BRIDGING REALMS

INTEGRATING MQTT AND SIEMENS SCADA DATA INTO THE 3D WORLD OF UNITY

SAFE HARBOR STATEMENT

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ABOUT ME

Experience

Siemens
Full-time · 5 yrs

- **Senior Key Expert**
  Jun 2022 - Present · 1 yr 10 mos
- **Technology Management**
  Dec 2021 - Present · 2 yrs 4 mos
- **Technology Architect**
  Apr 2019 - Dec 2021 · 2 yrs 9 mos

ETM professional control
Full-time · 11 yrs 10 mos
Austria

- **Oracle & SCADA Senior Consultant**
  Jan 2015 - Mar 2019 · 4 yrs 3 mos
- **Oracle & SCADA Project Manager**
  Jan 2011 - Dec 2014 · 4 yrs
- **Oracle DBA and Developer**
  Jun 2007 - Dec 2011 · 4 yrs 7 mos

SIEMENS

unity

APACHE IoTDB

MQTT.ORG

druid

Kotlin

APACHE PLC4X

Java

OPC UA

python

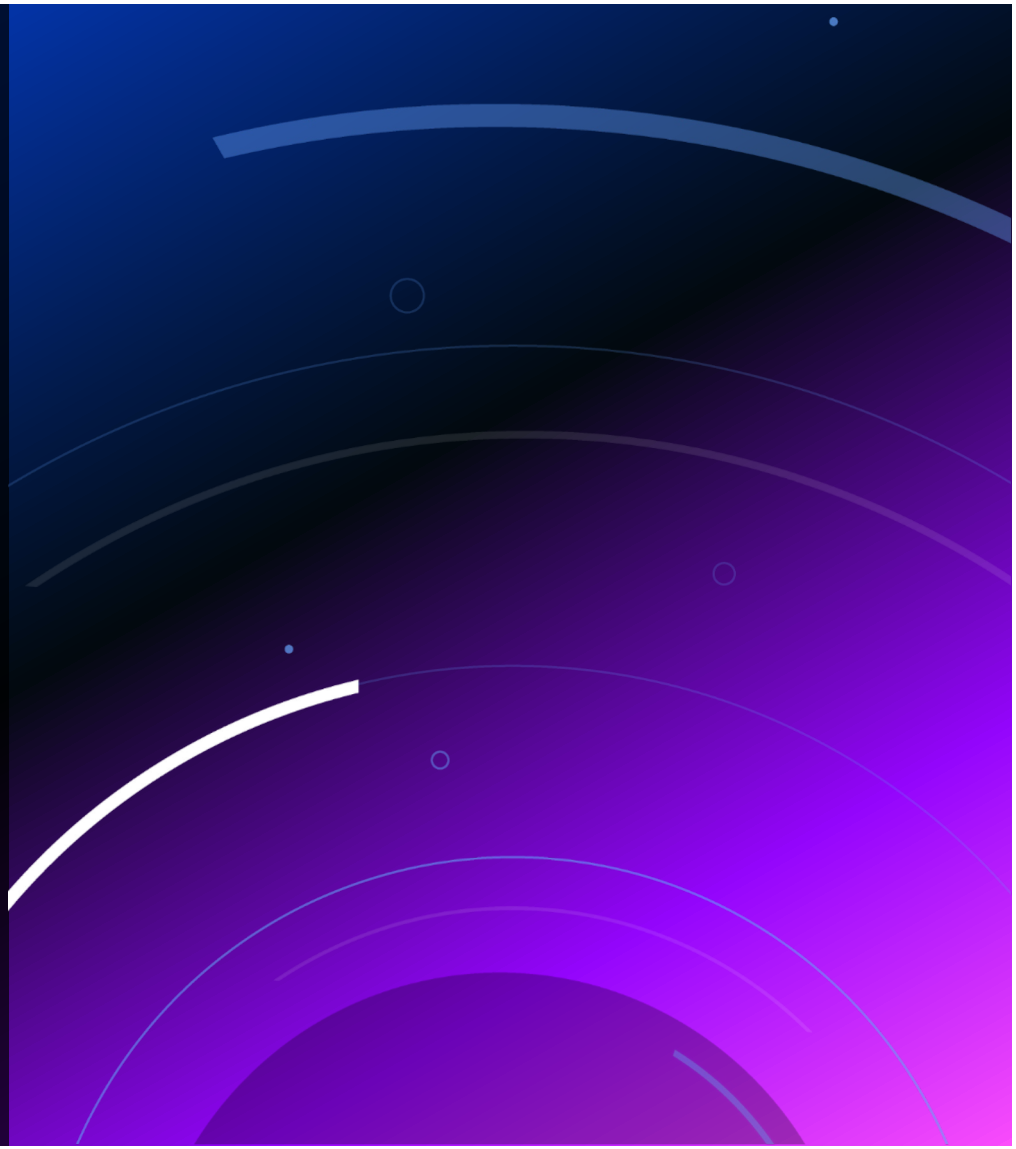
AGENDA

Introduction

MQTT for Gaming

GraphQL for Industry

Example Game with MQTT and GraphQL



UNITY 3D

Real Time 3D Game Engine

Programming Language C#

Multiplatform: Desktop, Mobile, ...

AR/VR/XR

THE POWER OF

MQTT FOR GAMING

MQTT FOR GAMING?

- **IoT turns to IoP**
  MQTT is used for connecting devices. Think about using MQTT for connecting players. “Internet of Things” (IoT) will turn to „Internet of Players“ (IoP).
- **Sharing Information**
  As players move around in the game, they keep sending updates like their location, healthy state, collected goodies, …. MQTT acts like a messenger, picking up this information and delivering it to everyone else playing.

MQTT FOR GAMING?

- **Join the game**
  In a multiplayer game, each player is like a device. When they join the game, it's like they're saying "Hello, I'm here!" to everyone else – this is known as a "**birth message**" in MQTT terms.

- **Handling player exits**
  What if a player leaves the game intentionally or unintentionally? MQTT has a smart feature called "**last will message**". It's like a goodbye note that tells other players someone has left the game. This way, everyone stays in the loop.

CENTRAL MANAGEMENT

A central game management connected to the central MQTT broker, written in any kind of language, could be used to observe and control the game and all the players.

CONCLUSION

1. Real-Time Updates: It's fast and perfect for real-time games.
2. Reliable: If a player's connection is shaky, MQTT makes sure messages get through.
3. Efficient: It doesn't eat up much data, so players won't lag.
4. Simple: It's not complicated to set up and to use.

Using MQTT in multiplayer games is like having a mailman who ensures everyone knows what's happening as it happens.

