

PROPOSAL

**Software development for “Smart Drainage
– Flood Monitoring System” with
Interfacing to Government Wide IoT
Network (GWIN)**

Wish Ref No.

W-0264

Date

5 May 2020

Introduction

LR IoT Limited (“LRIoT”) is a company dedicated to Internet of Things technology. LRIoT provide software and hardware solutions for technological problems related to IoT. LRIoT is part of LR group of companies including LR Construction Technologies, LR Construction and Consultancy and EADAS. As part of the group, LRIoT can leverage technologies developed within the group to provide best in class service and offer comprehensive end-to-end solutions from IoT hardware to cloud based data analytics to mobile software applications.

Project requirements

This proposed project is to provide a system platform for use in "Start Drainage – Flood Monitoring System". The platform will be required to handle interfacing functions with existing GWIN to interface with existing GWIN infrastructure, provide

The proposal can be summarized into the following parts:

1. Design, build and implement a system / platform for retrieval of sensor data, manage relevant alerts, monitoring of system health. Platform should also interface with GWIN protocol for data retrieval and equipment control
2. Design, build and implement platform to display the data. The display consists of GIS user interface, and is available on Web and mobile applications along with a dashboard display of the system.
3. Design, build and implement analytical capability within the system for subsequent analysis of data trends.
4. Platform to handle large number of sensors locations (up to 500) and capable of storing historic hydrometric and image data.
5. Application programming interface ("API") access point to provision for data exchange with other platforms.

Project proposal

The project requirements can be broken down into 3 major technical components. The 3 parts are:

1. Backend server (or cloud)
2. Data storage (or cloud-based storage)
3. Frontend applications

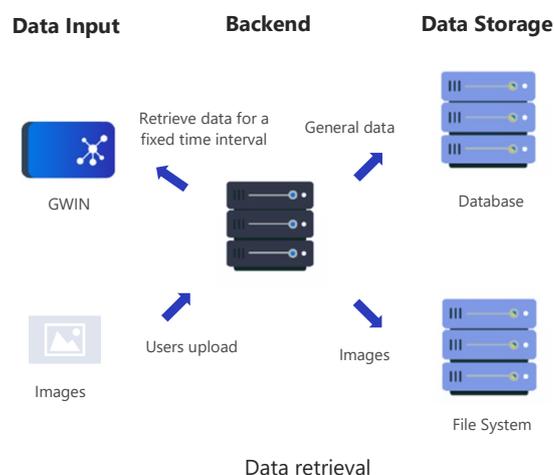
LRIoT along with the LR group of companies has completed numerous projects for the aforementioned 3 parts. Requirements and examples are listed in the following subsections.

Part 1 – Backend server

The backend server / cloud component forms the backbone of the proposed system. Based on the requirements as outlined in the Wish List W-0264, and the Project requirements section, the backend server will provide the following services:

- Interface with GWIN protocol for data retrieval and equipment control
- Provide APIs for frontend applications and data exchange with other platforms
- Retrieve data from GWIN and save to database periodically
- Handle image files from other systems or users
- Notification to users when abnormal readings or device status are detected (e.g. email, mobile notification, SMS, etc)
- Provision for add-on analytical programs for further data analyses (e.g. machine learning, statistical analysis)

LR group has developed and commissioned multiple systems with similar specifications. The proposed backend system schematic can be illustrated in the following diagrams:



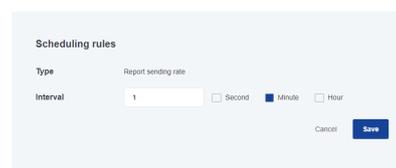
Device alerts on mobile applications



Alert items on mobile platform



Data analysis on Web interface



Equipment control on Web interface

Part 2 – Data storage

Data storage part of the system can be viewed from a data structure perspective and can be bifurcated into two separate subsystems. The 2 separate subsystems are:

1. Object storage enabled relational database system
2. Distributed file storage system

The data for the system will be mostly structured as the sensor data are limited in scope and dynamics. To provision for additional data, the data base system should provide the capability to store objects that can be self-described.

