Talking to Tulips

How we built Google Tulip using Serverless technology and Machine Learning

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Google Tulip

Introducing
Google Tulip

Matt Feigal

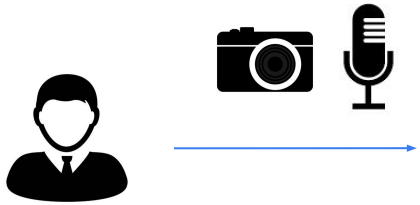
Founder & CTO Google Tulip

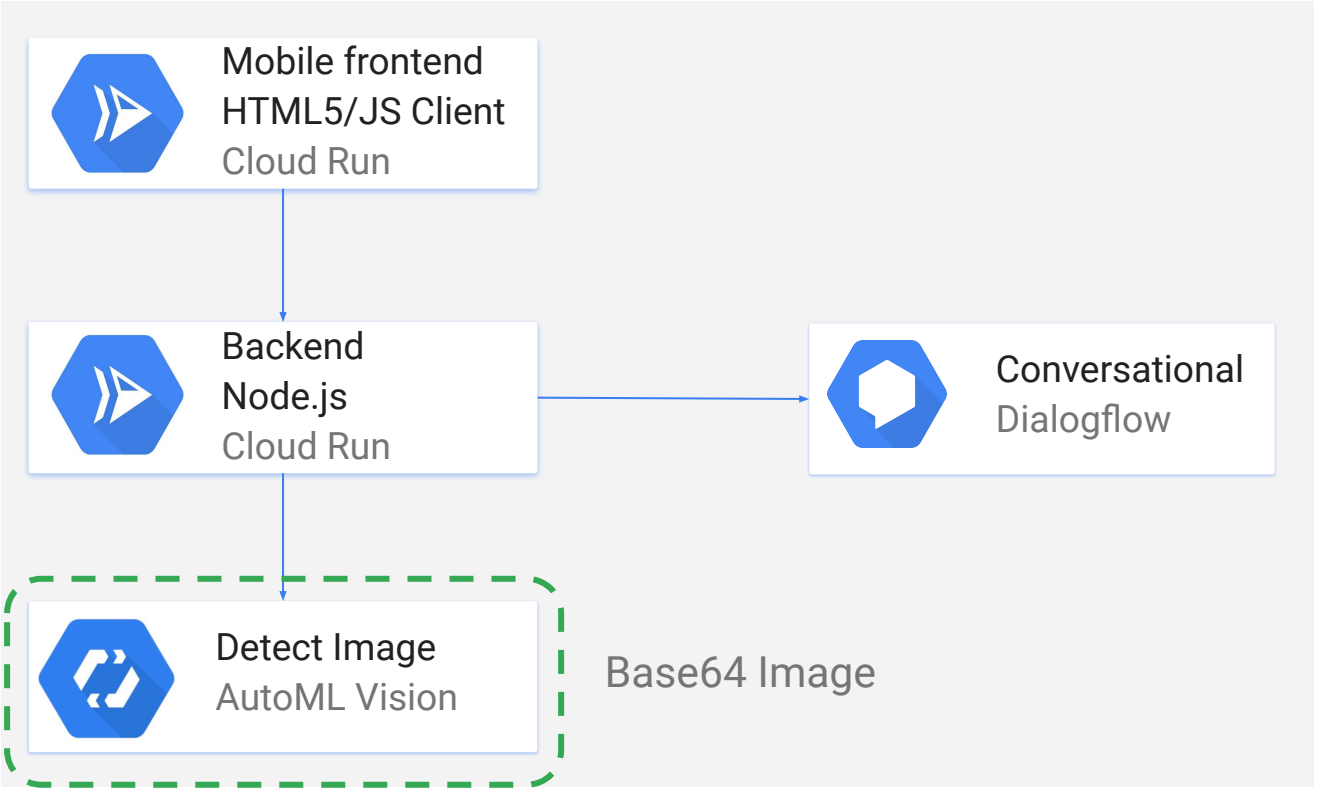
Google Tulip

One Giant Leap for Plant-kind

