ADK Streaming Quickstart

With this quickstart, you'll learn to create a simple agent and use ADK Streaming to enable voice and video communication with it that is low-latency and bidirectional. We will install ADK, set up a basic "Google Search" agent, try running the agent with Streaming with `adk web` tool, and then explain how to build a simple asynchronous web app by yourself using ADK Streaming and FastAPI.

Note: This guide assumes you have experience using a terminal in Windows, Mac, and Linux environments.

Supported models for voice/video streaming

In order to use voice/video streaming in ADK, you will need to use Gemini models that support the Live API. You can find the **model ID(s)** that supports the Gemini Live API in the documentation:

- Google AI Studio: Gemini Live API
- Vertex AI: Gemini Live API

1. Setup Environment & Install ADK

Create & Activate Virtual Environment (Recommended):

```
# Create
python -m venv .venv
# Activate (each new terminal)
# macOS/Linux: source .venv/bin/activate
# Windows CMD: .venv\Scripts\activate.bat
# Windows PowerShell: .venv\Scripts\Activate.ps1
```

Install ADK:

```
pip install google-adk
```

2. Project Structure

Create the following folder structure with empty files:

```
adk-streaming/  # Project folder
└── app/ # the web app folder
    ├── .env # Gemini API key
    └── google_search_agent/ # Agent folder
        ├── __init__.py # Python package
        └── agent.py # Agent definition
```

agent.py

Copy-paste the following code block to the `agent.py`.

For `model`, please double check the model ID as described earlier in the Models section.

```
from google.adk.agents import Agent
from google.adk.tools import google_search  # Import the tool

root_agent = Agent(
   # A unique name for the agent.
   name="basic_search_agent",
   # The Large Language Model (LLM) that agent will use.
   model="gemini-2.0-flash-exp", # Google AI Studio
   #model="gemini-2.0-flash-live-preview-04-09" # Vertex AI
Studio
   # A short description of the agent's purpose.
   description="Agent to answer questions using Google
Search.",
   # Instructions to set the agent's behavior.
   instruction="You are an expert researcher. You always stick
to the facts.",
   # Add google_search tool to perform grounding with Google
search.
   tools=[google_search]
)
```

Note: To enable both text and audio/video input, the model must support the generateContent (for text) and bidiGenerateContent methods. Verify these capabilities by referring to the List Models Documentation. This quickstart utilizes the gemini-2.0-flash-exp model for demonstration purposes.

`agent.py` is where all your agent(s)' logic will be stored, and you must have a `root_agent` defined.

Notice how easily you integrated grounding with Google Search capabilities. The `Agent` class and the `google_search` tool handle the complex interactions with the LLM and grounding with the search API, allowing you to focus on the agent's *purpose* and *behavior*.

Copy-paste the following code block to `__init__.py` and `main.py` files.

__init__.py

```
from . import agent
```

3. Set up the platform

To run the agent, choose a platform from either Google AI Studio or Google Cloud Vertex AI:

Gemini - Google AI Studio

1. Get an API key from Google AI Studio.
2. Open the `.env` file located inside (`app/`) and copy-paste the following code.

   .env

   ```
   GOOGLE_GENAI_USE_VERTEXAI=FALSE
   GOOGLE_API_KEY=PASTE_YOUR_ACTUAL_API_KEY_HERE
   ```

3. Replace `PASTE_YOUR_ACTUAL_API_KEY_HERE` with your actual `API KEY`.

Gemini - Google Cloud Vertex AI

1. You need an existing Google Cloud account and a project.
   - Set up a Google Cloud project
   - Set up the gcloud CLI

- Authenticate to Google Cloud, from the terminal by running `gcloud auth login`.
- Enable the Vertex AI API.

2. Open the `.env` file located inside (`app/`). Copy-paste the following code and update the project ID and location.

.env

```
GOOGLE_GENAI_USE_VERTEXAI=TRUE
GOOGLE_CLOUD_PROJECT=PASTE_YOUR_ACTUAL_PROJECT_ID
GOOGLE_CLOUD_LOCATION=us-central1
```

4. Try the agent with `adk web`

Now it's ready to try the agent. Run the following command to launch the **dev UI**. First, make sure to set the current directory to `app`:

```
cd app
```

Also, set `SSL_CERT_FILE` variable with the following command. This is required for the voice and video tests later.

```
export SSL_CERT_FILE=$(python -m certifi)
```

Then, run the dev UI:

```
adk web
```

Open the URL provided (usually `http://localhost:8000` or `http://127.0.0.1:8000`) **directly in your browser**. This connection stays entirely on your local machine. Select `google_search_agent`.

