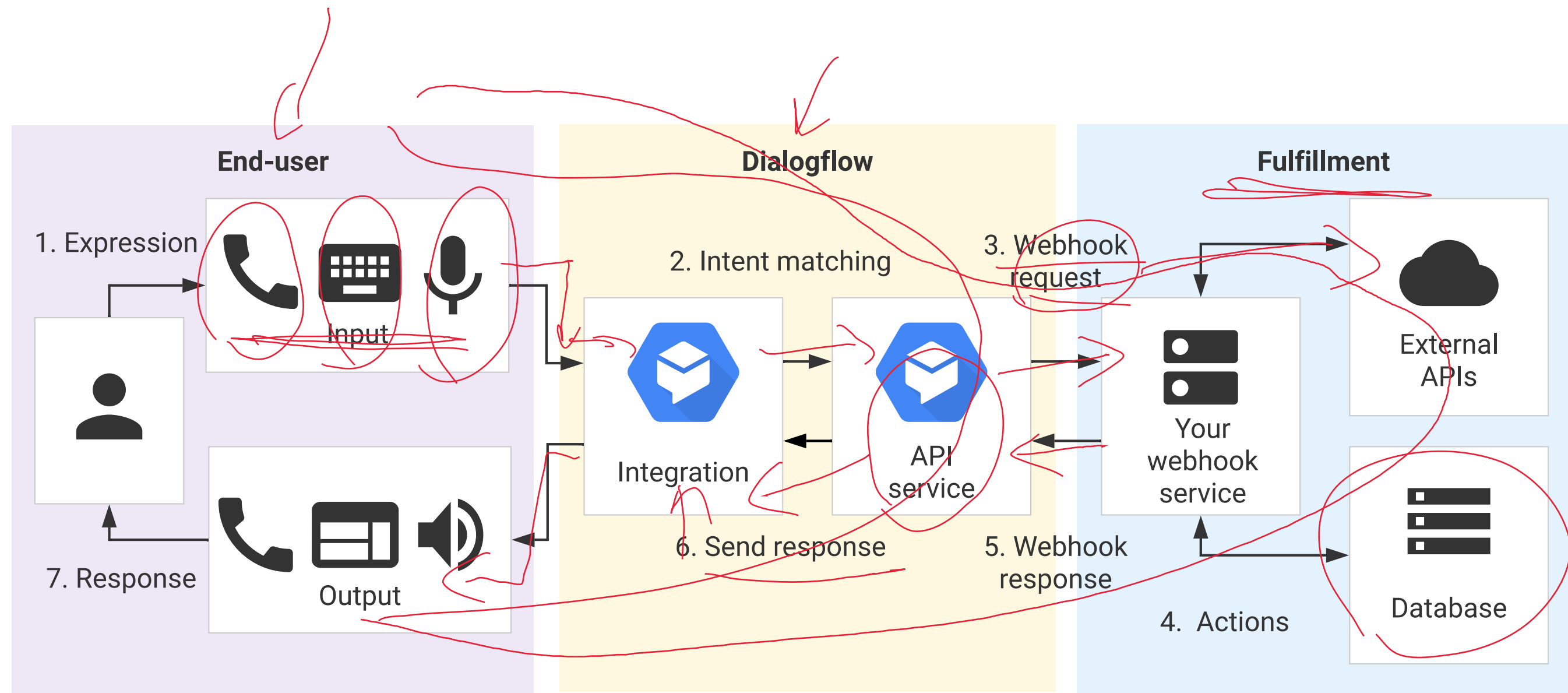


⁹ Image source

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

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

The End-to-end Dialogflow Workflow¹⁰





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

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-jmmvnmw
Service Account	dialogflow-cpgcaj@cs639demoagent-jmmvnmw.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 displays the Dialogflow console interface for a 'RobotPlanner' agent. The left sidebar contains navigation options: RobotPlanner (selected), Intents, Entities, Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta], History, Analytics, and Prebuilt Agents. The main content area shows the 'Export and Import' settings, which are circled in red. The 'en' language is selected. A 'SAVE' button is located in the top right corner. The 'Export and Import' section includes 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.).

Dialogflow

RobotPlanner

en

Intents

Entities

Knowledge [beta]

Fulfillment

Integrations

Training

Validation [beta]

History

Analytics

Prebuilt Agents

General Languages ML Settings **Export and Import** Speech Share Advanced

SAVE

Try it now

Please use test console above to try a sentence.

