NovaTooth (Men-in-the-middle)

Henry, Rob, Trevor, Kevin, Albert

Introduction & Our Team

Kevin Chan: 4th Year Computer Engineering (Team Lead)

Trevor Morris: 4th Year Computer Engineering (Team Scribe)

Henry Yu: 3rd Year Computer Science

Robert Stosick: 4th Year Computer Engineering

Albert Chen: 4th Year Computer Engineering

Company & Mentor

novacoast

IT services and solutions company
located in downtown Santa Barbara

Renato Untalan
UCSB Computer Science ‘09

Development practices

GitHub

Google Drive

DISCORD

Visual Paradigm

slack

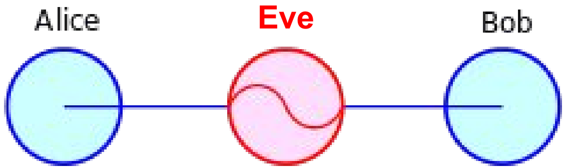
Trello

Bluetooth, Man-in-the-middle attacks & Security

Bluetooth®

A Man-In-The-Middle is a form of eavesdropping where communication between two users is monitored and modified by an unauthorized party.

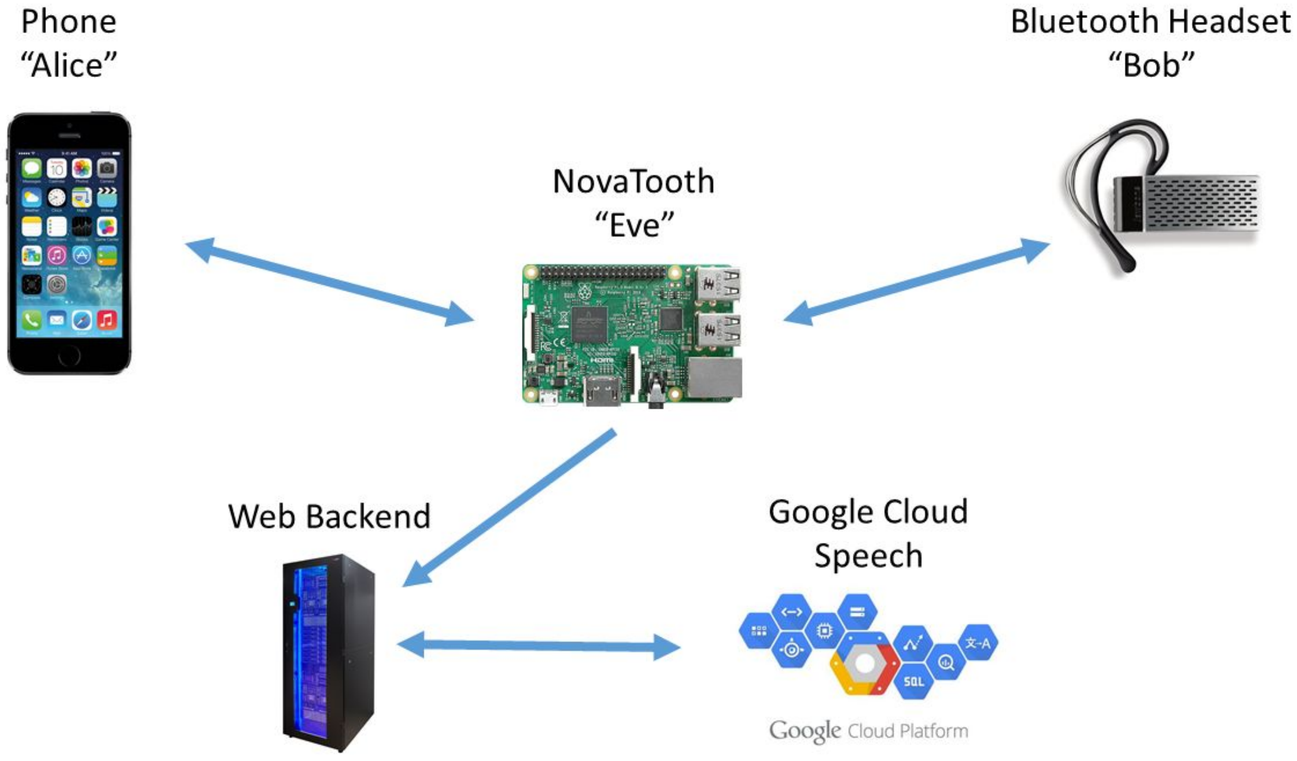
BlueZ



- Share data, voice, music, video, files
- Uses low power radio frequency, takes up very little energy

