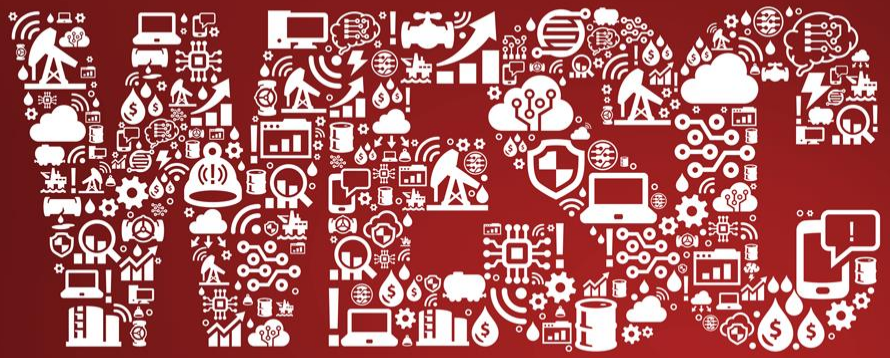

CYGNET IOT ENABLED: MQTT SUPPORT

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Weatherford®

AGENDA

1. Overview
2. History / Features / Structure / QoS
3. Brokers
4. Communications Device
5. Topics
6. Remote Device
7. Payload
8. Data Structures
9. Demo

MQTT HISTORY

- Arlen Nipper (IBM) and Andy Stanford-Clark(Cirrus Link) 1999
- Requirement : Minimal battery loss and min bandwidth connecting oil pipelines over satellite connection
- Goal
  - Simple to implement
  - Provide a Quality of Service Data Delivery
  - Lightweight and Bandwidth Efficient
  - Data Agnostic
  - Continuous Session Awareness

MQTT STRUCTURE

- Low overhead (at min 2 bytes)

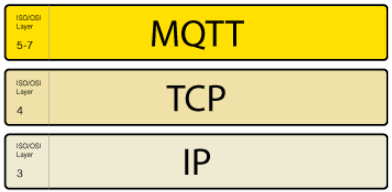


Figure 2.1 – Structure of an MQTT Control Packet

Fixed header, present in all MQTT Control Packets
Variable header, present in some MQTT Control Packets
Payload, present in some MQTT Control Packets

2.2 Fixed header

Each MQTT Control Packet contains a fixed header. Figure 2.2 - Fixed header format illustrates the fixed header format.

Figure 2.2 - Fixed header format

Bit	7	6	5	4	3	2	1	0
byte 1	MQTT Control Packet type				Flags specific to each MQTT Control Packet type			
byte 2...	Remaining Length							

QUALITY OF SERVICE

- Different priority
- 3 levels
  - 0 At most once
  - 1 At least once
  - 2 Exactly once

WHY MQTT?

- A lot has changed since 1999.
  - Increased bandwidth
  - Many standard protocol options
- Why is MQTT better than all the other protocols?
  - It’s not, it’s different.
  - The Pub/Sub model works well in our environment.
- It’s the adoption and tooling
  - Many client and server options
  - Tools, tools, tools.

WHAT IS AN MQTT BROKER

- The middle component.
- What is the benefit over going direct?
  - One to many publishers to subscribers
  - Notification of communication failure