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

Agent Speech

The screenshot shows the Dialogflow console interface for a 'RobotPlanner' agent. The left sidebar contains navigation options: RobotPlanner (selected), Intents, Entities, Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta], History, Analytics, Prebuilt Agents, and Small Talk. The main content area is titled 'RobotPlanner' and has a 'SAVE' button. Below the title are tabs for General, Languages, ML Settings, Export and Import, Speech (selected), Share, and Advanced. The 'Speech' tab is divided into three sections: 'IMPROVE SPEECH RECOGNITION QUALITY', 'TEXT TO SPEECH', and 'VOICE CONFIGURATION'. In the 'VOICE CONFIGURATION' section, the 'Agent Language' dropdown menu is circled in red and currently shows 'en (English)'. Other settings include 'Enable Enhanced Speech Models and Data Logging' (disabled), 'Enable Auto Speech Adaptation [beta]' (disabled), and 'Output Audio Encoding' set to '16 bit linear PCM (signed, little-end...)'. A 'Try it now' button with a microphone icon is located in the top right corner. A note below it says 'Please use test console above to try a sentence.' and a link to 'See how it works in Google Assistant.' is provided.

Intents

What are intents?

Consider the following user requests:

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

weather - general - query

weather - rain - query

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

Dialogflow

RobotPlanner

en

Intents

Entities

Knowledge [beta]

Fulfillment

Integrations

Training

Validation [beta]

History

Analytics

Intents

CREATE INTENT

Try it now

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.

Please use test console above to try a sentence.

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

Default Fallback Intents

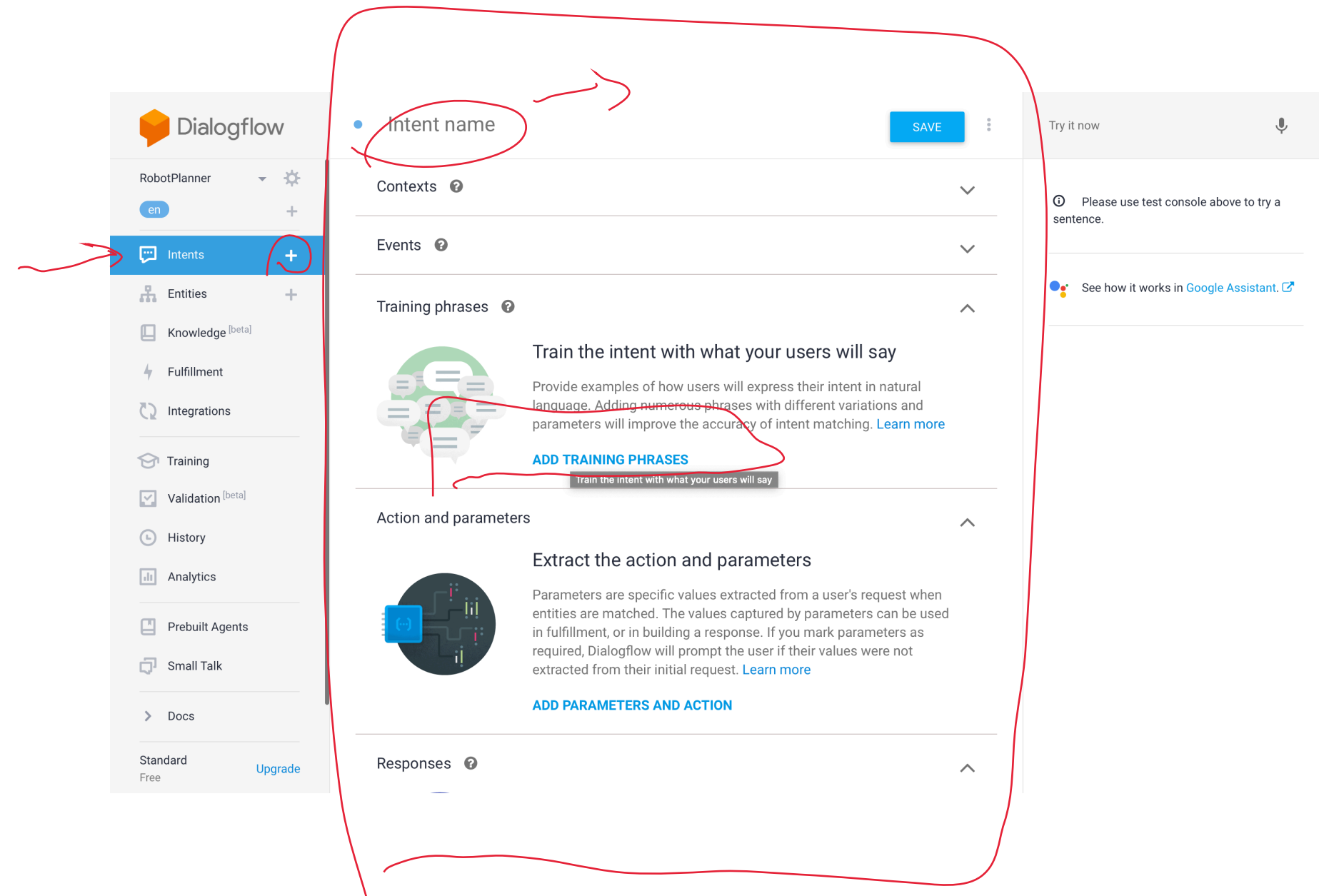
- Engaged if no other intents are recognized.
- Could be a result of not being able to "hear" the user, or unable to parse what they said.
- Can provide training examples of things that will serve as negative examples for your desired intents.