- Vulnerabilities
  - Eavesdropping
  - DoS
- Bluetooth range is bigger than you think - 100m

What's that got to do with us? Problem statement



Phone
"Alice"

Bluetooth Headset
"Bob"

NovaTooth
"Eve"

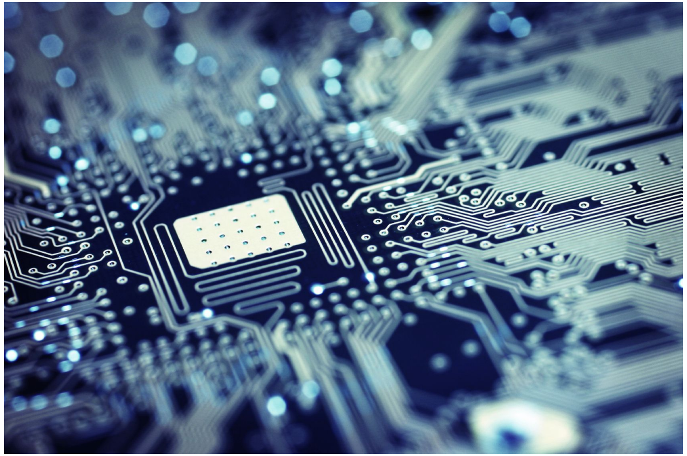
Web Backend

Google Cloud
Speech

Technology Overview

Main technologies

- Bluetooth profiles
- Bluetooth scanner
- Connecting to bluetooth media: 3 way handshake
- Connecting to bluetooth phone calls: oFono
- Manipulating and recording the audio
- Automating the entire process
- Web backend and text to speech



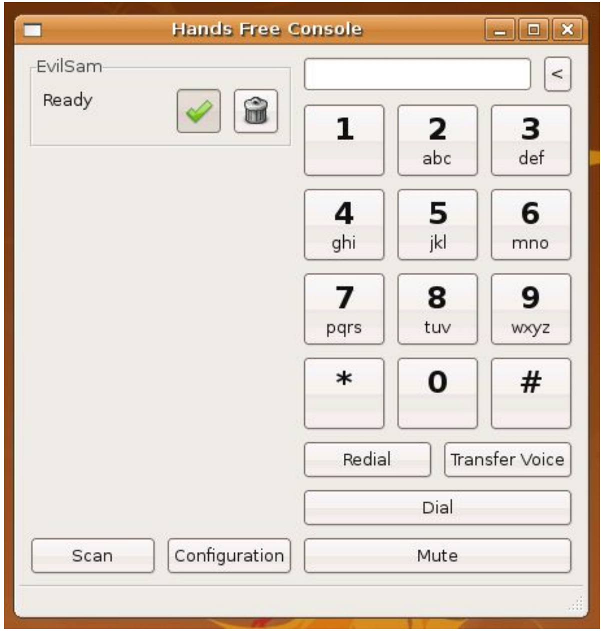
Bluetooth Profiles

A Bluetooth profile is a specification regarding an aspect of Bluetooth-based wireless communication between devices. It resides on top of the Bluetooth Core Specification and additional protocols

A2DP: Advanced Audio Distribution Profile (Media)

