Use Case: Manual valve position indication

Company: Aloxy

Industry: Oil & Gas, Chemical

Latency < 1 sec

3.000 - 5.000 sensors

DASH7

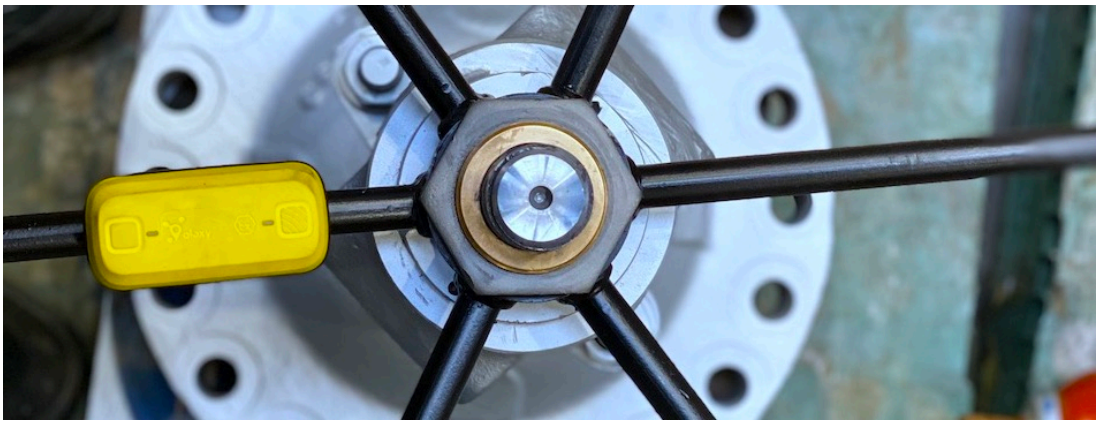
The DASH7 Alliance Protocol (D7A) is an Open Standard for bi-directional, sub-Ghz medium range wireless communication tailored for ultra-low sensor-actuator applications using private networks. D7A stems from ISO 18000-7 for Active RFID and operates in the sub-GHz ISM bands. The protocol specification is free to use without any patent or license requirements.

Sensors will securely report events and actuators can receive commands with a typical latency of 1 second while consuming only 30 uA on average. It's local synchronization and smart addressing features allow to upgrade thousands of sensors simultaneously, drastically reducing the upgrade time.

D7A fills the gap between the Short and the Large Area Networks. D7A excels in urban and industrial network installations connecting actuators and messaging applications (sensors, alarms, states) with ranges up to 500m.

Intro

A typical chemical or oil & gas company has numerous valves, some are motor operated however the majority is manual, and their status is generally unknown. In a typical chemical or oil & gas plant, you find thousands of manual valves that are often only operated during maintenance or turnarounds. Due to the large number of manual valves, it can be challenging to keep a good oversight of their position, for example during the different stages of maintenance.
Leaving a valve accidently in the wrong position has proven to be dangerous and has led to incidents and catastrophic accidents in the past all across the industry.



Challenges

- An industrial site has a lot of metal and is considered a harsh RF environment however the number of gateways needs to be limited to make the business case.
- Since valve positioning is seen as event monitoring near real time monitoring was essential!
- The correct valve position is critical, which require a high reliability of the network. Therefor Ack's had to be used to make sure the signal was received by the gateway, as well as periodic heartbeats.
- Since the total number of sensors could easily reach 3.000 – 5.000 scalability was important
- Battery replacement in a chemical plant can be expensive and therefore minimum lifetime was expected to be 5 years.
- OTA updates were a must because of the large number of devices and cost of going into a chemical plant to update every sensor.

Solution

- With DASH7 we managed to reach 250 meters to the sensor with acceptable power consumption.
- Latency of less than 1 second was accomplished, both up- and downlink
- Every sensor message was confirmed with an Ack, if no Ack was received the message would be resent. Frequent heartbeats are used to detect network deterioration, device failure or sabotage early.
- Where other protocols often offer limited scalability when your use case requires reliability and low latency, DASH7 allows to scale up to larger sensor quantities in these cases.
  With a 10-minute ack interval and 3 manipulations per day, a 5-year battery lifetime was accomplished, even on the low data rate (compared to LoRaWAN SF12 this would be 1-2 years).
- OTA updates can be performed

Highlights

- Reliability of the signal is crucial and can save lives, with D7A the reliability and near real-time monitoring was established!
- Significant cost reduction due to extended battery lifetime and OTA updates. For 5000 sensors it is expected to be 250K / year.
- Selected by major Chemical and Oil companies such as DOW and Repsol.
- Potential use cases with low latency downlink are being explored with end users.