The screenshot displays the Dialogflow console interface. On the left is a navigation sidebar with options: RobotPlanner, Intents, Entities, Knowledge [beta], Fulfillment, Integrations, Training, Validation [beta], History, Analytics, and Prebuilt Agents. The main area is titled "Default Fallback Intent" and features a "SAVE" button. Below the title, there is a "Responses" section with a "DEFAULT +" button. A "Text Response" list is shown with 12 items, each with a number and a text response. Items 2, 3, and 4 are underlined in red. Item 3 is also underlined in blue. On the right side of the console, there is a "Try it now" button and a message: "Please use test console above to try a sentence." Below this is a link: "See how it works in Google Assistant."

Text Response
1 I didn't get that. Can you say it again?
2 I missed what you said. What was that?
3 Sorry, could you say that again?
4 Sorry, can you say that again?
5 Can you say that again?
6 Sorry, I didn't get that. Can you rephrase?
7 Sorry, what was that?
8 One more time?
9 What was that?
10 Say that one more time?
11 I didn't get that. Can you repeat?
12 I missed that, say that again?

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.

The screenshot shows a web interface for creating intents. At the top, there is a blue 'SAVE' button and a menu icon. Below the title 'Pickup Command', there is a search bar for 'Training phrases'. A list of phrases is displayed, each in a separate row. The phrases are: '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', and 'Pick up that red cube'. The words 'green' and 'red' in the last three phrases are highlighted in yellow. Handwritten red annotations include a large bracket on the left side of the list, arrows pointing to the highlighted words, and circles around the words 'green' and 'red' in the last three phrases. A trash icon is visible at the end of the 'Please get the green ball' row.

Test

Test your agent using the Default Welcome Intent

The screenshot displays the Dialogflow console interface. On the left is a navigation sidebar with options like Intents, Entities, Knowledge, Fulfillment, Integrations, Training, Validation, History, Analytics, Prebuilt Agents, Small Talk, Docs, and account settings. The main area shows the 'Intents' page for 'CS639DemoAgent'. A list of intents includes 'Default Fallback Intent' and 'Default Welcome Intent'. Below the list, there is an informational message: '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.' On the right, the 'Try it now' panel is active, showing a simulated user input 'Hello!' and the agent's default response 'Hi! How are you doing?'. The 'Default Welcome Intent' and its associated action 'input.welcome' are visible in the details below. A red hand-drawn box highlights the 'Try it now' panel and the 'Default Welcome Intent' in the list.

Entities

What are entities?

Let's consider those requests again.

- How do I get to *Middleton*? destination (location)
 - What is the price of a *basketball*? price - query (object)
 - Buy one box of tissues from Amazon. purchase (item, service, amount)
-

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, *today*

Entities in Dialogflow

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

The screenshot shows the Dialogflow interface for defining entities. The left sidebar has a menu with 'Entities' highlighted in blue and circled in red. The main area has a header with 'Entity name' circled in red and the handwritten word 'object' next to it. Below the header are several checkboxes: 'Define synonyms' (checked), 'Regex entity', 'Allow automated expansion', and 'Fuzzy matching'. A message box says 'Separate synonyms by pressing the enter, tab or ; key.' Below this is a table with four rows, each with a red arrow pointing to the input field and a 'Click here to edit entry' link. At the bottom left is a '+ Add a row' link. The right sidebar has a 'Try it now' button and a test console with instructions: 'Please use test console above to try a sentence.' and a link to '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	<input type="text" value="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.

