



Smart Residential Pipes

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Introduction

SmartPipes is a system of sensors and actuators that seamlessly attach to the existing piping system to provide detailed water monitoring and flow control for each residential unit.

01 Problem Statement

Saudi Arabia confronts significant water scarcity that aggravated by rapid urbanization and industrial growth. Smart Pipes could help to reduce water consumption and contributes in digital transformation of the real estate sector.

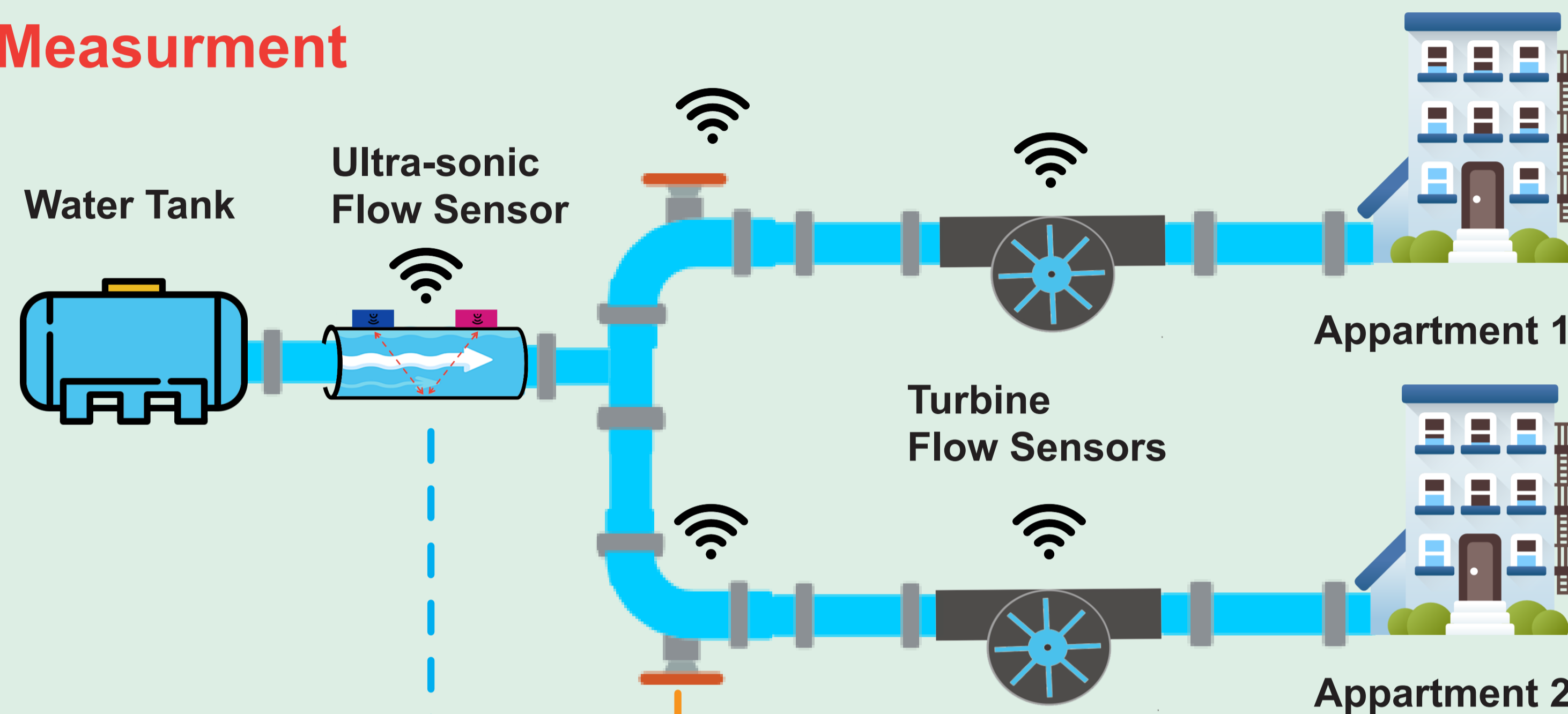
02 Constraints

- Pipes Infrastructure Compatibility
- Power Supply for Electronics
- Data Reliability and Availability for AI

03 Target Specifications

- Low cost per outlet ~50 SAR
- AI model Mean Absolute Percentage Error (MAPE) < 2.5%
- Coverage of at least 4 floors
- Overall system reading accuracy $\pm 2\%$