https://github.com/GoogleCloudPlatform/tulip

Architecture





Google Tulip

your data + your model

TensorFlow

your data + our models

AutoML

our data + our models

Vision API

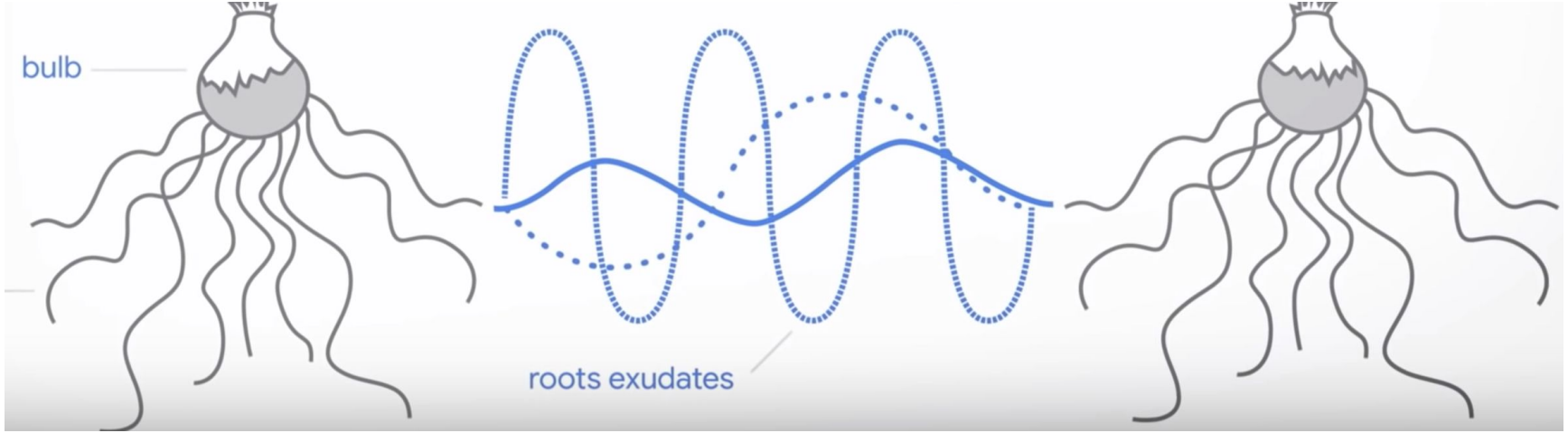
Build your own models

Train on state-of-the-art models

Call pretrained models

AutoML Demo

And when we get sensor data again...



