IoT Messaging for Tidal Gauge Data

Project Proposal, 2023

Supervisor(s): Paul Crocker (DI)
Fernando Geraldes (C4G)

1 Objectives

This project is concerned with reliable and secure data transmission of data from water level monitoring stations, in particular data about tidal ranges. These stations have sensors that continuously record the data about water levels, station position etc. This data is important for many activities such as navigation, habitat, weather modelling etc. In this project we are interested in data retrieval and subsequent transmission to IPMA (Instituto Português do Mar e da Atmosfera), see https://www.ipma.pt/en/maritima/ssh/. The current system is based on an unreliable system based on routers that write files that are then sent by a simple file sending protocol which is unreliable – for instance file sending may fail due to any one of many reasons such as power failure, internet connection (4G/Wifi etc) problems etc.

In this project a new architecture shall be designed and a Proof of Concept application(s) shall be created. In particular we shall build a system based on MQTT messaging https://mqtt.org/.

MQTT is a standard messaging protocol designed for the publish/subscribe messaging transport model that is appropriate for connecting remote devices with low computing resources and minimal network bandwidth (such as routers) with clients over unreliable networks. It will be necessary to create a Server (broker), a Simple Client (subscriber) for IPMA (file retrieval and storage) and a small monitoring application for statistics. Other requirements are that the system will have to verify that the service be able to automatically reset itself, sending data that was not sent while the system was down. The system must also be prepared to send alerts (eg email) when stations are down or unable to send data.

2 Tasks

T1 Study of the existing System. (0,5 month)

T2 Requirements Specifications. (0,5 month)

T3 MQTT Software's and Technologies. (0,5 month)

T4 Development of the Solution. (1.5 Months)

T5 Testing and Validation. 0,5 month

T6 Project Write-up. 0,5 month

3 Technical and Academic Requirements

Network and Distributed Programming. SQL Databases. Java Programming Language. Software Engineering.

4 Expected Results

- 1 Project Software
- 1 Report.

5 Contacts

Paul Andrew Crocker (crocker@di.ubi.pt)