WEB-BASED LIVE VISUALISATION OF SENSOR DATA

Jannis Lübbe · PyCon DE · bcc Berlin Congress Center · 12 April 2022

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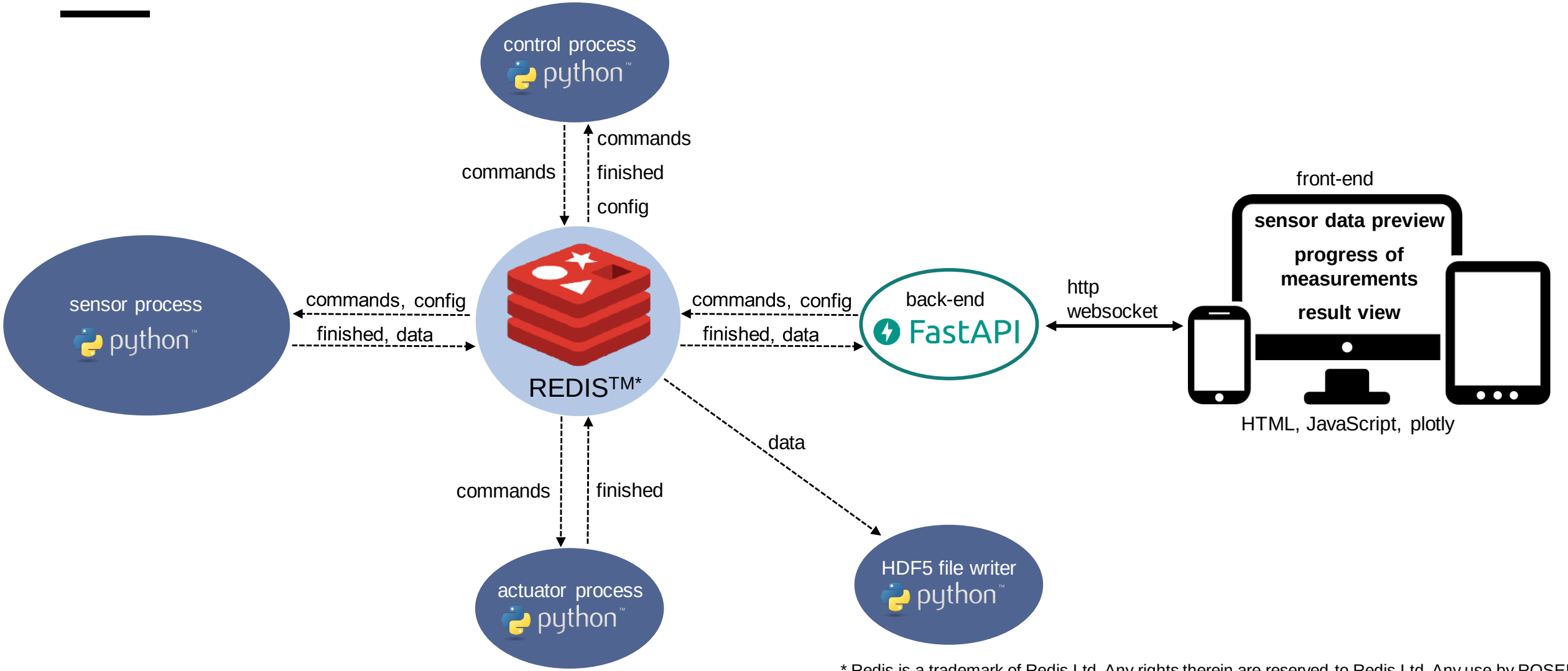
LAB SETUP