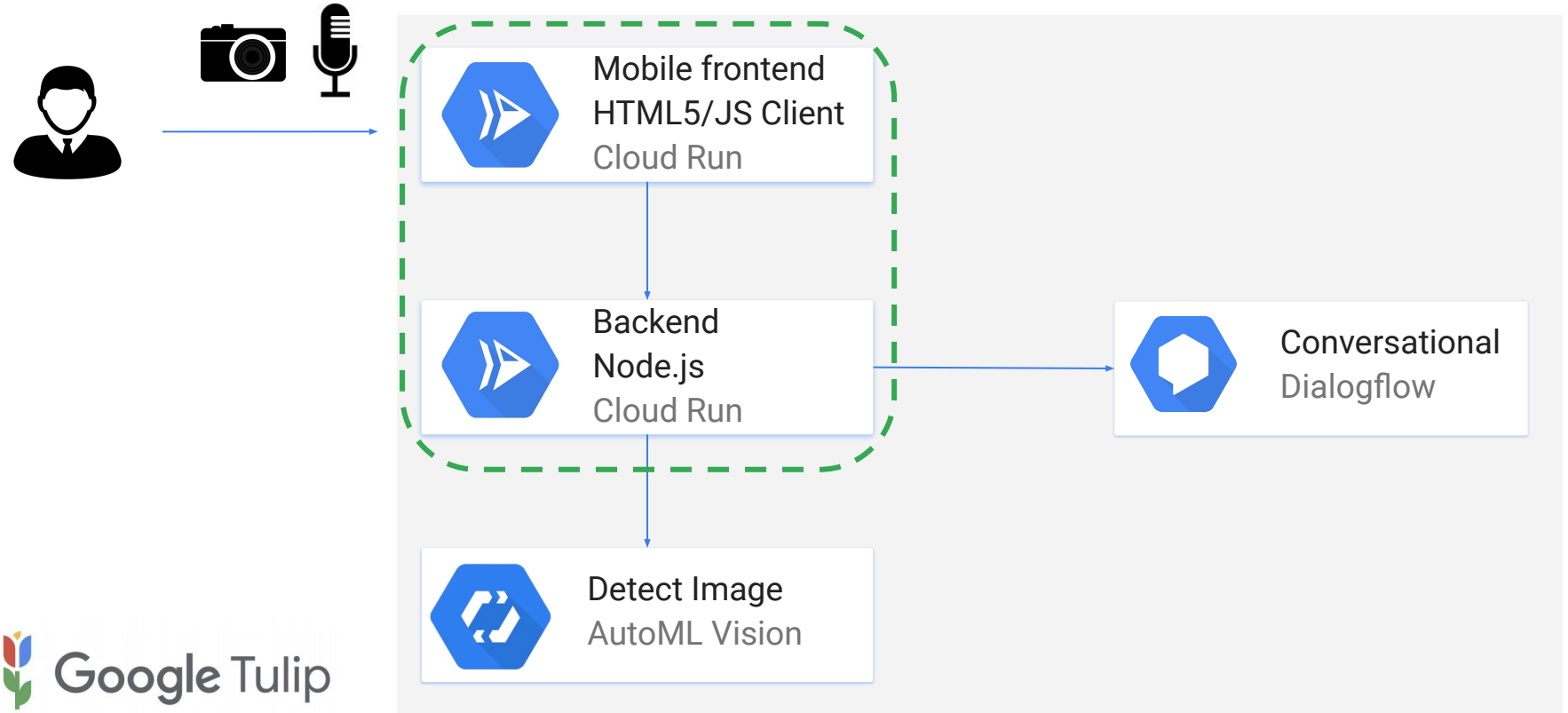
Google Tulip

Christiaan Hees

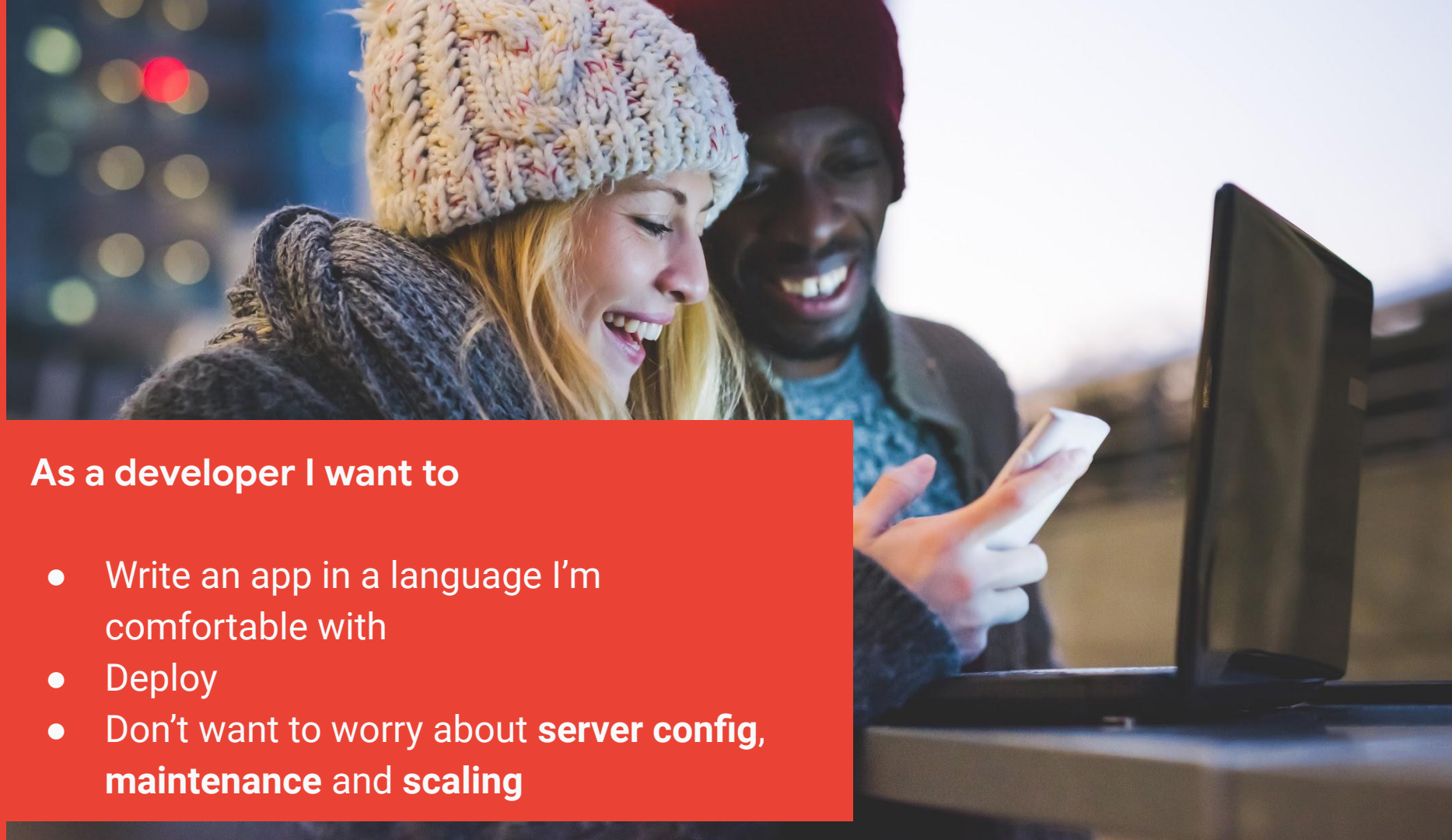
VP of Infrastructure, Google Tulip

Google Tulip

Architecture



Google Tulip



As a developer I want to

- Write an app in a language I'm comfortable with
- Deploy
- Don't want to worry about **server config**, **maintenance** and **scaling**

Cloud Run

- Serverless platform
- Years of experience from GAE, GAE Flex and Cloud Functions
- Auto scales (also down to 0)
- Not just functions
- Any web app you can put in a container

- Add a Dockerfile and deploy
- Google handles the rest

Google Tulip

Example Dockerfile

```
1   FROM node:11.15-alpine
2
3   WORKDIR /app/
4   COPY package.json ./
5   COPY yarn.lock ./
6   RUN yarn install
7
8   COPY . .
9   RUN yarn run build
10
11  CMD node dist/server/server.js
```

Build & Deploy Containers

```
docker build -t gcr.io/<my-project>/tulip .
```

```
docker push gcr.io/<my-project>/tulip
```

```
gcloud beta run deploy tulip \
--image gcr.io/<my-project>/tulip
```

Google Tulip

Google Cloud Platform

project-shunkaen

Cloud Build

History

Triggers

Settings

Edit trigger

DISABLE

DELETE

Source: Cloud Source Repository

Repository: https://source.d

View triggered builds

Name

Push to cloudrun branch

Trigger type

- (●) Branch
- ( ) Tag

Branch (regex)

Matches the branch: cloudrun

[ ] Invert Regex

cloudrun

Customer Case

- Heavily regulated
- ~~Personally~~ Plant Identifying Information (PII)
- General Plant Protection Regulation (GPPR)
- Use existing Kubernetes infra

Knative

open source building blocks

for **serverless on Kubernetes**

Google Tulip

Serverless on Kubernetes **Everywhere**

Cloud Run

Fully managed, deploy your workloads and don't see the cluster.

Cloud Run on GKE

Deploy into your GKE cluster, run serverless side-by-side with your existing workloads.

Cloud Run Everywhere Else

Use the same APIs and tooling anywhere you run Kubernetes with Knative.

