

WEDOFOOTBALL! MQTT Topic Hierarchy and Purpose

In this project, we have a set of MQTT topics used to facilitate the communication and data exchange between the simulation scripts and the real-time data processing. These topics are categorized based on their usage in different parts of the project.

Topics Used in `simulators.py`

1. **football/players/{player_id}/sensors**
2. **football/players/{player_id}/sensors/coordinates**

These two topics are used during the 90-second simulation to continuously send updated data for each player. Here's a detailed breakdown:

football/players/{player_id}/sensors

- **Purpose:** This topic is used to publish a comprehensive set of sensor data for each player, including metrics such as heart rate, body temperature, blood pressure, calories consumed, sweat rate, blood oxygenation, GPS data (latitude, longitude, velocity), elapsed time, and timestamp.
- **Usage:** During the 90-second simulation, this topic receives updated sensor data in real-time for each player, helping to simulate the continuous flow of data as it would occur in a real-life scenario.

football/players/{player_id}/sensors/coordinates

- **Purpose:** This topic is specifically for publishing the GPS coordinates of each player. It focuses on the "latitude" and "longitude" values to track the player's movement on the field.
- **Usage:** Like the previous topic, this one also receives updates during the 90-second simulation, but it isolates the location data to be used for any specific geolocation-based analysis or visualization.

Topics Used in `realtime.py`

1. `football/players/{player_id}/realtime/average_velocity`
2. `football/players/{player_id}/realtime/distance_traveled`
3. `football/players/{player_id}/realtime/calories_consumed`

These three topics are used to publish summarized metrics extracted from the database. These metrics provide a snapshot of the current state of the simulation.

`football/players/{player_id}/realtime/average_velocity`

- **Purpose:** This topic publishes the average velocity of each player. It is calculated from the historical data stored in the database.
- **Usage:** By subscribing to this topic, users can obtain real-time updates on each player's average speed, offering insights into their overall performance and stamina.

`football/players/{player_id}/realtime/distance_traveled`

- **Purpose:** This topic is used to publish the total distance traveled by each player. It is derived from the velocity and elapsed time values stored in the database.
- **Usage:** This metric helps in understanding the workload and movement patterns of each player throughout the simulation.

`football/players/{player_id}/realtime/calories_consumed`

- **Purpose:** This topic publishes the total calories consumed by each player, based on the data accumulated in the database.
- **Usage:** This information is crucial for monitoring the energy expenditure and physical exertion of each player during the simulation.

Summary

Simulation Data Topics: `football/players/{player_id}/sensors` and `football/players/{player_id}/sensors/coordinates` are used during the simulation to send continuous real-time updates of player data.

Real-time Summary Topics:
`football/players/{player_id}/realtime/average_velocity`,
`football/players/{player_id}/realtime/distance_traveled`, and
`football/players/{player_id}/realtime/calories_consumed` are used to publish summary metrics derived from the database, providing a snapshot of the player's performance and physical state.

By organizing the topics in this manner, the project ensures a clear separation between continuous data updates during the simulation and periodic snapshots of key metrics for analysis and visualization.