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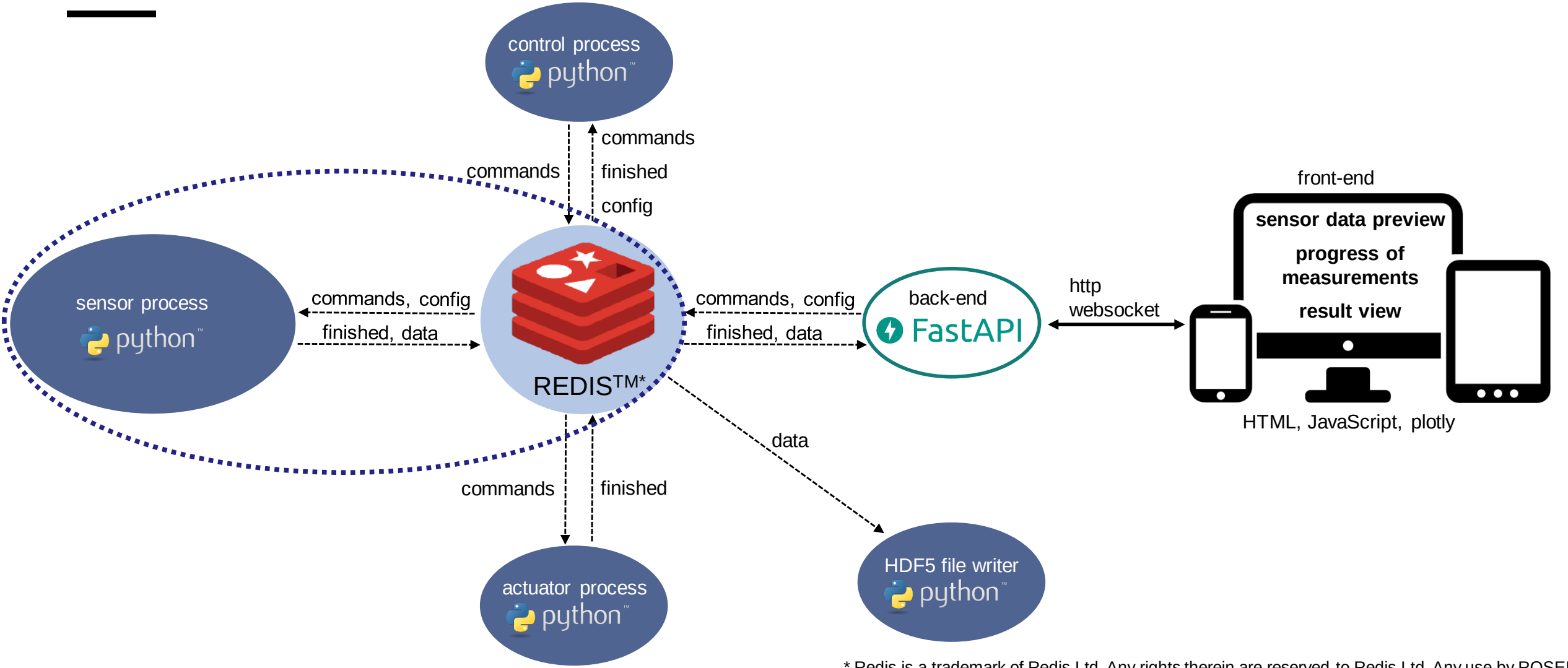
LAB SETUP



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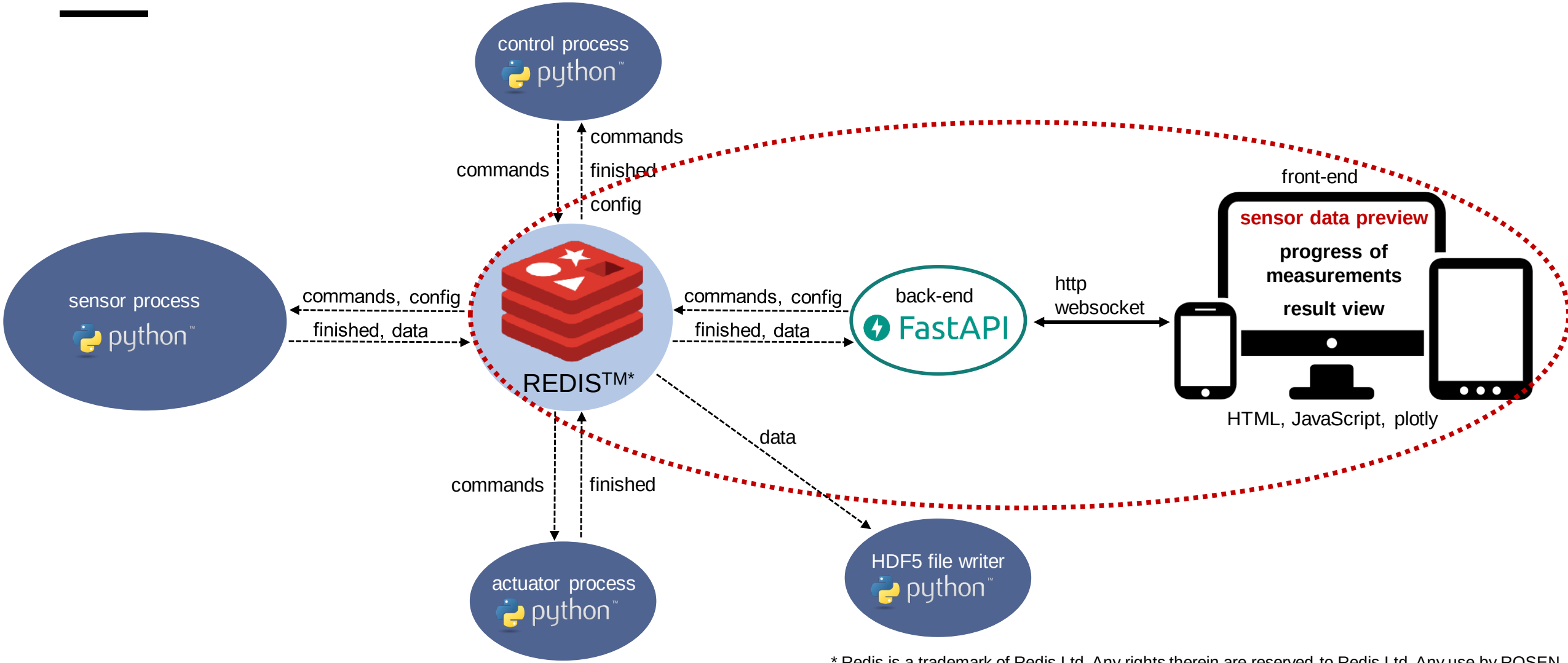
LAB SETUP