Google Cloud Platform project-shunkaen

Cloud Run ← Service details DEPLOY NEW REVISION

tulip Location: europe-west4-c GKE Cluster: cloud-run-cluster Namespace: default URL: https://tulip.dev

METRICS REVISIONS LOGS DETAILS

Revisions

Filter revisions

	Name	Traffic	Deployed
◉	tulip-g2wqb	100%	4 minutes ago
○	tulip-zmwjx	0%	23 hours ago

DETAILS YAML

Container image URL	gcr.io/project-shunkaen/cloud-run-tulip@sha256:2c95...
Memory allocated	(default)
Concurrency	(system managed)
Request timeout	300 seconds
Service account	(system managed)

Environment variables

ML_MODEL_LOCATION	us-central1
PROJECT_ID	project-shunkaen
ML_MODEL_ID	ICN2578843068229442226

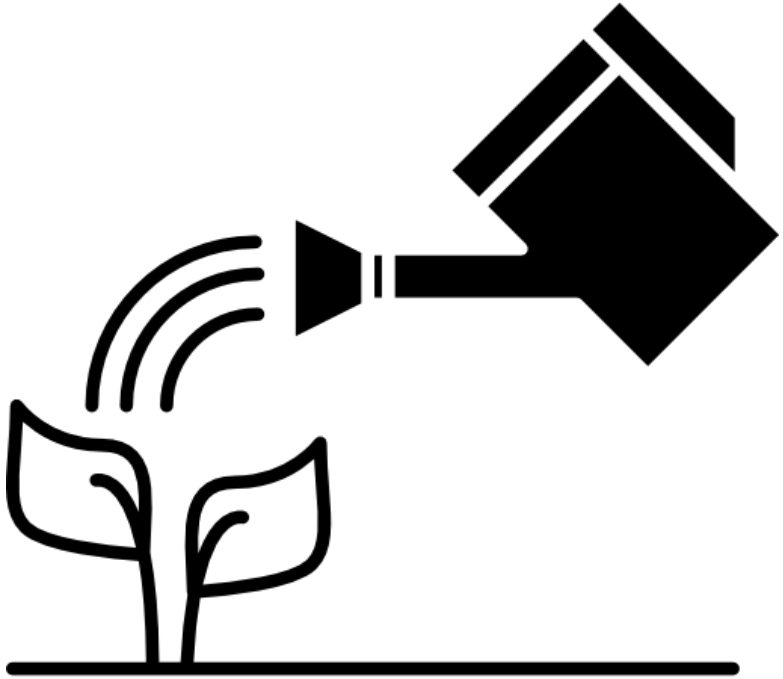
Google Tulip

Lee Boonstra

VP of Engineering, Google Tulip

Google Tulip

How does this work?



Google Tulip

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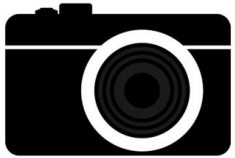
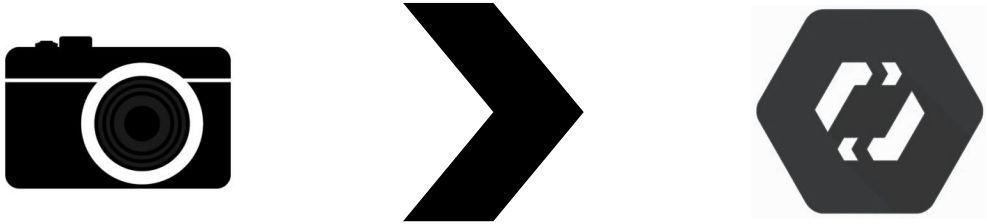


Point your mobile camera to a flower

Google Tulip

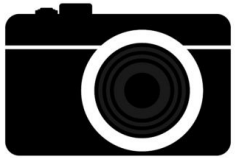
How does this work?

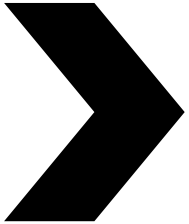


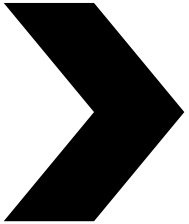
AutoML Vision detects the type of flower

Google Tulip

How does this work?