Try with text

Try the following prompts by typing them in the UI.

- What is the weather in New York?
- What is the time in New York?

- What is the weather in Paris?
- What is the time in Paris?

The agent will use the google_search tool to get the latest information to answer those questions.

Try with voice and video

To try with voice, reload the web browser, click the microphone button to enable the voice input, and ask the same question in voice. You will hear the answer in voice in real-time.

To try with video, reload the web browser, click the camera button to enable the video input, and ask questions like "What do you see?". The agent will answer what they see in the video input.

Stop the tool

Stop `adk web` by pressing `Ctrl-C` on the console.

Note on ADK Streaming

The following features will be supported in the future versions of the ADK Streaming: Callback, LongRunningTool, ExampleTool, and Shell agent (e.g. SequentialAgent).

5. Building a Custom Streaming App (Optional)

In the previous section, we have checked that our basic search agent works with the ADK Streaming using `adk web` tool. In the this section, we will learn how to build your own web application capable of the streaming communication using FastAPI.

Add `static` directory under `app`, and add `main.py` and `index.html` as empty files, as in the following structure:

```
adk-streaming/  # Project folder
└── app/ # the web app folder
    ├── main.py # FastAPI web app
    └── static/ # Static content folder
        └── index.html # The web client page
```

By adding the directories and files above, the entire directory structure and files will look like:

```
adk-streaming/  # Project folder
└── app/ # the web app folder
    ├── main.py # FastAPI web app
    ├── static/ # Static content folder
    |   └── index.html # The web client page
    ├── .env # Gemini API key
    └── google_search_agent/ # Agent folder
        ├── __init__.py # Python package
        └── agent.py # Agent definition
```

main.py

Copy-paste the following code block to the main.py file.

```
import os
import json
import asyncio

from pathlib import Path
from dotenv import load_dotenv

from google.genai.types import (
    Part,
    Content,
)

from google.adk.runners import Runner
from google.adk.agents import LiveRequestQueue
from google.adk.agents.run_config import RunConfig
from google.adk.sessions.in_memory_session_service import
InMemorySessionService

from fastapi import FastAPI, WebSocket
from fastapi.staticfiles import StaticFiles
from fastapi.responses import FileResponse

from google_search_agent.agent import root_agent

#
# ADK Streaming
#

# Load Gemini API Key
load_dotenv()

APP_NAME = "ADK Streaming example"
session_service = InMemorySessionService()


def start_agent_session(session_id: str):
    """Starts an agent session"""

    # Create a Session
    session = session_service.create_session(
        app_name=APP_NAME,
        user_id=session_id,
        session_id=session_id,
    )

    # Create a Runner
    runner = Runner(
        app_name=APP_NAME,
        agent=root_agent,
        session_service=session_service,
    )

    # Set response modality = TEXT
```

```
    run_config = RunConfig(response_modalities=["TEXT"])

    # Create a LiveRequestQueue for this session
    live_request_queue = LiveRequestQueue()

    # Start agent session
    live_events = runner.run_live(
        session=session,
        live_request_queue=live_request_queue,
        run_config=run_config,
    )
    return live_events, live_request_queue


async def agent_to_client_messaging(websocket, live_events):
    """Agent to client communication"""
    while True:
        async for event in live_events:
            # turn_complete
            if event.turn_complete:
                await
websocket.send_text(json.dumps({"turn_complete": True}))
                print("[TURN COMPLETE]")

            if event.interrupted:
                await
websocket.send_text(json.dumps({"interrupted": True}))
                print("[INTERRUPTED]")

            # Read the Content and its first Part
            part: Part = (
                event.content and event.content.parts and
event.content.parts[0]
            )
            if not part or not event.partial:
                continue

            # Get the text
            text = event.content and event.content.parts and
event.content.parts[0].text
            if not text:
                continue

            # Send the text to the client
            await websocket.send_text(json.dumps({"message":
text}))
            print(f"[AGENT TO CLIENT]: {text}")
            await asyncio.sleep(0)


async def client_to_agent_messaging(websocket,
live_request_queue):
    """Client to agent communication"""
    while True:
```

```
    while True:
        text = await websocket.receive_text()
        content = Content(role="user",
parts=[Part.from_text(text=text)])
        live_request_queue.send_content(content=content)
        print(f"[CLIENT TO AGENT]: {text}")
        await asyncio.sleep(0)


#
# FastAPI web app
#

app = FastAPI()

STATIC_DIR = Path("static")
app.mount("/static", StaticFiles(directory=STATIC_DIR),
name="static")


@app.get("/")
async def root():
    """Serves the index.html"""
    return FileResponse(os.path.join(STATIC_DIR, "index.html"))


@app.websocket("/ws/{session_id}")
async def websocket_endpoint(websocket: WebSocket, session_id:
int):
    """Client websocket endpoint"""

    # Wait for client connection
    await websocket.accept()
    print(f"Client #{session_id} connected")

    # Start agent session
    session_id = str(session_id)
    live_events, live_request_queue =
start_agent_session(session_id)

    # Start tasks
    agent_to_client_task = asyncio.create_task(
        agent_to_client_messaging(websocket, live_events)
    )
    client_to_agent_task = asyncio.create_task(
        client_to_agent_messaging(websocket,
live_request_queue)
    )
    await asyncio.gather(agent_to_client_task,
client_to_agent_task)

    # Disconnected
    print(f"Client #{session_id} disconnected")
```