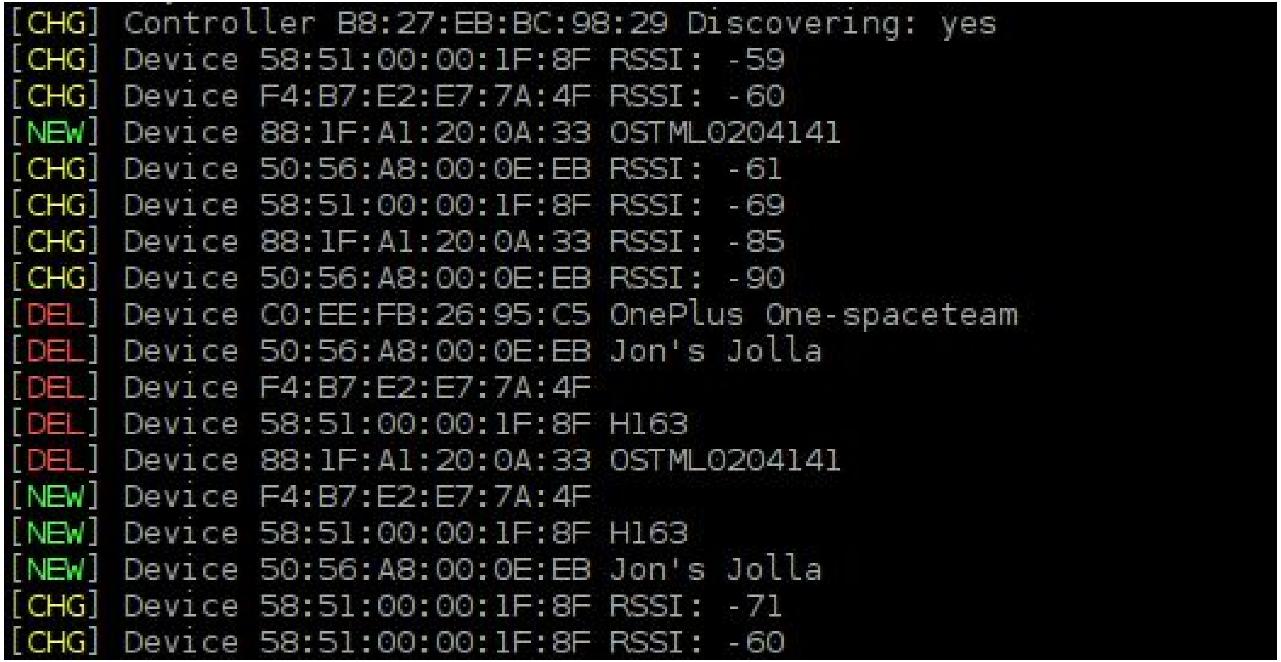
HFP: Hands Free Profile (Phone calls)

HSP: Headset Profile



Bluetooth Scan

Bluetoothctl scan on: List of available devices to connect to



```
[CHG] Controller B8:27:EB:BC:98:29 Discovering: yes
[CHG] Device 58:51:00:00:1F:8F RSSI: -59
[CHG] Device F4:B7:E2:E7:7A:4F RSSI: -60
[NEW] Device 88:1F:A1:20:0A:33 OSTML0204141
[CHG] Device 50:56:A8:00:0E:EB RSSI: -61
[CHG] Device 58:51:00:00:1F:8F RSSI: -69
[CHG] Device 88:1F:A1:20:0A:33 RSSI: -85
[CHG] Device 50:56:A8:00:0E:EB RSSI: -90
[DEL] Device C0:EE:FB:26:95:C5 OnePlus One-spaceteam
[DEL] Device 50:56:A8:00:0E:EB Jon's Jolla
[DEL] Device F4:B7:E2:E7:7A:4F
[DEL] Device 58:51:00:00:1F:8F H163
[DEL] Device 88:1F:A1:20:0A:33 OSTML0204141
[NEW] Device F4:B7:E2:E7:7A:4F
[NEW] Device 58:51:00:00:1F:8F H163
[NEW] Device 50:56:A8:00:0E:EB Jon's Jolla
[CHG] Device 58:51:00:00:1F:8F RSSI: -71
[CHG] Device 58:51:00:00:1F:8F RSSI: -60
```

Bluetooth media connection: 3-way Handshake

Using Bluetoothctl

First, scan for devices first, then…

Pair: allows device to communicate
Trust: allows device to establish connection
Connect: fully connected, able to send data

Bluetooth Phone calls: Ofono

- Ofono is a “mobile telephony API” that uses the D-Bus interprocess communication system
- It provides the APIs we need to allow Kali to support the Hands-Free Profile (HFP) and emulate a Bluetooth headset

Recording the audio

PulseAudio

Pulseaudio: sound server running in a background process that accept multiple sound sources and redirects them to sound systems

1. Turn on pulseaudio
2. Listen to media/phone sound source
3. Redirect source to microphone output
4. Select which output to record
5. Use pulseaudio recording system (pavucontrol) to record output as mp3