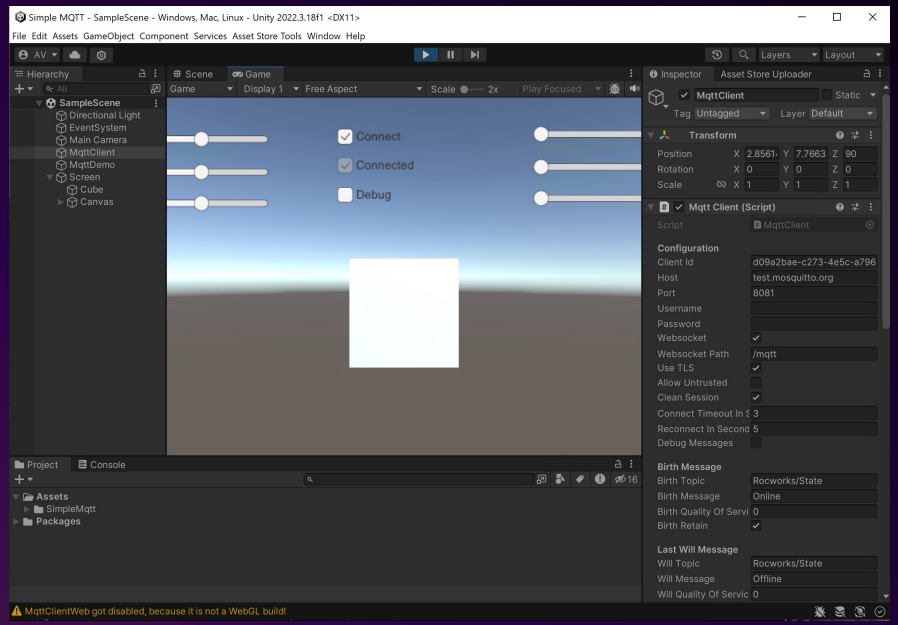
TIPS

- Use a UNS like topic structure to separate lot of players in the world space.
  - Game XYZ
    - Game-Instance-1
      - Room1
        - Player 1
      - Room2
        - Player 2
        - Player 3
- Plan your Topic structure and well, also which ones must be retained.
- Plan your Topic Payload well, also the payload of birth and last will message.
- For Unity there is a „**MQTT for Unity**“ asset. Link to Asset

  Easy to use and usable with all the main build targets, including WebGL!

MQTT IN UNITY DEMO

YouTube Link to Cube Demo



ADDING
SIEMENS
SCADA DATA

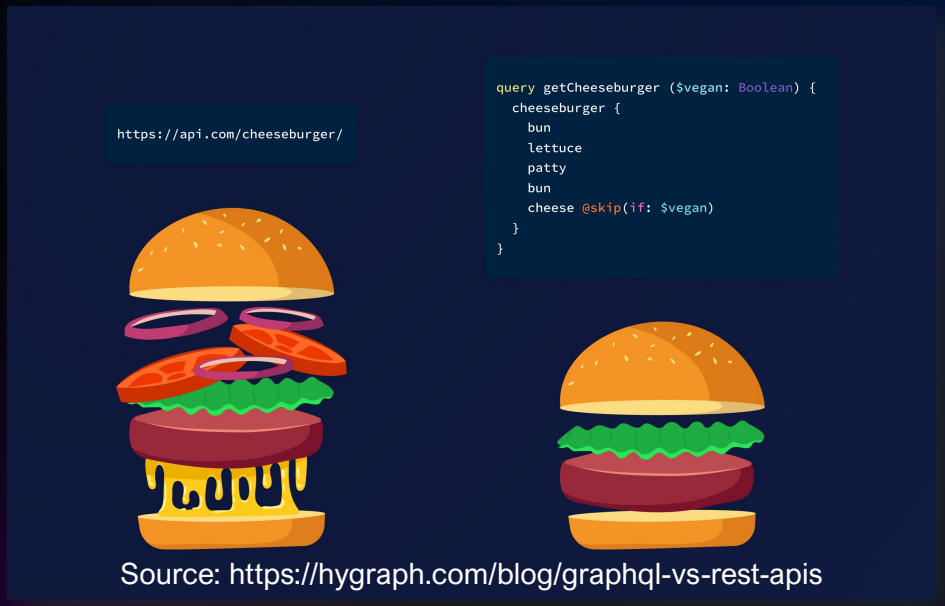
GRAPHQL

GRAPHQL

- Descriptive language, you get what you describe
- GraphQL can be used for any kind of an API
- Support for Subscriptions for Real Time Notifications
- Mostly based on HTTP and WebSocket's
- Made by Facebook/Meta, Open-Source, Foundation

GRAPHQL

- The better REST
- No Over-fetching
- No Under-fetching
- Documentation always included!