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HOBBY PROJECT: FLIGHT DATA RECORDER

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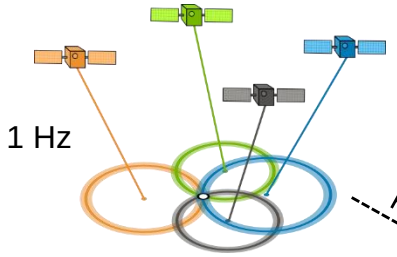


1 Hz

GPS

position, speed, time

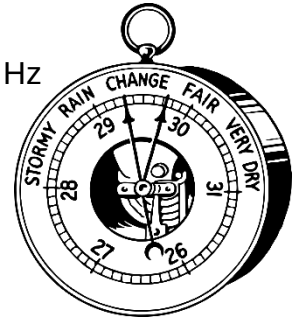
merge process
python

sensor data

combined sensor data

storage of combined sensor data

12.5 Hz



barometer

pressure

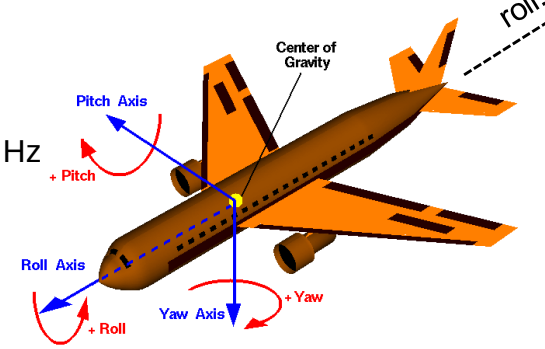
REDIS™*

review / export

FastAPI

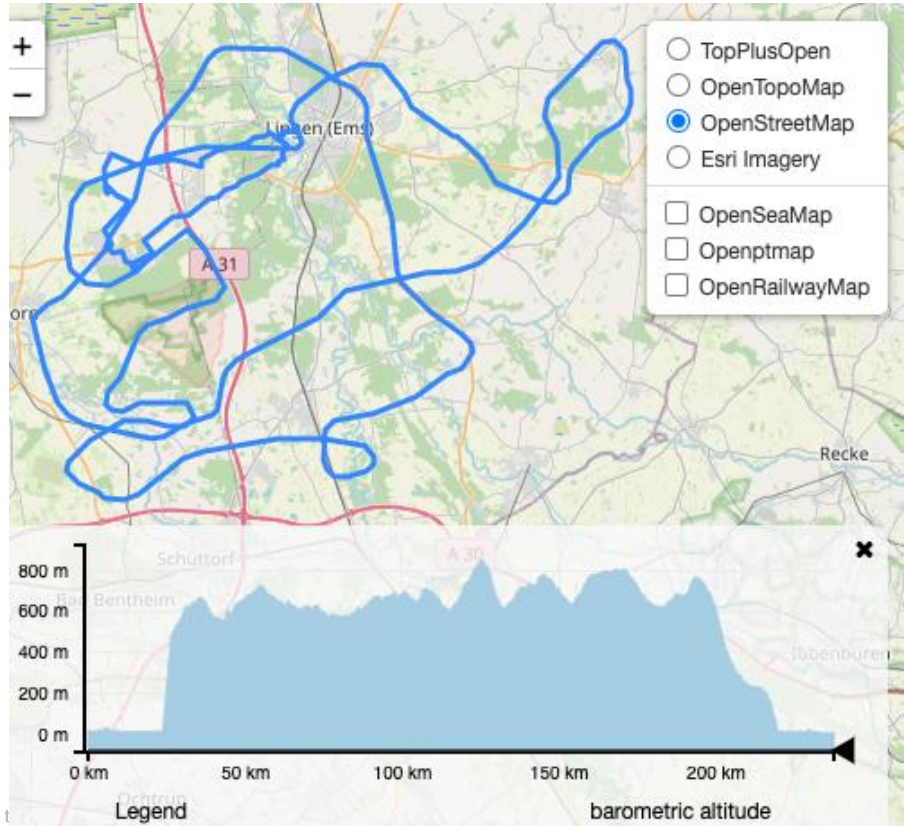
roll, pitch, yaw

25 Hz

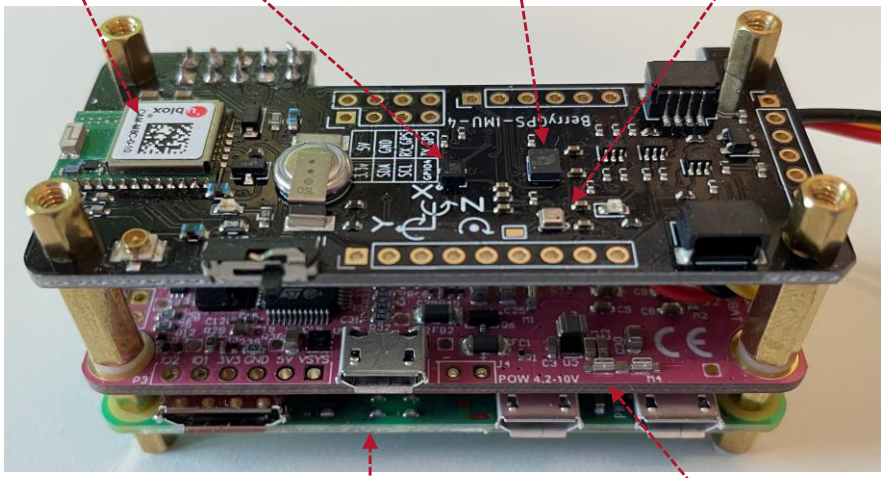


accelerometer, gyro, magnetometer

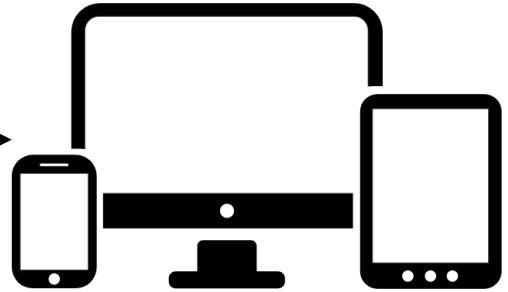
https://github.com/jaluebbe/GPSTracker



TODAY'S SETUP



mobile WiFi hotspot

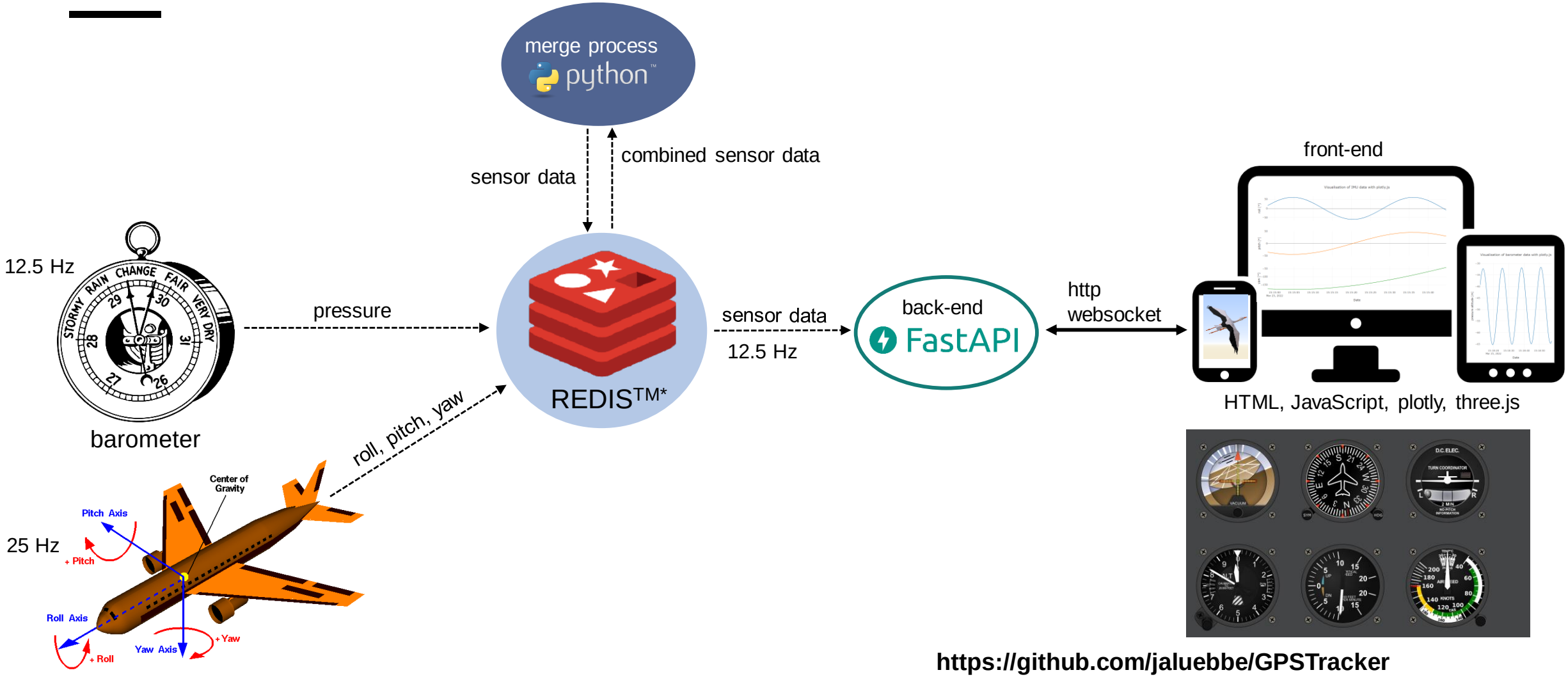


my notebook and your devices

(WiFi credentials are published later)