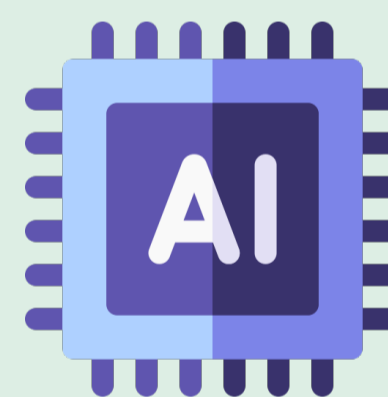
Measurement



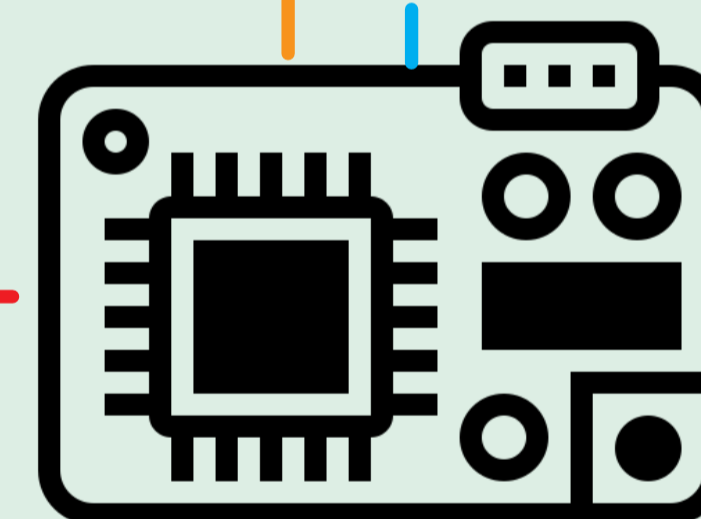
Cloud



IoT Platform



AI Model



Microcontroller

Calibration & Leak Detection

- Reading Sensors Data
- Comparing water flow between sensors
- Water valve control

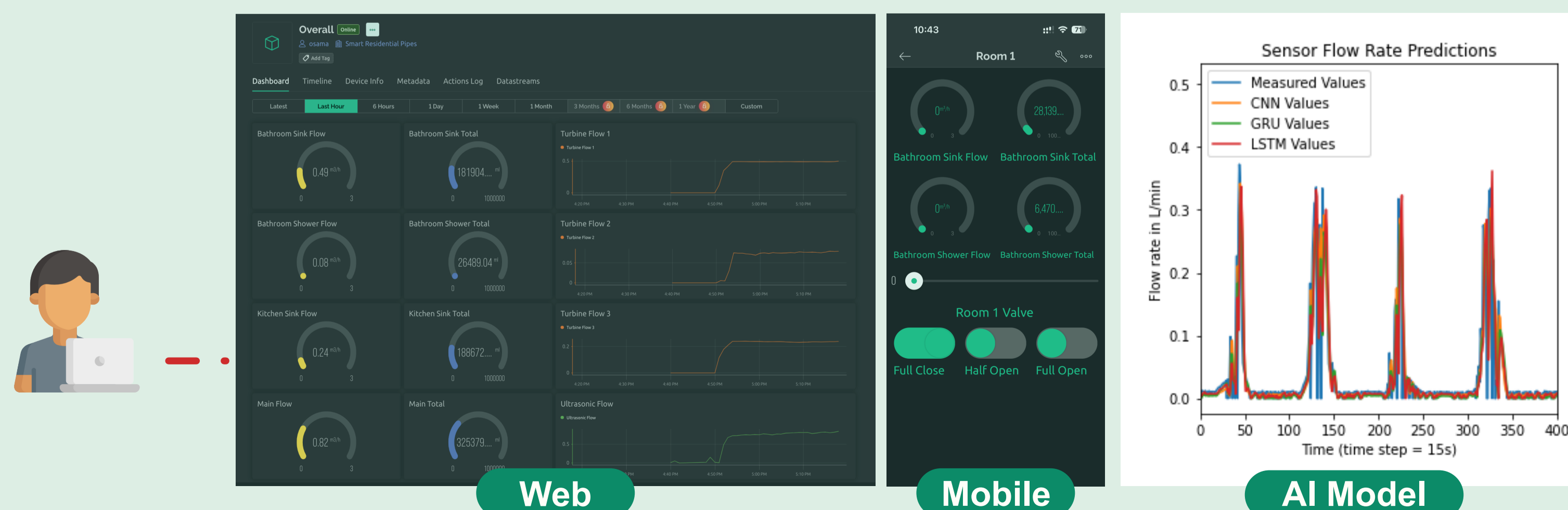
Validation

- Ease of Installation and Maintenance
- Low Cost per Outlet (~50 SAR)
- AI Model Mean Absolute Percentage Error (MAPE) < 2.5%
- Overall System Reading Accuracy $\pm 2\%$
- Coverage of at Least 4 Floors

Conclusions

Smart residential pipes is a vital tool for smart and efficient buildings as it facilitates real time water monitoring and control for residential buildings. The project provides an easily accessible web/mobile dashboard that provides detailed water consumption, user-specific consumption analysis, and remote water flow controllers. This will promote water rationing behavior in tenants while easing the work for real estate managers.

Dashboards



What is Next ?

- Adding sensors for leak localization
- Adding sensors for water pollutants detection
- Targeting water irrigation systems