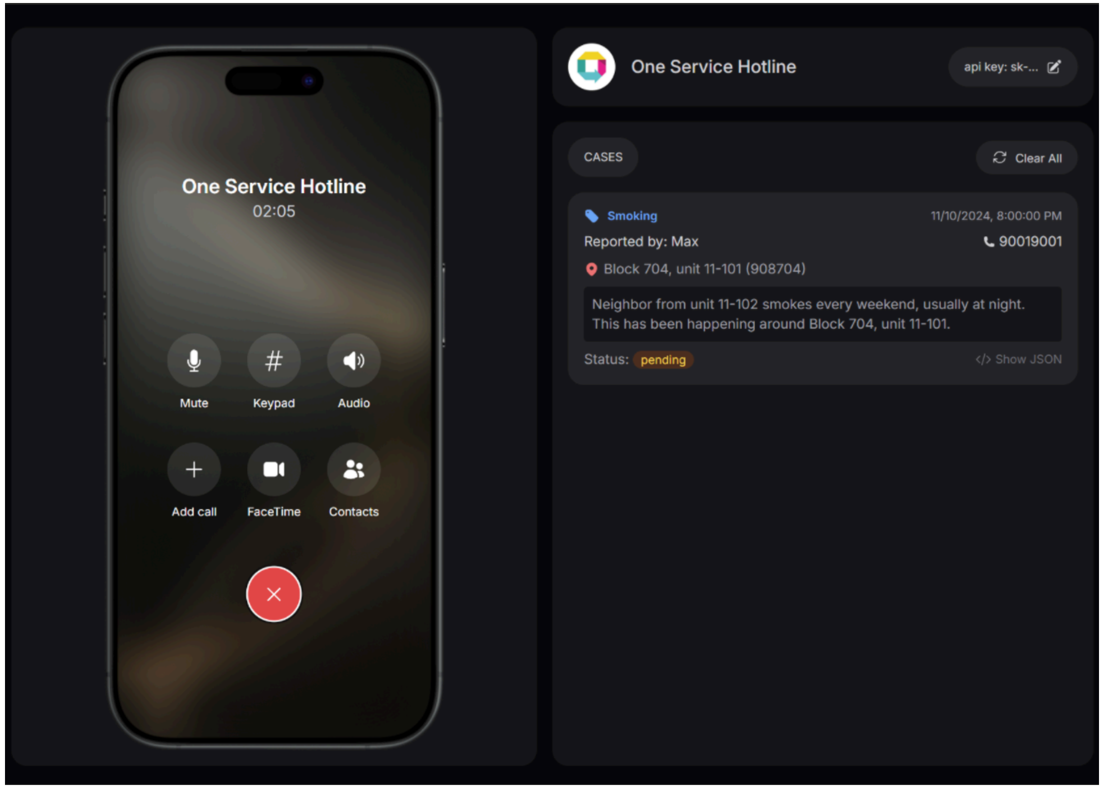
Oneservice Hotline v0.1

Helpful AI assistant to submit cases on municipal issues.

First prize winner of GovTech x OpenAI Hackathon 2024



Smoking 11/10/2024, 8:00:00 PM

Reported by: Max ☎ 90019001

Block 704, unit 11-101 (908704)

Neighbor from unit 11-102 smokes every weekend, usually at night. This has been happening around Block 704, unit 11-101.

Status: pending

About Us

Group of aspiring young engineers

- Ong Zheng Kai
- Wong Zhao Wu, Bryan (looking for Summer Intern 2025!)
- Oh Tien Cheng
- Muhammad Faqih Akmal