BROKERS

- HiveMQ, Mosquitto, VerneMQ, EMQ, Paho, …

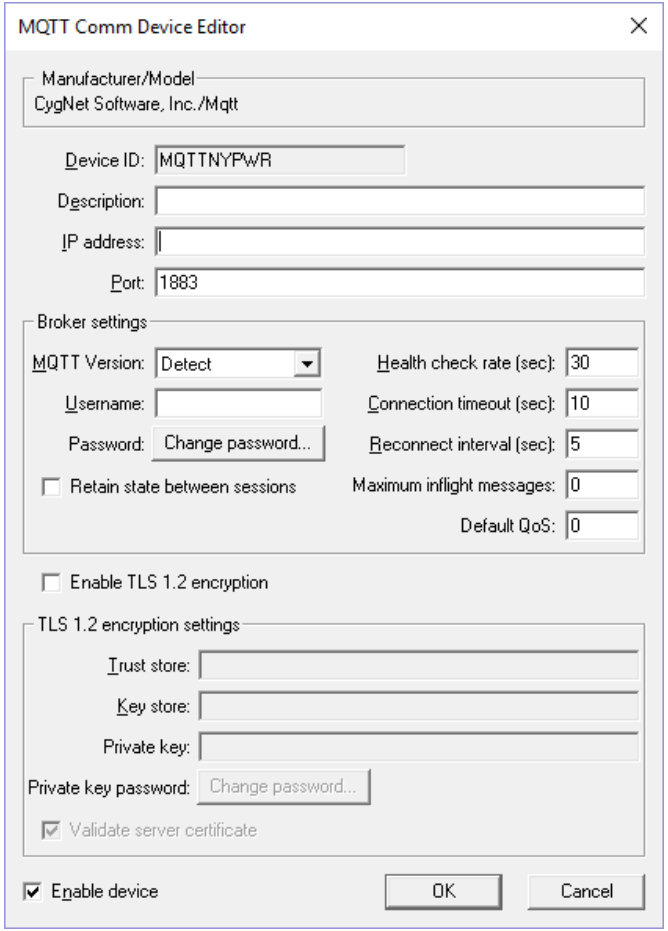
WHAT BROKERS ARE CURRENTLY IN USE?

How does this relate to CygNet?

- With version 9.2 CygNet will consume data from an MQTT broker.
- All the CygNet technologies you know and love can make use of this data source.
- We are using the EIE framework for MQTT
- A communications driver will support the protocol.
- A remote device driver will support the data normalization and processing

COMMUNICATIONS DRIVER

- Not traditional poll based comm
- Notified when data is ready
- No get button, no MSS task
- Similar to OPC async comm driver



FAILOVER

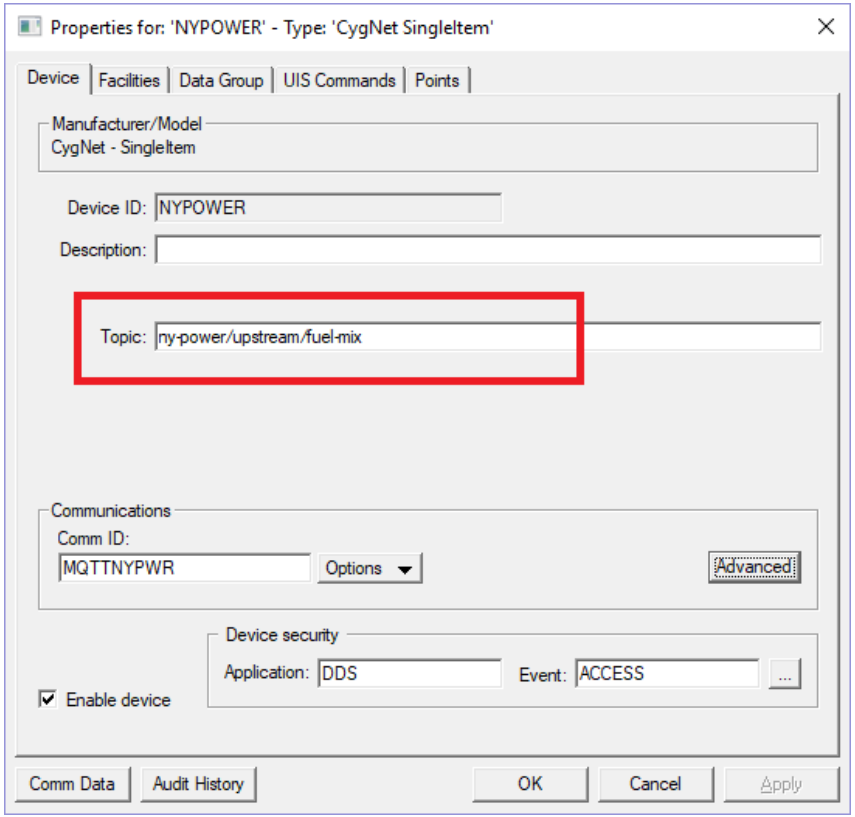
- Utilize existing methods
- Define additional communications devices as necessary

TOPICS

- String identifier that categorizes, identifies or describes the data.
  - Subscriptions can include wild cards ‘#’ or ‘+’ for names
  - Case sensitive
- Examples
  - facility/meter
  - spBv1.0/Houston/NDATA/Facility/Device
- Length
  - Unsigned short