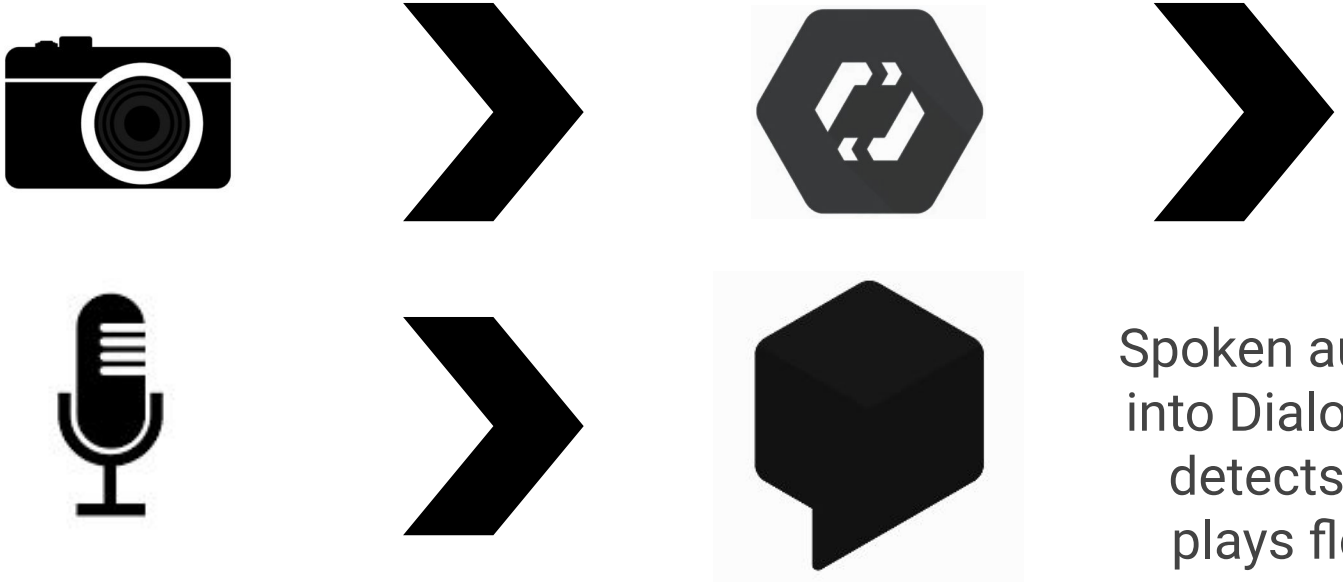




Talk to the flower via your mobile microphone

Google Tulip

How does this work?



Spoken audio streams into Dialogflow, which detects Intent and plays flower voice

Google Tulip

Dialogflow

project-shunkaen

en nl

Intents

Entities

Knowledge [beta]

Fulfillment

Integrations

Training

History

Analytics

Prebuilt Agents

Small Talk

Docs

Intents

CREATE INTENT

Search intents

1 OF 2

- About you
- Are you thirsty
- Cactus Intent
- Compliment intent
- Default Fallback Intent
- Default Welcome Intent
- Goodbye
- How are you greeting — Add follow-up intent
- how much water?
- Interview 0 (welcome)
- Interview 1 (humans, water)
- Interview 2 (famous)
- Interview 3 (Damaged)

Dialogflow

Internal only

project-shunkaen

en nl

Intents

Entities

Knowledge [beta]

Fulfillment

Integrations

Training

History

Analytics

Prebuilt Agents

Small Talk

Docs

Enterprise Essentials
Pay as You Go
Edit

Are you thirsty

SAVE

Add user expression

Do you need some water?

Want some water?

Want a drink?

Thirsty?

Do you want to drink something?

Are you thirsty?