This code creates a real-time chat application using ADK and FastAPI. It sets

This code creates a real-time chat application using ADK and FastAPI. It sets up a WebSocket endpoint where clients can connect and interact with a Google Search Agent.

Key functionalities:

- Loads the Gemini API key.
- Uses ADK to manage agent sessions and run the `google_search_agent`.
- `start_agent_session` initializes an agent session with a live request queue for real-time communication.
- `agent_to_client_messaging` asynchronously streams the agent's text responses and status updates (turn complete, interrupted) to the connected WebSocket client.
- `client_to_agent_messaging` asynchronously receives text messages from the WebSocket client and sends them as user input to the agent.
- FastAPI serves a static frontend and handles WebSocket connections at `/ws/{session_id}`.
- When a client connects, it starts an agent session and creates concurrent tasks for bidirectional communication between the client and the agent via WebSockets.

Copy-paste the following code block to the `index.html` file.

index.html

```
<!doctype html>
<html>
  <head>
    <title>ADK Streaming Test</title>
  </head>

  <body>
    <h1>ADK Streaming Test</h1>
    <div
      id="messages"
      style="height: 300px; overflow-y: auto; border: 1px solid
black"></div>
    <br />

    <form id="messageForm">
      <label for="message">Message:</label>
      <input type="text" id="message" name="message" />
      <button type="submit" id="sendButton" disabled>Send</
button>
    </form>
  </body>

  <script>
    // Connect the server with a WebSocket connection
    const sessionId = Math.random().toString().substring(10);
    const ws_url = "ws://" + window.location.host + "/ws/" +
sessionId;
    let ws = new WebSocket(ws_url);

    // Get DOM elements
    const messageForm = document.getElementById("messageForm");
    const messageInput = document.getElementById("message");
    const messagesDiv = document.getElementById("messages");
    let currentMessageId = null;

    // WebSocket handlers
    function addWebSocketHandlers(ws) {
      ws.onopen = function () {
        console.log("WebSocket connection opened.");
        document.getElementById("sendButton").disabled = false;
        document.getElementById("messages").textContent =
"Connection opened";
        addSubmitHandler(this);
      };

      ws.onmessage = function (event) {
        // Parse the incoming message
        const packet = JSON.parse(event.data);
        console.log(packet);

        // Check if the turn is complete
        // if turn complete, add new message
        if (packet.turn_complete && packet.turn_complete ==
```

```
true) {
          currentMessageId = null;
          return;
        }

        // add a new message for a new turn
        if (currentMessageId == null) {
          currentMessageId =
Math.random().toString(36).substring(7);
          const message = document.createElement("p");
          message.id = currentMessageId;
          // Append the message element to the messagesDiv
          messagesDiv.appendChild(message);
        }

        // Add message text to the existing message element
        const message =
document.getElementById(currentMessageId);
        message.textContent += packet.message;

        // Scroll down to the bottom of the messagesDiv
        messagesDiv.scrollTop = messagesDiv.scrollHeight;
      };

      // When the connection is closed, try reconnecting
      ws.onclose = function () {
        console.log("WebSocket connection closed.");
        document.getElementById("sendButton").disabled = true;
        document.getElementById("messages").textContent =
"Connection closed";
        setTimeout(function () {
          console.log("Reconnecting...");
          ws = new WebSocket(ws_url);
          addWebSocketHandlers(ws);
        }, 5000);
      };

      ws.onerror = function (e) {
        console.log("WebSocket error: ", e);
      };
    }
    addWebSocketHandlers(ws);

    // Add submit handler to the form
    function addSubmitHandler(ws) {
      messageForm.onsubmit = function (e) {
        e.preventDefault();
        const message = messageInput.value;
        if (message) {
          const p = document.createElement("p");
          p.textContent = "> " + message;
          messagesDiv.appendChild(p);
          ws.send(message);
          messageInput.value = "";
```

```
            messageInput.value = "";
          }
          return false;
        };
      }
    </script>
  </html>
```