Source: https://hygraph.com/blog/graphql-vs-rest-apis

SIEMENS

GRAPHQL FOR WINCC UNIFIED

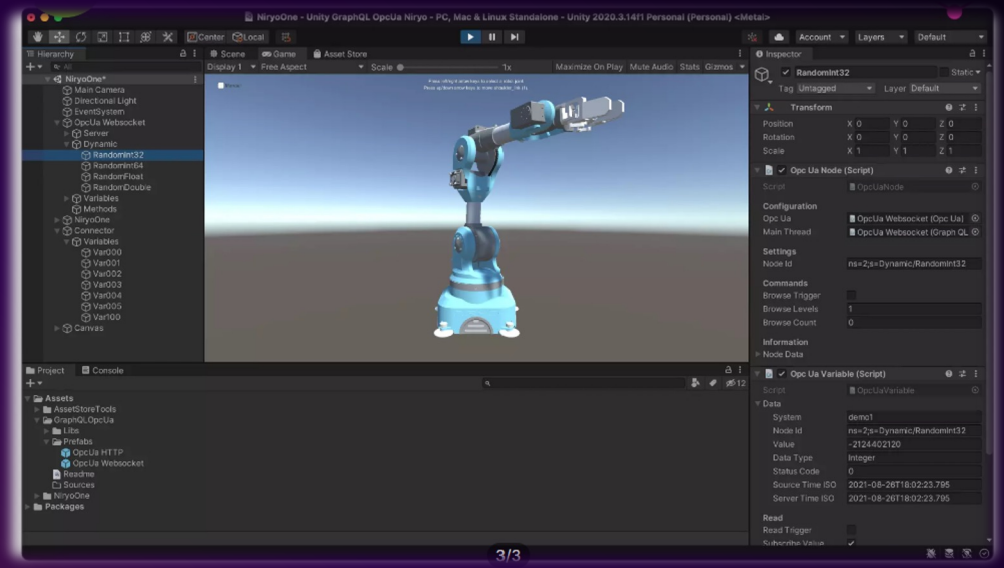
- **Built in WinCC Unified SCADA System (>V18)**
  Out of the box you can get actual and history data out of WinCC Unified SCADA system.
- **IT/OT Convergence**
  The IT can easily get the data out of the SCADA System
- **Game Integration**
  Can also be easily integrated into Unity 3D
- **Industrial Data**
  Bring industrial data easily to the 3D world

CONCLUSION GRAPHQL

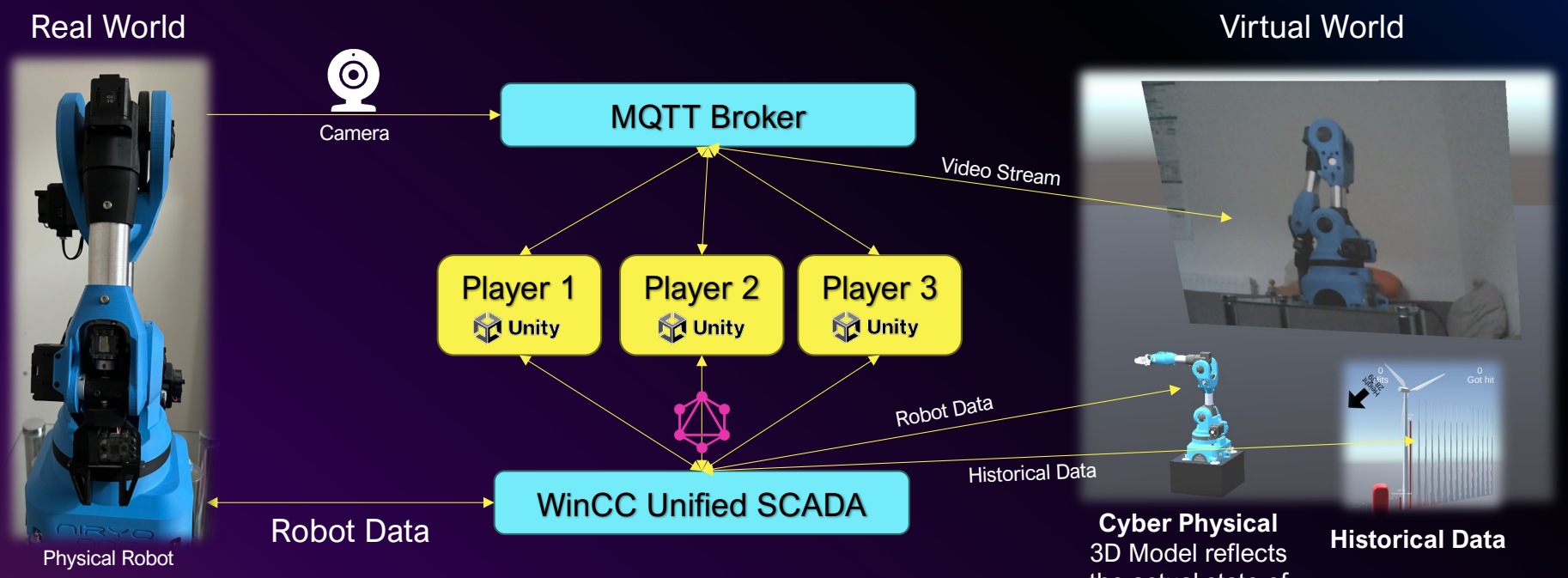
1. Real-Time Updates: GraphQL supports real time updates by its nature.
2. Reliable: Based on HTTP and WebSocket's.
3. Efficient: GraphQL only transports data which was requested.
4. Simple: It’s not complicated to set up and to use.