Action and parameters

Responses

DEFAULT GOOGLE ASSISTANT +

Text response

1 Why yes. I'm always thirsty. What else would you like to know?

2 No, I'm hungry. Feed Me! Would you like to know something else?

Try it

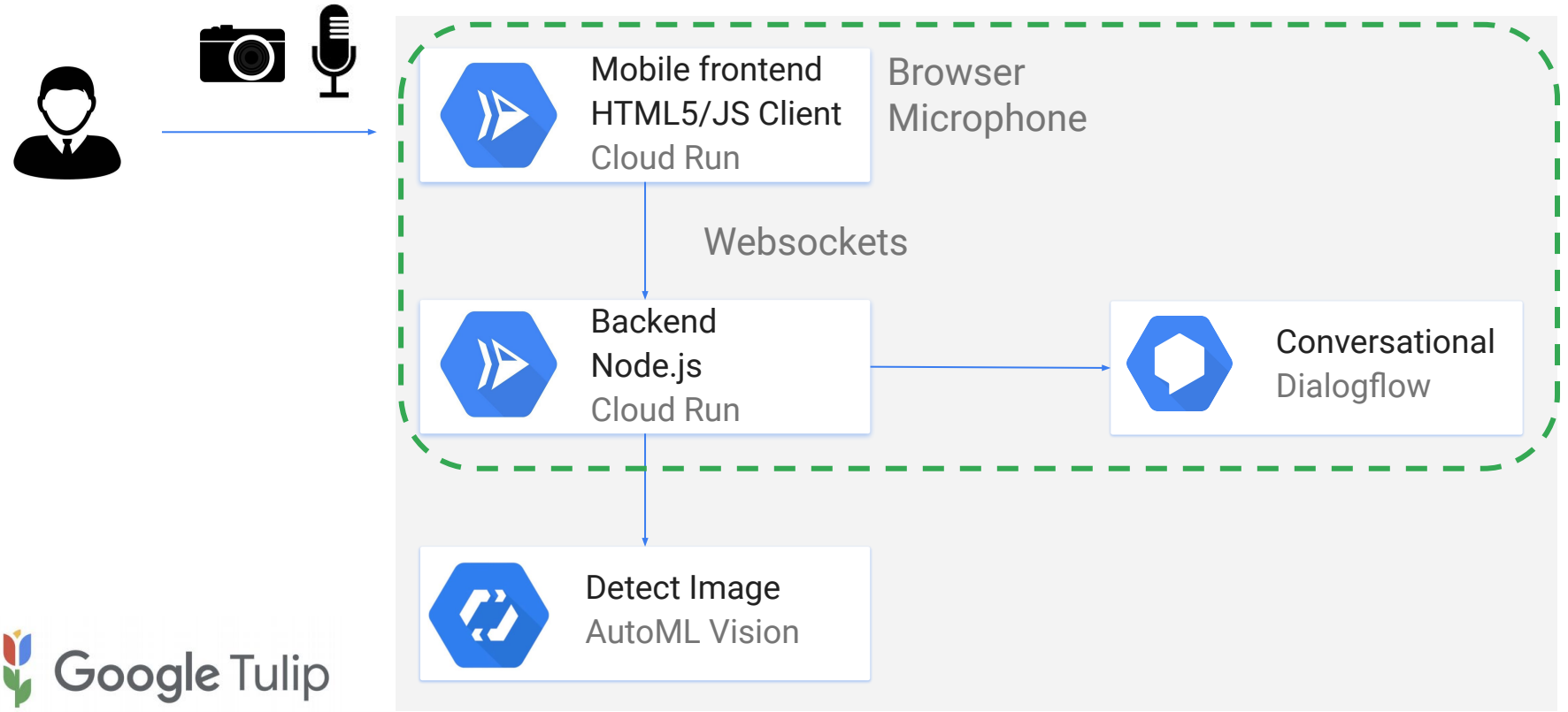
Environ

Draft

sente

Google Tulip Demo

Architecture



Google Tulip

Dialogflow SDK

```
const request = {
  session: this.sessionPath,
  queryInput: {
    audioConfig: {
      sampleRateHertz: 48000,
      audioEncoding: 'OUTPUT_AUDIO_ENCODING_LINEAR_16',
      languageCode: 'en_US',
    },
  },
  inputAudio: inputAudio,
  outputAudioConfig: {
    audioEncoding: 'OUTPUT_AUDIO_ENCODING_LINEAR_16',
    sampleRateHertz: 48000,
    synthesizeSpeechConfig: {
      voice: { ssmlGender: 'SSML_VOICE_GENDER_FEMALE' }
}}};
const [response] = await this.sessionClient.detectIntent(request);
```

Conclusion

In case you wondered. The Google Tulip Project is an April Fools joke.