This HTML file sets up a basic webpage with:

- A form (`messageForm`) with an input field for typing messages and a "Send" button.
- JavaScript that:
- Connects to a WebSocket server at `wss://[current host]/ws/[random session ID]`.
- Enables the "Send" button upon successful connection.
- Appends received messages from the WebSocket to the `messages` div, handling streaming responses and turn completion.
- Sends the text entered in the input field to the WebSocket server when the form is submitted.
- Attempts to reconnect if the WebSocket connection closes.

6. Interact with Your Streaming app

1. **Navigate to the Correct Directory:**

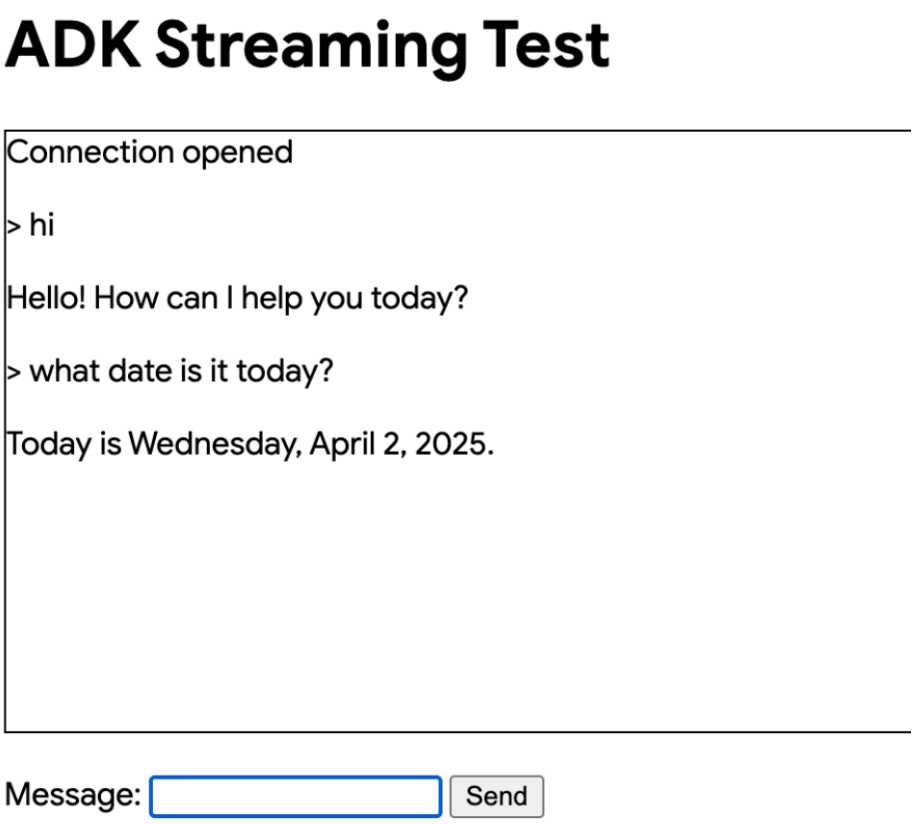
To run your agent effectively, you need to be in the **app folder (`adk-streaming/app`)**

2. **Start the Fast API**: Run the following command to start CLI interface with

```
uvicorn main:app --reload
```

3. **Access the UI:** Once the UI server starts, the terminal will display a local URL (e.g., http://localhost:8000). Click this link to open the UI in your browser.

Now you should see the UI like this:



Try asking a question `What is Gemini?`. The agent will use Google Search to respond to your queries. You would notice that the UI shows the agent's response as streaming text. You can also send messages to the agent at any time, even while the agent is still responding. This demonstrates the bidirectional communication capability of ADK Streaming.

Benefits over conventional synchronous web apps:

- Real-time two-way communication: Seamless interaction.
- More responsive and engaging: No need to wait for full responses or constant refreshing. Feels like a live conversation.
- Can be extended to multimodal apps with audio, image and video streaming support.

Congratulations! You've successfully created and interacted with your first Streaming agent using ADK!

Next steps

- **Add audio/image modality:** with the Streaming, you can also have real-time communication with the agent using audio and image. We will add more samples for the multimodal support in the future. Stay tuned!