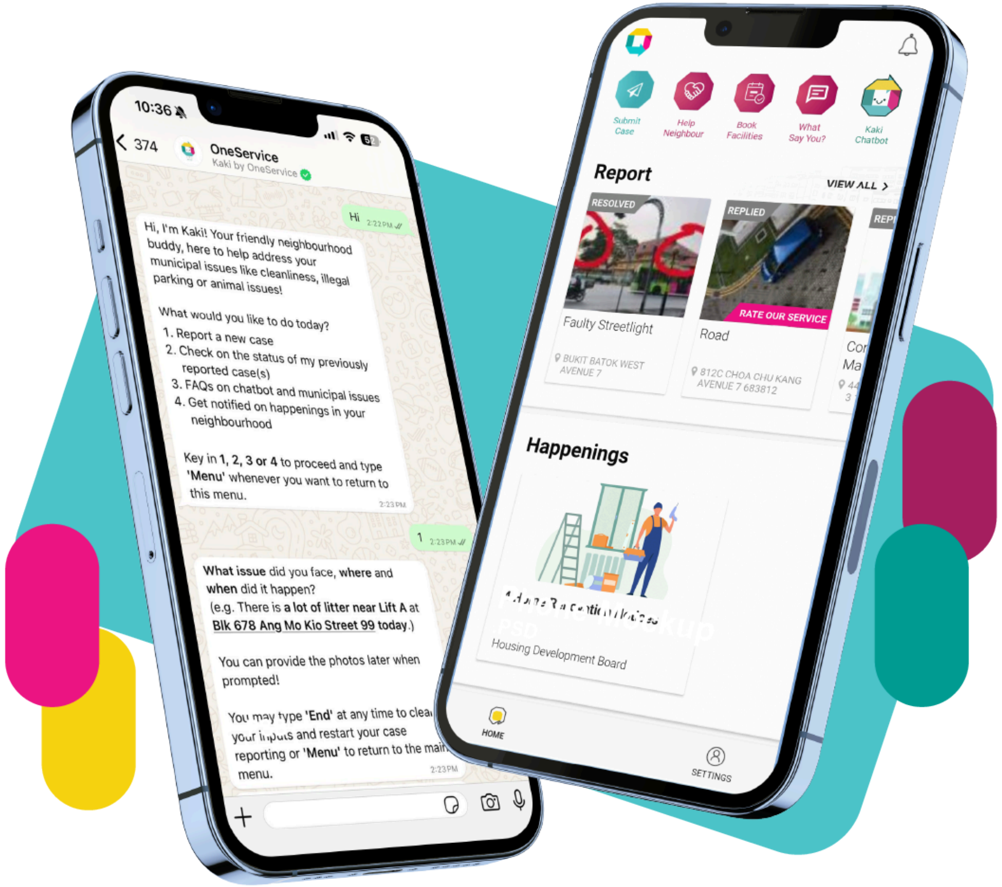
Problem Statement

How might we enable **elderly users** in submitting **municipal cases or feedback** without requiring them to navigate the OneService App, which can be challenging due to **limited digital literacy**?

Existing Platform

- The OneService App & Chatbot is a one-stop platform that lets citizens feedback on municipal issues.
- Perfect for majority of citizens.

https://www.smartnation.gov.sg/initiatives/oneservice-app/



Hi 2:22 PM

Hi, I'm Kaki! Your friendly neighbourhood buddy, here to help address your municipal issues like cleanliness, illegal parking or animal issues!

What would you like to do today?

1. Report a new case
2. Check on the status of my previously reported case(s)
3. FAQs on chatbot and municipal issues
4. Get notified on happenings in your neighbourhood

Key in **1, 2, 3 or 4** to proceed and type **'Menu'** whenever you want to return to this menu. 2:23 PM

1 2:23 PM

What issue did you face, **where** and **when** did it happen?
(e.g. There is **a lot of litter near Lift A** at **Blk 678 Ang Mo Kio Street 99 today**.)

You can provide the photos later when prompted!