https://github.com/jaluebbe/GPSTracker

ADDING SENSOR DATA LIVE VISUALISATION



https://github.com/jaluebbe/GPSTracker

https://github.com/jaluebbe/FastAPIWebSocketExample

PUBLISHING DATA TO A REDIS CHANNEL

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```
import time, redis, json
from my_sensors import Barometer

r = redis.Redis()
sensor = Barometer()

while True:
    data = sensor.get_sensor_data()
    r.publish("barometer", json.dumps(data))
    time.sleep(0.08)
```

```
{
    "sensor": “my_barometer"
    "timestamp": 1648123202.19,
    "pressure": 100682.2,
    "temperature": 5.1,
}
```

https://github.com/jaluebbe/GPSTracker

CONSUMING DATA FROM A REDIS CHANNEL

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```
import redis, json

r = redis.Redis(decode_responses=True)
pubsub = r.pubsub(ignore_subscribe_messages=False)
pubsub.subscribe("barometer")

for item in pubsub.listen():
    barometer_data = json.loads(item["data"])
```

```
{
    "sensor": “my_barometer"
    "timestamp": 1648123202.19,
    "pressure": 100682.2,
    "temperature": 5.1,
}
```

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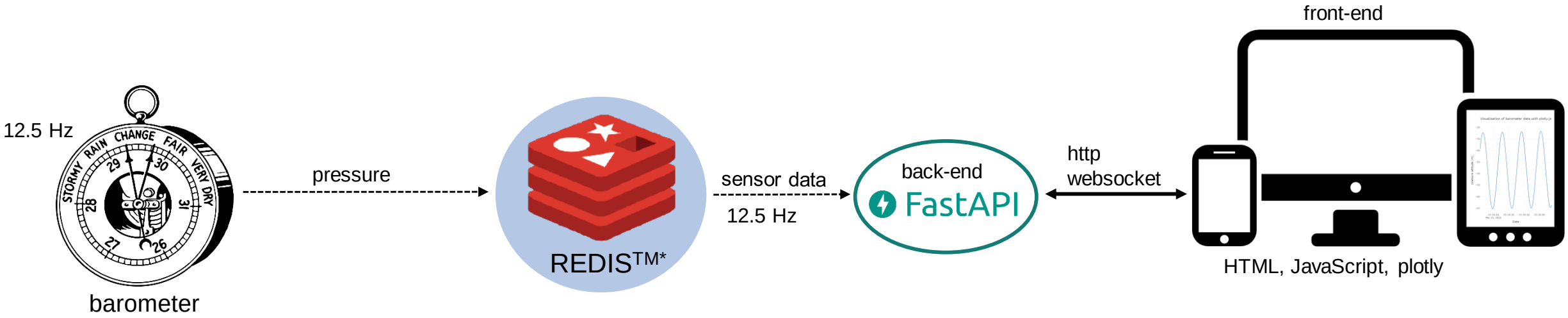
BAROMETER DEMO



https://github.com/jaluebbe/GPSTracker

https://github.com/jaluebbe/FastAPIWebSocketExample

HOSTING WEBSOCKETS WITH FASTAPI

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```
from fastapi import FastAPI, WebSocket
from fastapi.staticfiles import StaticFiles
import aioredis, asyncio

r = aioredis.Redis(decode_responses=True)
app = FastAPI()
app.mount("/static", StaticFiles(directory="static"), name="static")