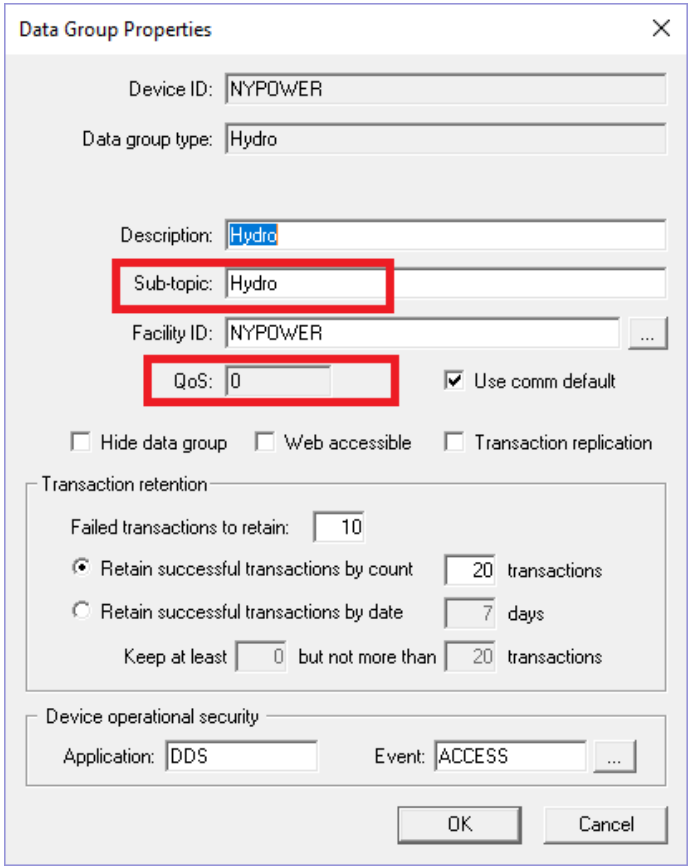
CYGNET IOT REMOTE DEVICE

- Partial topics are defined on the remote device
- First step in identifying incoming data
- The comm device associated with the remote will handle subscriptions



DATA GROUP PROPERTIES

- Using the remote device partial topic a complete topic is created
- Define quality of service settings
- Comm device creates an MQTT subscription from the properties



PAYLOAD

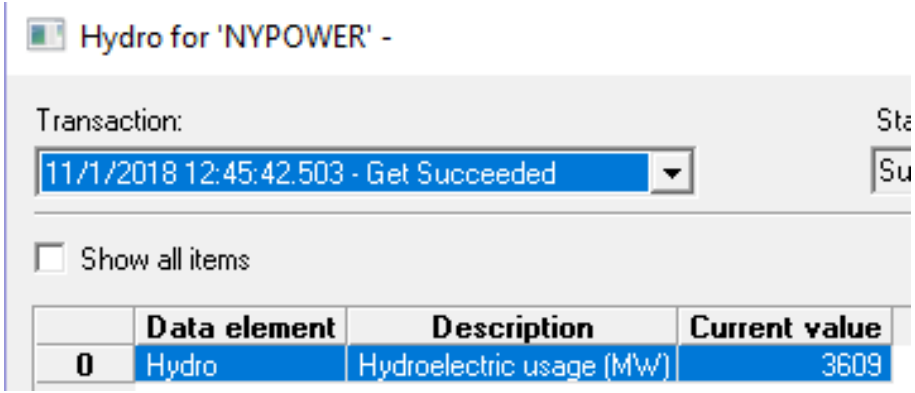
- Payload data is a simple array of bytes
  - 268,435,456 bytes -> Should not be reached… Ever.
- Can be interpreted as JSON document. Arbitrary data structure.
- Also Google protocol buffers. Well defined data structure.

DATA STRUCTURE

- Sparkplug
  - Data definition already defined
- JSON
  - Device template defines relationship
  - Elements in the template are associated with elements in the payload
  - Data relationship is used on data arrival to update CygNet points

EXAMPLE PAYLOAD

```
{
        "ts": "11/01/2018 13:40:00",
        "value": 3609,
        "units": "MW“
}
```



- Incoming is examined and processed
- Timestamp is applied to point
- Unit conversions
- All other point processing events

DEMO

- Consuming data from http://ny-power.org/ MQTT broker
- If you want to see MQTT data from a CygNet data source attend “CygNet IoT: Collect, manage, distribute at the Edge”

THANK YOU