International Institute of Information Technology, Bangalore

Smart Water Networks - Project Scope

Abhijith Madhav Kumudini Kakwani

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1 Problem

Water needed for the IIIT-B campus is sourced in three ways

1. IIITB has its own source of water in the form of three functional borewells. Water is pumped out of these borewells for almost twenty hours a day.
2. Water supply from BWSSB for a limited amount of time each day.
3. Almost 20000-30000 liters of water per day is procurred from commercial water tankers.

Currently there is no insight into how water is being used and about whether its use is optimal or not. Informal estimates term the per-capita water consumption within the campus as excessive.

2 Objective

There is a proposal to make the water distribution network of the IIIT-B campus a smart one with the installation of sensors in the network. Our system intends to plug into this smart network and work on the data that the sensors produce.

Specifically this project intends to

1. Be general purpose enough to plug into any small to medium sized smart water network(An institute, a corporate campus, a gated community, a farm etc)

2. Help in better water management by offering control and insights into the water network across the installation.

3 Scope

We will be focusing on architecting, designing and implementing the below

1. Supervisor mobile apps which
   - Detail water usage patterns.
   - Help in monitoring the status of resolution of anomalous events in the water network by the field personnal.
2. Mobile apps for the field personnal to notify them of anomalous events in the smart water network which need attention.
3. Architecting and implementing a modular backend storage system to
   - Represent the smart water network.
   - Manage all the data generated by the sensors.

We are limiting the extent of our implementation to **not** include the below

1. Web UI's to construct the smart water network. We will load the structure of the smart water network in batch mode to our backend systems and then work on the same.
2. A visual geospatial representation of the water network where a centralized view of the whole network is possible. Here each network asset has a visual representation and its parameters can be inspected by clicking on them.

4 Use cases

Use Case 1	**Insights into the water network**
Actors	Administrators

Activities	• Will be able to see the breakdown of water usage across aggregations with options to drill down to specific granularity. Aggregations can be buildings, blocks, floors etc. Aggregations can be nested. • Will be able to inspect health parameters of the water network. Health parameters can quality of water, electricity used, level of water in storage etc.

Use Case 2	**Predictions**
Actors	Administrators
Activities	• Will get predictions regarding future water usage.

Use Case 2	**Anomaly notifications**
Actors	Administrators, Field Staff
Activities	• Field staff will be notified of specific anomalies in the water network. • Administrators will be able to aggregate alerts w.r.t the type and origin and assign them to the field staff. • Administrators will be able to monitor resolution of anomalies by field staff.

Use case 3	**Reporting leaks**
Actors	General populace

Activities	• Will be able to report leaks.

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5 Key features and functionalities

5.1 Android Application for the supervisor

1. Gets Notifications
   a) When there are leaks(Leak detection)...
   b) When to water the garden...
   c) When quality of water goes down below a certain level...
   d) When level of water goes below a certain level in storage or sources...
   e) When water consumption increases beyond a certain in level...
2. Can subscribe field staff to relevent alerts and notifications.
3. Can track notification/alert resolution by field staff.
4. Reports
   a) Water consumption pattern with options to drill down w.r.t to buildings(Academic, Cafeteria, Hostels etc) and activities(Cooking, gardening, cleaning etc).
   b) Water consumption vs time vs number of students.
5. Predictions
   a) Water tanker requirement prediction.

5.2 Android application for field staff

1. Customized notifications and options to update status of resolution.

5.3 Android application for the general populace

1. Report leaks

5.4 Basic Web Application for the supervisor

The supervisor can then obtain relevent details for each network asset like the below with options to drill down w.r.t. time.

1. Quality of water
2. Storage levels
3. Consumption of water

4. Status information of pumps, i.e., whether they are switched on or switched off.

5. Electricity consumed to pump water.

6 External Dependencies

1. Installation of flow, quality and level sensors at suitable points in the water network to make it a smart one.

2. Installation of a SCADA like system with a ODMS(A historian) from where sensor data can be read off.

In the absence of the above we intend to implement a stop-gap sensors simulator which will fill database with psuedo sensor data until real sensors are deployed in the network.