# continued on next slide
```

https://github.com/jaluebbe/FastAPIWebSocketExample

HOSTING WEBSOCKETS WITH FASTAPI

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```
@app.websocket("/ws/imu_pressure")
async def websocket_endpoint(websocket: WebSocket):
    await websocket.accept()
    pubsub = redis_connection.pubsub(ignore_subscribe_messages=True)
    await pubsub.subscribe("imu_pressure")

    while True:
        try:
            message = await pubsub.get_message()
            if message is not None:
                await websocket.send_text(message["data"])
            await asyncio.sleep(0.01)
        except asyncio.TimeoutError:
            pass
```

https://github.com/jaluebbe/FastAPIWebSocketExample

CONSUMING WEBSOCKETS WITH JAVASCRIPT

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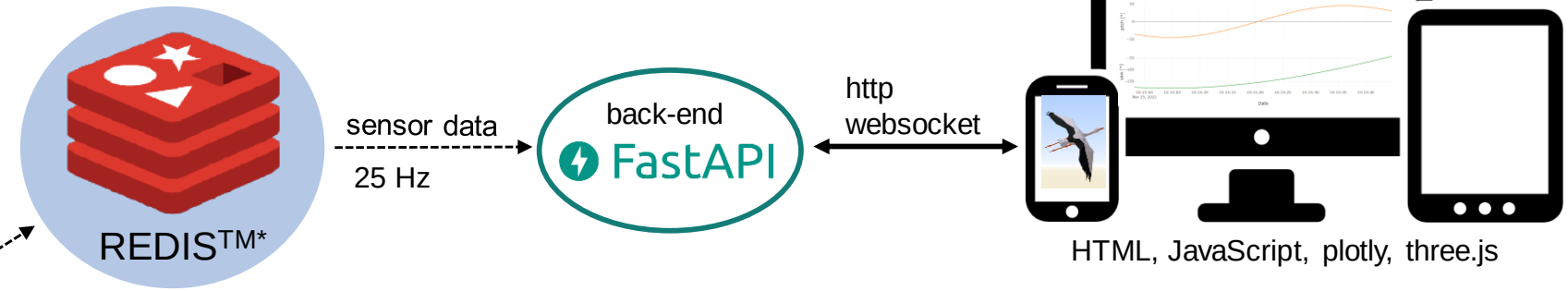
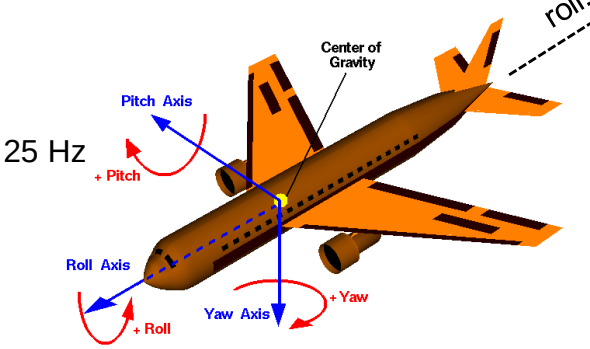
```
var url = "ws://" + window.location.host + "/ws/imu_pressure“;
var ws = new WebSocket(url);

ws.onmessage = function(event) {
    let message = JSON.parse(event.data);
    visualiseData(message);
}
```