” 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.



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

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.

The screenshot shows a 'Training phrases' interface with a search bar and a list of phrases. The phrases are: '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', and 'Pick up that red cube'. The phrases 'Take that.', 'Grab this from me.', 'Please get the green ball', and 'Get the green ball' are circled in red. The phrases 'Please get the green ball' and 'Get the green ball' are also enclosed in a larger red box. The phrase 'Grab the toy' is crossed out with a red line.

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*.

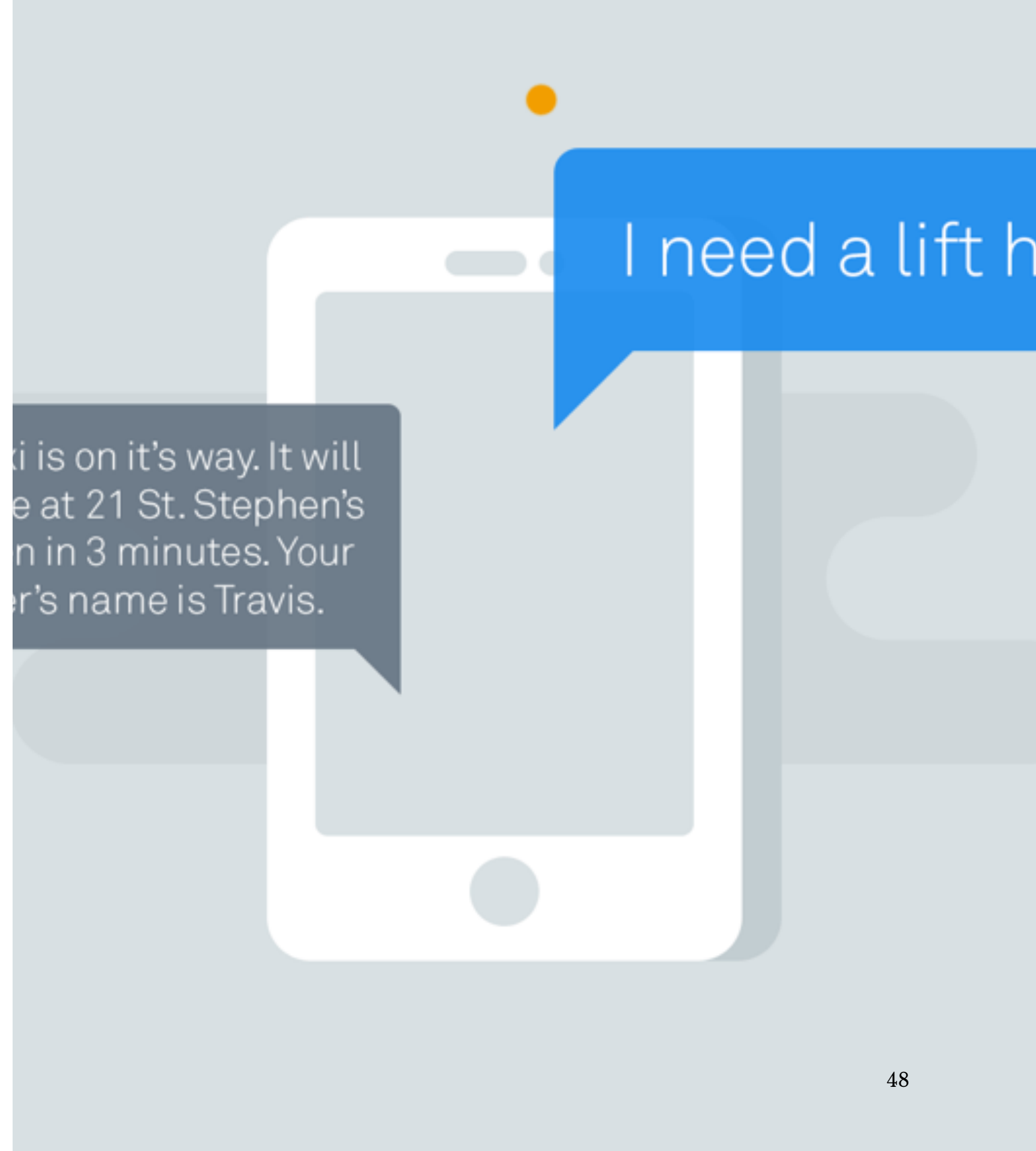
- Dialogflow α — Develop specifications
- Dialogflow β — Implementation
- Dialogflow γ — User evaluation