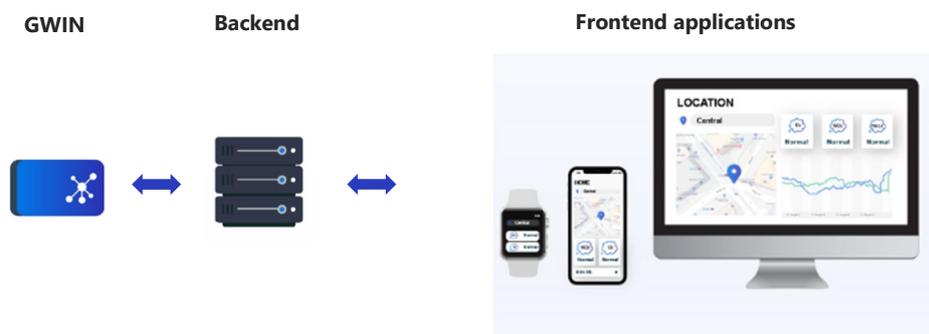
For the storage of images, a distributed file system would be ideal to store the images. As the images will not be standardize, flexibility is required in handling the numerous files.

Part 3 – Frontend applications

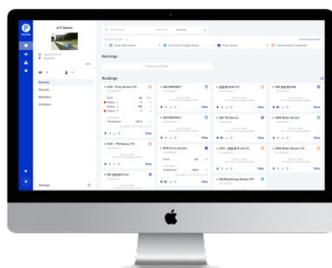
Frontend applications are critical in promoting user interactions with the system. As such, the frontend applications must fulfil the following requirements:

- Provide web-based and mobile application dashboard
- Implement a GIS platform to display data and analyze the data trend
- Provide user-friendly interfaces for devices and alert management
- Provide data report for download

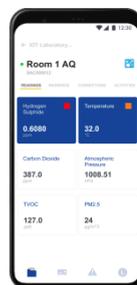
LR group has developed and commissioned frontend applications with varying specifications. The proposed frontend system can be illustrated in the following diagrams:



Data flow and equipment control of the system

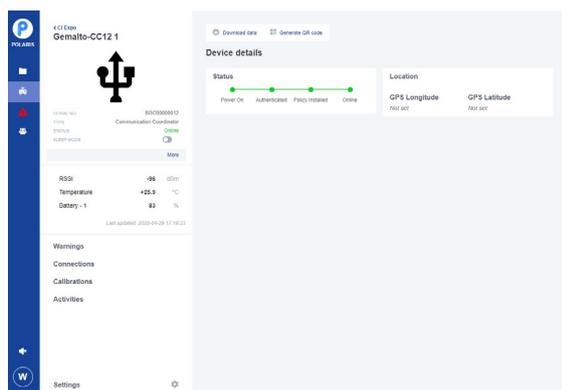


Web-based dashboard

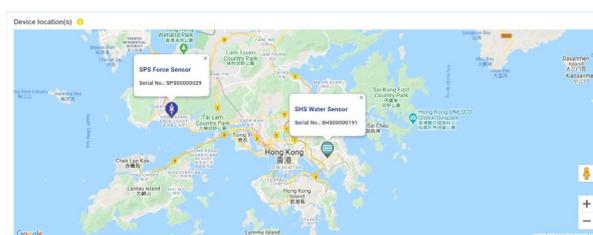


Mobile application dashboard





Web based interface for device status and locations



Geographic-based interface

LR IoT Advantages

LR IoT along with LR group of companies provide numerous advantages to ensure the success of this project. LR group's experience with deployment of numerous IoT devices and systems can ensure success of the project. LR group is experienced in handling different systems and provide unique solutions to challenging problems.

The combined group of companies also allows for further customization and changes in specifications without significant extensions in the commissioning of the system. This allows the greatest flexibility in tackling challenging and evolving projects.