https://github.com/jaluebbe/FastAPIWebSocketExample

ORIENTATION SENSOR DEMO





accelerometer, gyro, magnetometer

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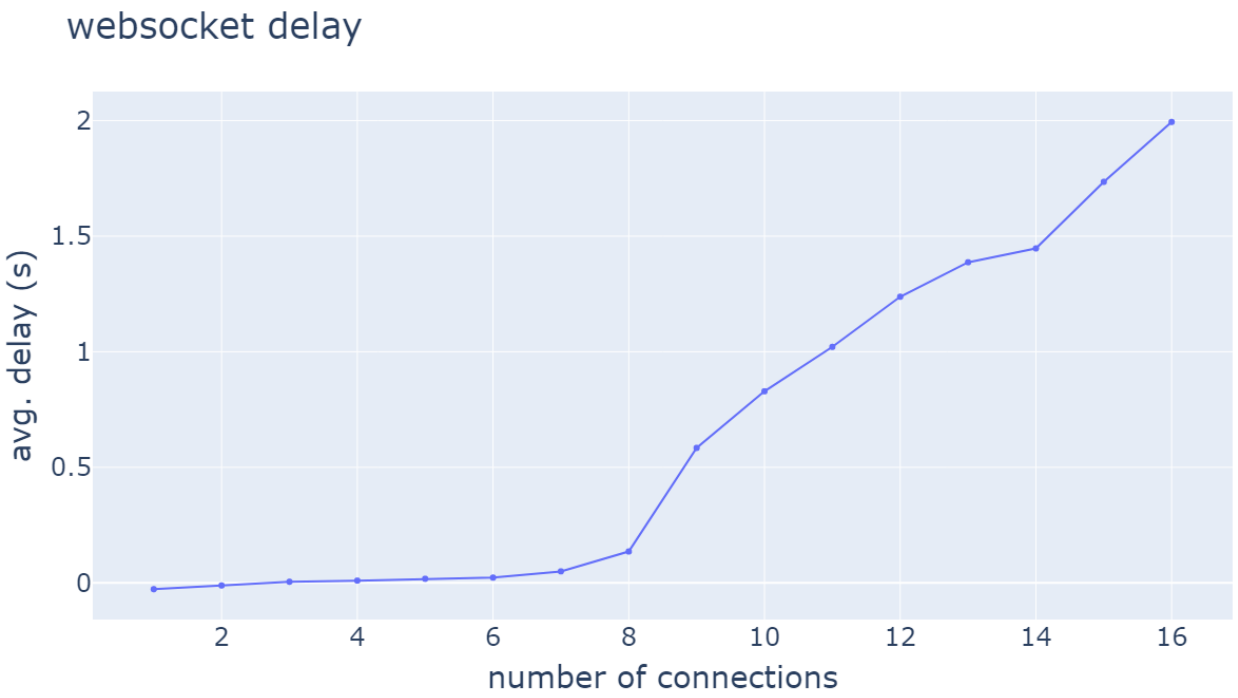
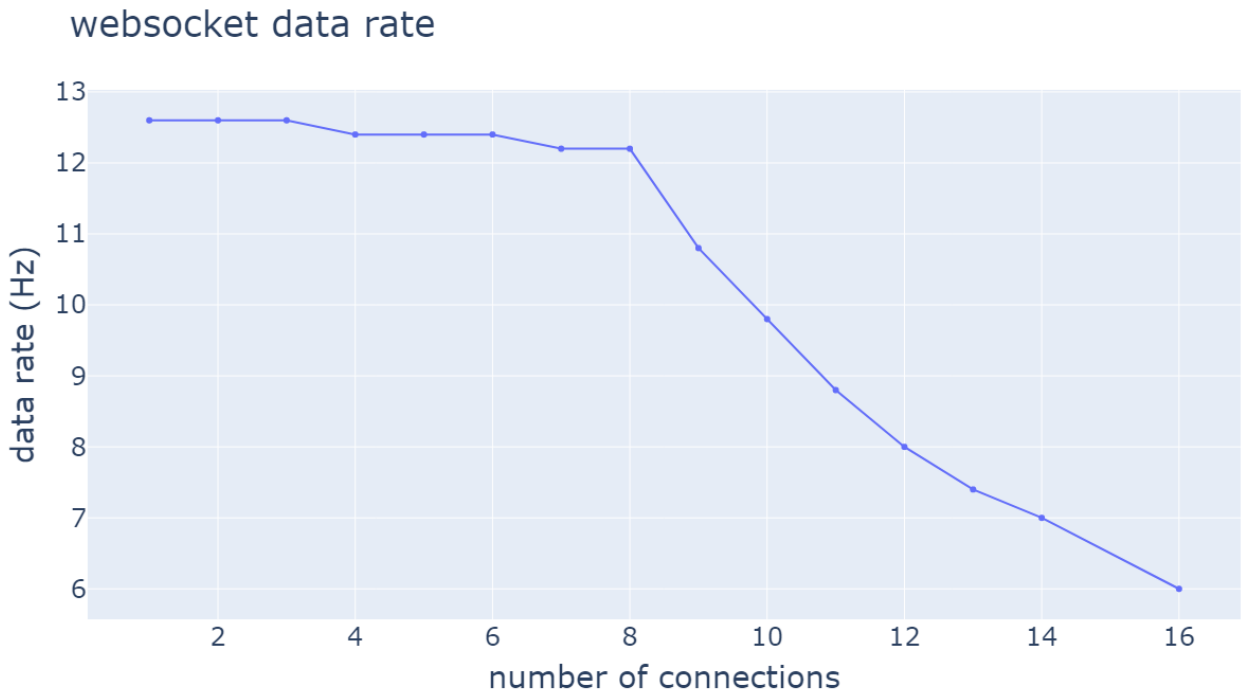
PERFORMANCE

Raspberry Pi Zero W (single core)

data rate 12.5 Hz





System clock difference on host and client may cause negative delays.