TIPS

- For Unity there is a **GraphQL for Unity** asset. Link to Asset
  Easy to use and usable with all the main build targets, including WebGL!



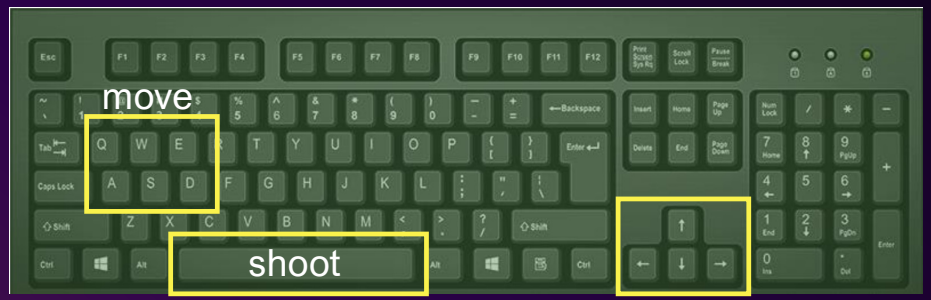
DEMO

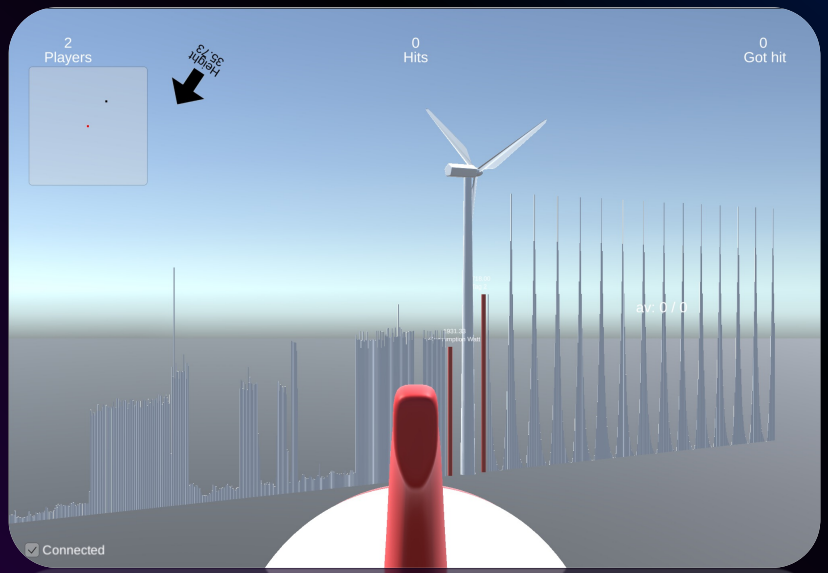

Real World
Virtual World
Camera
MQTT Broker
Video Stream
Player 1
Unity
Player 2
Unity
Player 3
Unity
Robot Data
Historical Data
WinCC Unified SCADA
Robot Data
Physical Robot
Cyber Physical
3D Model reflects the actual state of the real robot
Historical Data

DEMO

YouTube Link to Game Demo

R … reset rocket
SHIFT… move faster
Right Shift + Up/Down … rotate rocket





Pres Enter-Key to control Robot. Select joints with keys 1..6. Move selected joint with Q and E.
Press space to execute the Robots movement.

CONCLUSION

1. Demonstrated the use of MQTT for Gaming
2. Combined MQTT and SCADA data in Unity
3. Combined real world with the virtual world
4. Included historical sensor data from SCADA

THANK YOU

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