Web Backend - Technologies

django

python™

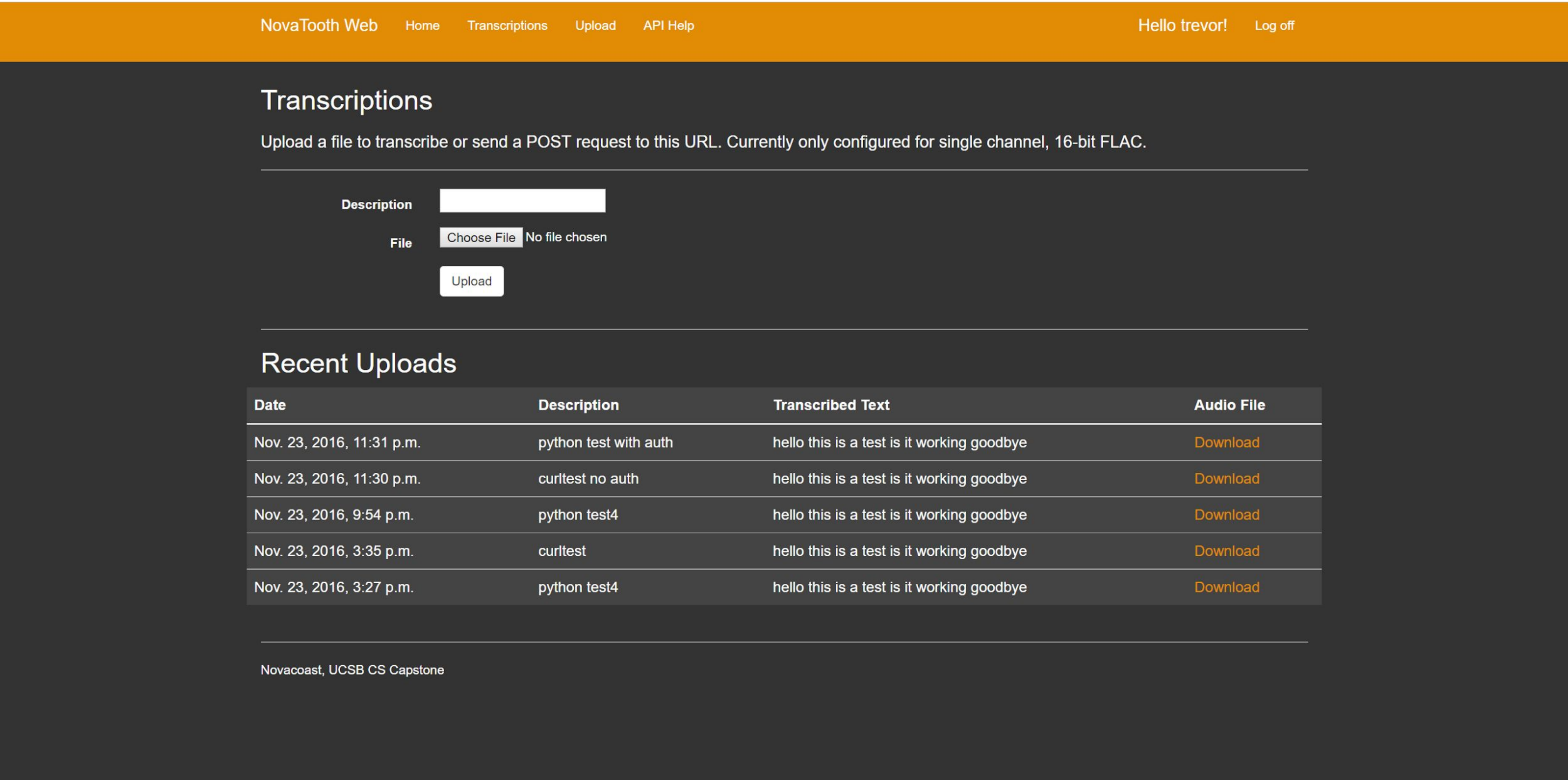
amazon web services

Google Cloud Platform

TASTYPIE

SQLite

Web Backend - Interface



Transcriptions

Upload a file to transcribe or send a POST request to this URL. Currently only configured for single channel, 16-bit FLAC.