You may type **'End'** at any time to clea your inputs and restart your case reporting or **'Menu'** to return to the main menu. 2:23PM

The Average Elderly

- Has a smartphone, but not technologically savvy.
- Has a lot of feedback to improve the community.
- Loves to call their friends

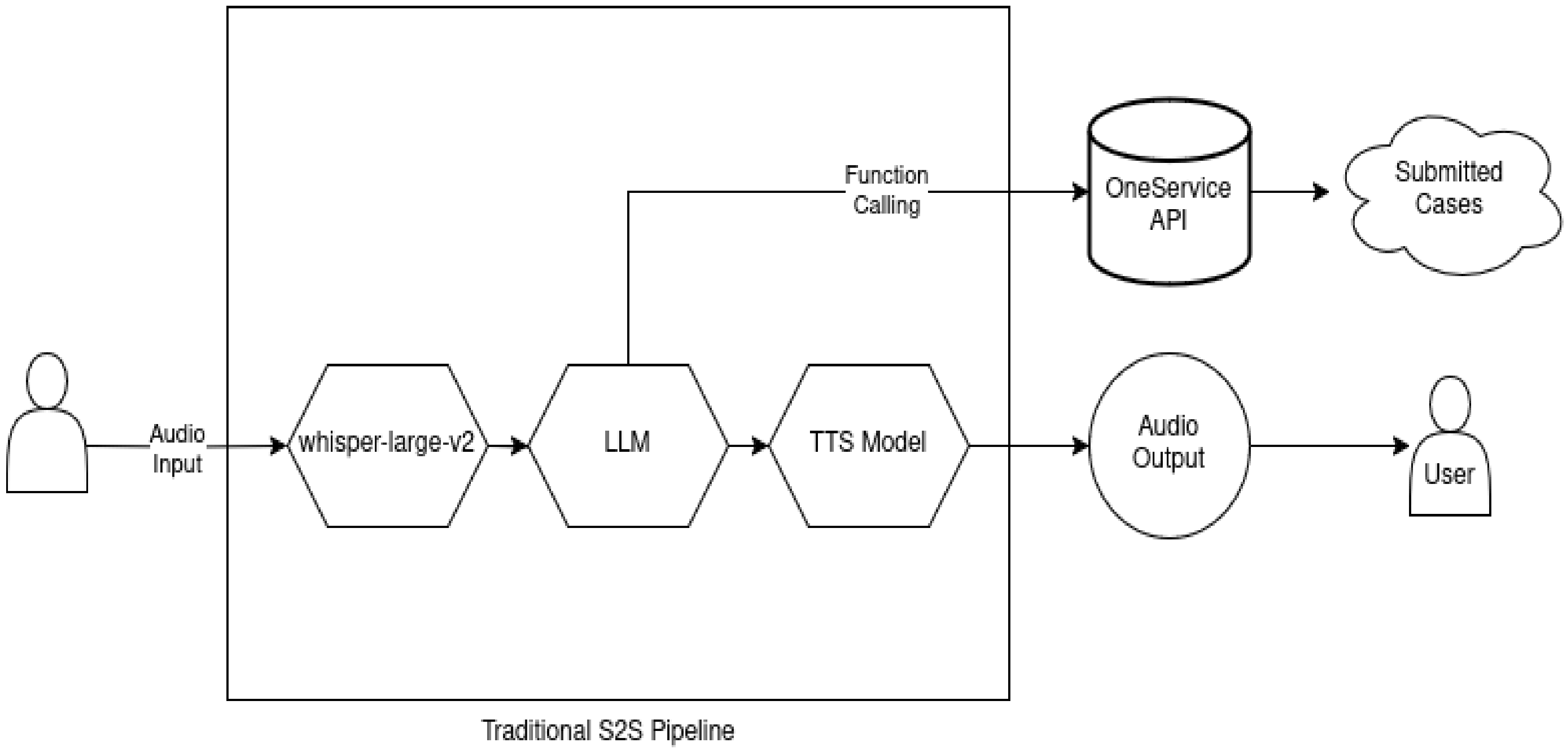
Our Solution

A **speech-to-speech** AI hotline that can be used to assist the caller in **filing OneService cases** in multiple Singapore spoken language using **OpenAI's Realtime API**.