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

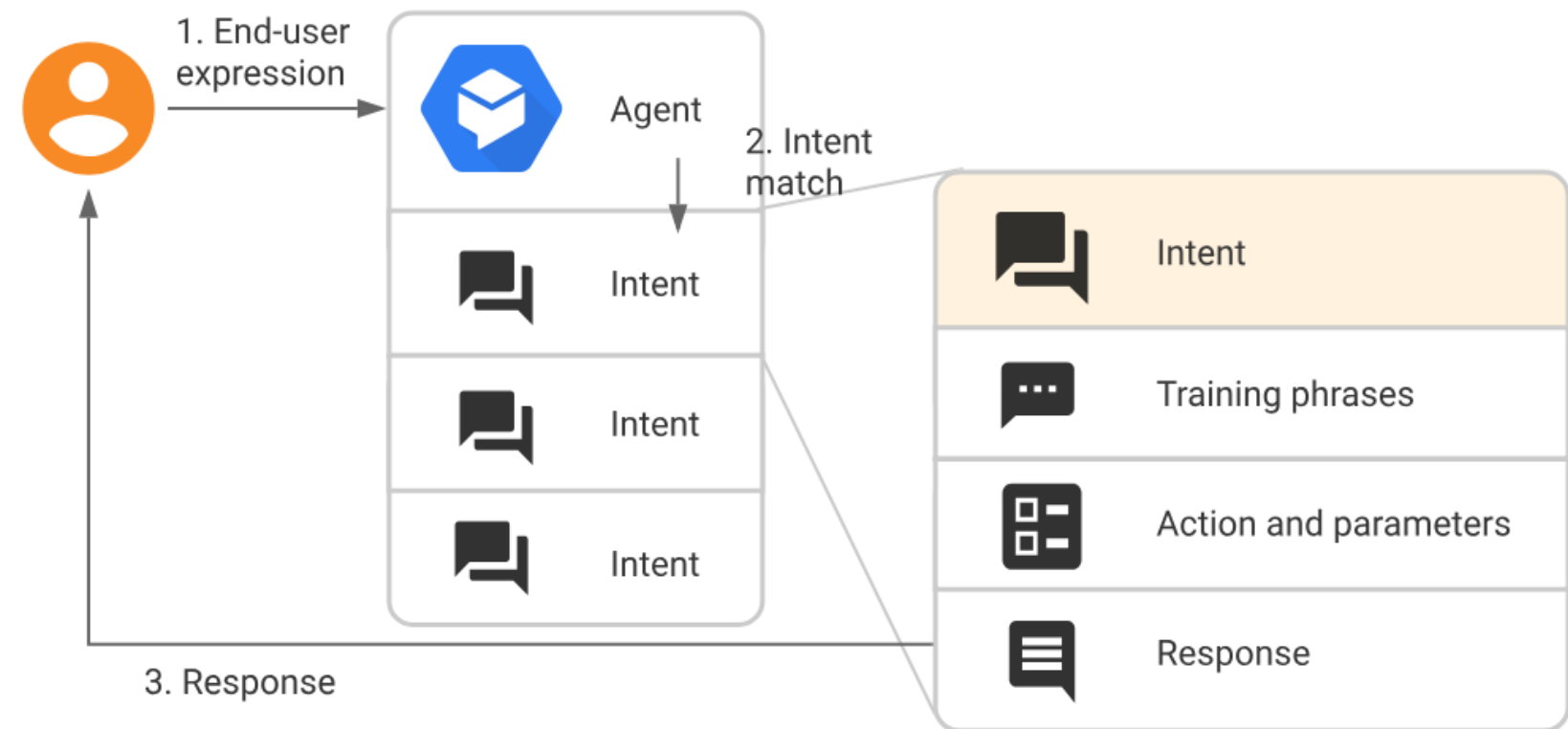


Capabilities

- 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 .



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
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- Dialogflow Building Blocks, Part 1
- Let's Make an Agent
- Assignment Preview