**Architecture Summary**

system involves:

* **PX4**  broadcasting telemetry via MAVLink protocol through a **SiK radio module**.
* The telemetry is received by **SiK ground module** on a PC connected via pc
* My server will parses MAVLink data and streams it to a frontend via WebSockets.
* UI visualizes the telemetry on a live map, dashboard, and status indicators.

**Backend Handling**

**1 Conection**

* The SiK radio modules communicate over **UART**  with a baud rate (**57600**).
* The ground module creates a serial interface on the PC (COM3), which is used to establish a connection.

**2. Parsing MAVLink Messages**

* Using the **pymavlink** library, the backend listens for messages like:
  + HEARTBEAT (first time message)

**3. Data Filtering and Conversion**

* The backend interprets raw MAVLink values and converts them to user-friendly formats:

**4. Data Structuring**

* The telemetry data is organized into structured JSON-like payloads that represent the current state of the vehicle in a human-readable form.

**Data Streaming into frontend**

**1. Dynamic Data**

The backend uses **WebSocket protocol** to stream telemetry updates to connected frontend clients.

* It pushes new data

**2. Session and Connection Management**

* Multiple clients can connect and receive telemetry simultaneously.
* The websocket handles all the conenctions

**UI Handling**

**1. Live Map Visualization**

* A **LeafletJS** map displays the drone’s live GPS position.
* The marker is updated in real time as new GPS coordinates arrive.
* A polyline is drawn to show the drone's path.

**2. Telemetry Dashboard**

* The frontend contains:
  + A battery gauge like symbol showing voltage and current levels.

Numerical values for altitude, speed, and flight mode.

**3. Dynamic Data**

* The websockets updates the data dynamically.

Resources:

<https://youtu.be/QTkLUARSv3c?si=iism9kYpQmDC-Kcn>

[Using SITL — Dev documentation](https://ardupilot.org/dev/docs/using-sitl-for-ardupilot-testing.html)

[ArduPilot/pymavlink: python MAVLink interface and utilities](https://github.com/ArduPilot/pymavlink)

[MAVLINK Common Message Set (common.xml) | MAVLink Guide](https://mavlink.io/en/messages/common.html)

[MAVLink Messages | Dissecting the Protocol](https://www.youtube.com/watch?v=Ha66uKC-od0)

[TangramFlex/mavpx4-mission: Tangram Maker tutorial to create a MAVLink PX4 ground control station, and example mission C++ app](https://github.com/TangramFlex/mavpx4-mission)

Archi:

Features thought:

Show **real-time drone location** on a map

Show **live telemetry** data (altitude, battery, Battery Current, etc.)

Library:

LeafletJs-for maps

MavLink protocol