Demo

- English Demo
- Chinese (Hokkien) Demo

Speech-to-Speech Pipeline



- [audio input] ➔ [ASR/SST] ➔ [GPT4] ➔ [TTS] ➔ [audio output]

Speech-to-Speech Pipeline: Common Challenge

- Higher Latency
- Lack of context for tone and emotions in text
- NLP challenge like phrase endpointing (*figuring out when the LLM should respond*), and interruption handling
- Robotic output from TTS models

OpenAI's Realtime API

- Uses GPT-4o for native audio and text token ingestion and generation.
- Uses Stateful WebSocket or WebRTC session with event-based communication protocol.
  - client-sent events to update the state of session (`input_audio_buffer.append`, `response.create`)
  - listen server-sent events to received updates (`response.audio.delta`, `response.done`)
- Supports function-calling / structured output.

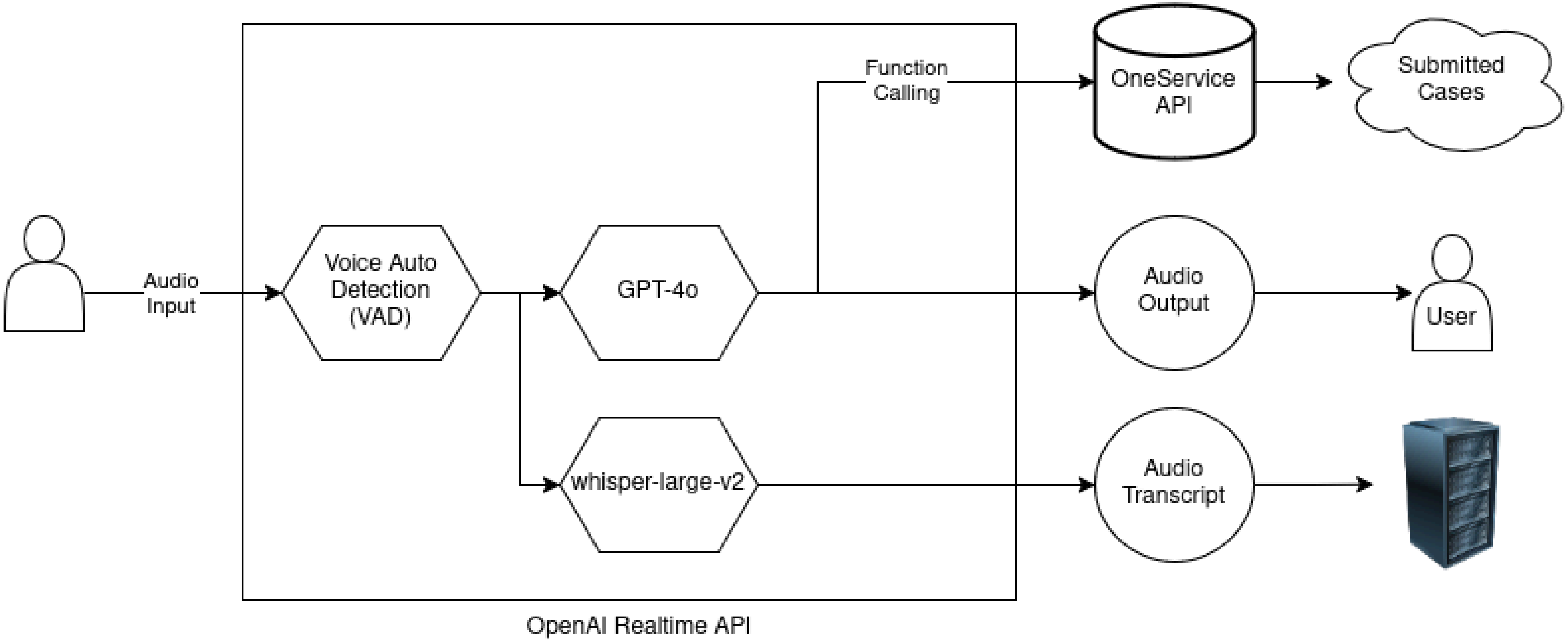
What audio-to-audio solves?