However, with Google Cloud technology, like AutoML Vision, Cloud Run and Dialogflow STT, TTS we were close, in getting there.

Thank you!

More Info & Source Code

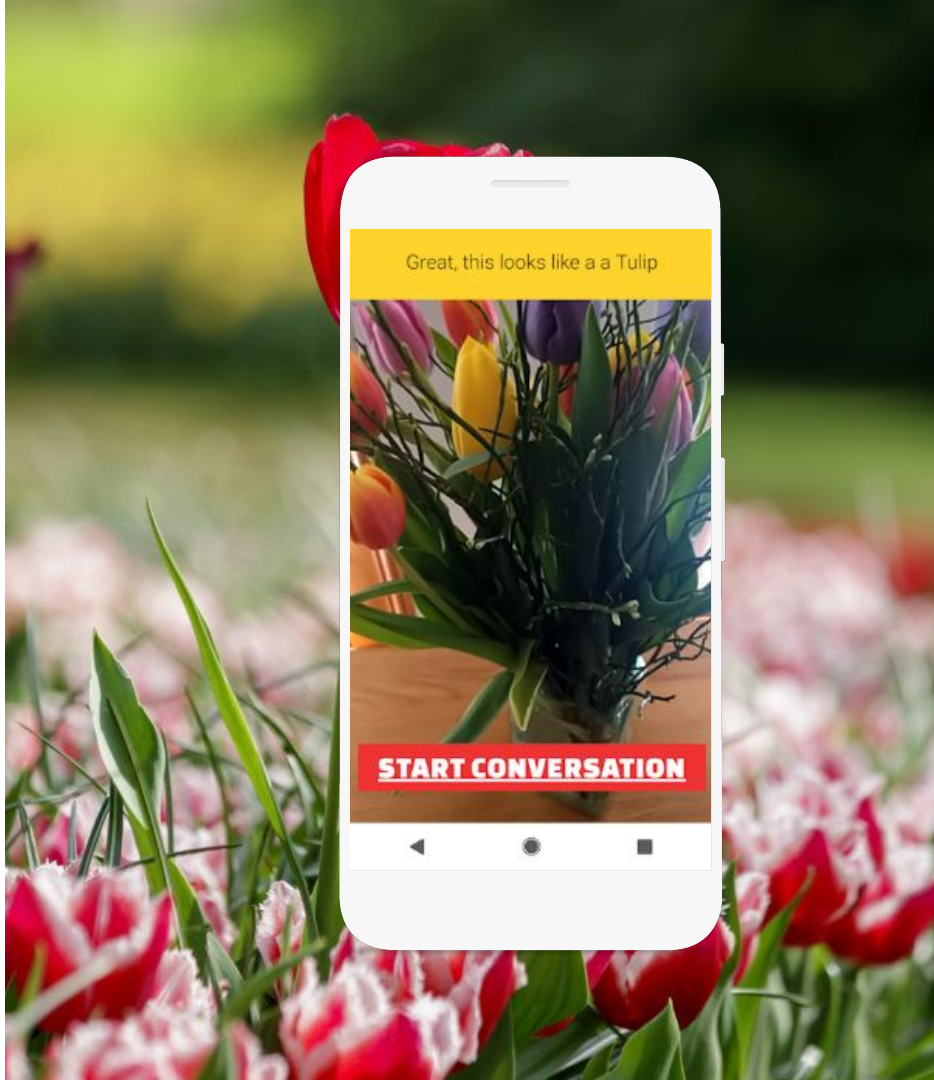
https://tulip.dev

https://github.com/GoogleCloudPlatform/tulip

Video

https://www.youtube.com/watch?v=nsPQvZm_rgM

Technical Blog post

https://medium.com/google-cloud/google-tulip-the-technical-details-719c317bf2df

Google Tulip