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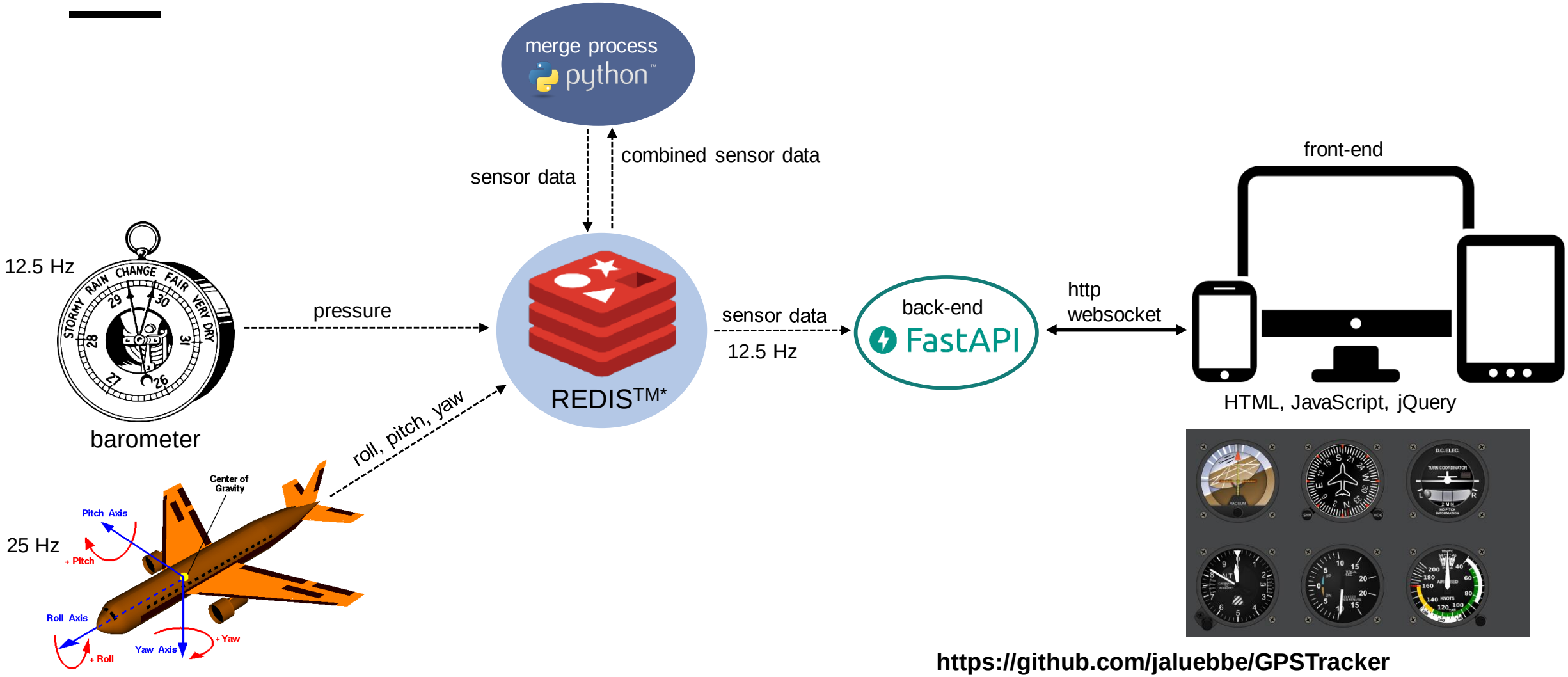
FLIGHT INSTRUMENTS DEMO



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https://github.com/jaluebbe/FastAPIWebSocketExample

INTERACTIVE EXAMPLE

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Join with your mobile device:

WIFI: ROSEN_DEMO
password: websockets

Bird with single core Raspberry Pi zero:
http://192.168.4.12:8080

Quad core Raspberry Pi zero 2:
http://192.168.4.11:8080

THANK YOU FOR JOINING THIS PRESENTATION.

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