- Lower latency
- Easier model interruption (stop model from thinking immediately such that no extra information is added into the context length)
- More realistic voice

More About Realtime sessions

- Server-side context management.
    - Uses client-sent event to update the remote conversations (i.e. LLM's context)
    - Save bandwidth by not sending audio-buffer repeatedly
- Maximum session length of 30 minutes.
- Supports creating of response outside of default conversation.

Realtime API: GPT-4o



Voice Activity Detection

- Two-mode of audio inputs: Press-to-talk or VAD
- VAD will analyse audio stream and determine if the user has stopped speaking or has interrupted the model

Function Calling

- Developer can define `Functions` which is tools available for LLM to call to accomplish their tasks.
- Description for each fields can be used by LLM to steer conversations.

Speech-to-Text Model

- Realtime API uses `whisper-large-v2` to transcribe input audio stream asynchronously.
- Transcription is not used by LLM but serves as "representation" understood by the model.

What Works Well?

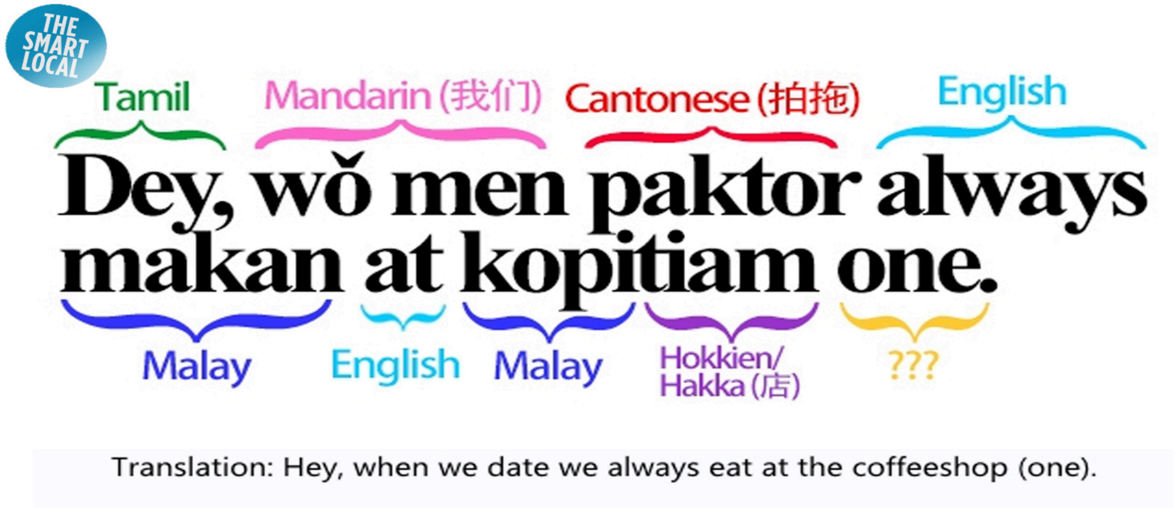
- GPT-4o **understands Singapore languages and dialects** (*Singlish, English, Mandarin, Hokkien, Teochew, Cantonese*) well enough to submit case reliably.
- GPT-4o orchestrated the workflow with just **25 lines of instruction prompting** (without complex agentic workflow).

What Doesn't work?

- Voice Activity Detection (VAD) is not reliable in loud environments with multiple speakers in background.
- Default Whisper doesn't work reliably with Singlish (*when different languages mixes*).
- Stateful server interaction of Realtime session with maximum duration of 30 minutes.

Challenge: Singlish is "cha-ba-lang"

- Multiple languages in a single conversations.
- Lack of fully localised **multilingual** whisper implementation (Singlish + Other dialects at same time)



Dey, wǒ men paktor always makan at kopitiam one.

Translation: Hey, when we date we always eat at the coffeeshop (one).

[Source: Renae Cheng.]

What's Next

Reflection

Thank You

> Let us know if you have interesting idea on how to uses 25k USD of OpenAI Credits 😁