Recent Uploads

Date	Description	Transcribed Text	Audio File
Nov. 23, 2016, 11:31 p.m.	python test with auth	hello this is a test is it working goodbye	Download
Nov. 23, 2016, 11:30 p.m.	curltest no auth	hello this is a test is it working goodbye	Download
Nov. 23, 2016, 9:54 p.m.	python test4	hello this is a test is it working goodbye	Download
Nov. 23, 2016, 3:35 p.m.	curltest	hello this is a test is it working goodbye	Download
Nov. 23, 2016, 3:27 p.m.	python test4	hello this is a test is it working goodbye	Download

Novacoast, UCSB CS Capstone

Automating the entire process

Python scripting

1. Start bluetooth, pulseaudio, ofono services
2. Establish bluetooth connection for media and phone calls
3. Set up sound input and output streams

Bash scripting:

1. Start the recording
2. Output to mp3
3. Upload the mp3 to backend

Tests

Bluetooth scan started?
-test by detecting nearby bluetooth devices

Bluetooth media connected?
-test by playing music media

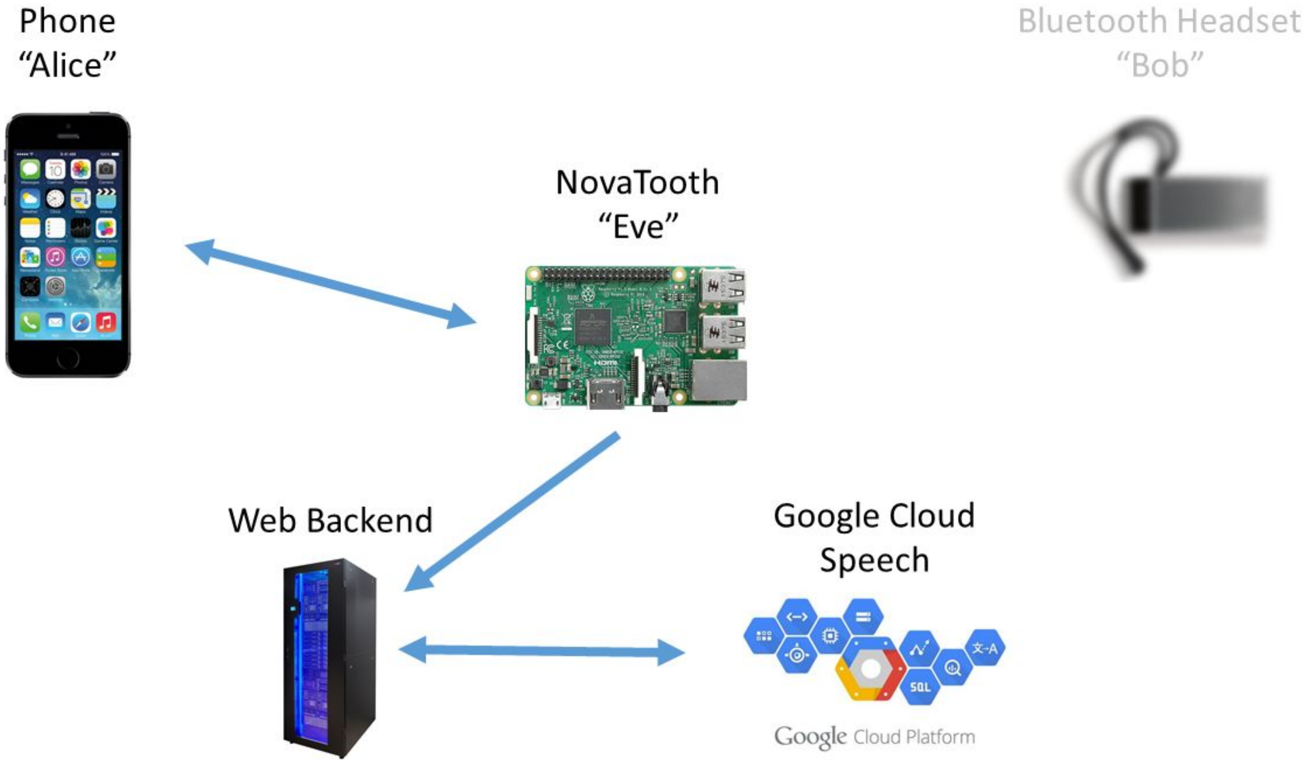
Bluetooth phone connected?
-test by making a phone call

Record audio stream?
-verifying recorded mp3 is not empty

Future Goals and Vision

- Full functionality
- Self-containment
- Statistical Analysis
- Correctness Testing

Demo.



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https://drive.google.com/drive/folders/0B89ugIl8FwyMZ1h1MlhFWHpkZzA