Lab in a Box : A Rapidly Deployable Environmental Monitoring IoT System

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Internet of Things (IoT)

Interconnected network of heterogeneous smart objects capable making intelligent decision based on environmental parameters

A smart object contains

- Cloud services and storage
- Internet gateway device
- Transceiver module
- Embedded device
- Various sensors
- Power source

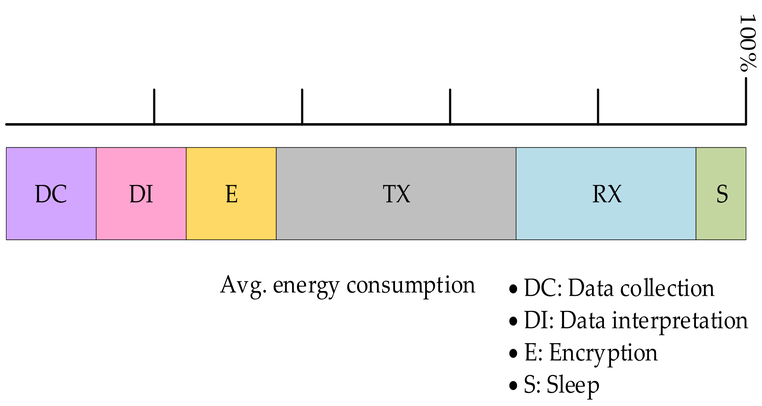
IoT Challenges

- Heterogeneous components and protocols make interoperability complicated
- Limited memory, processing capability, and power means most end-node devices are not secured

To overcome these challenges a modular architecture with lightweight encryption is needed to make designing IoT sensor platforms easier and immune to remote attacks.

Lab in a Box (LiB)

- Modular architecture
- Easy to deploy and set-up
- Lightweight, small in size, and portable



Avg. energy consumption

- DC: Data collection
- DI: Data interpretation
- E: Encryption
- S: Sleep

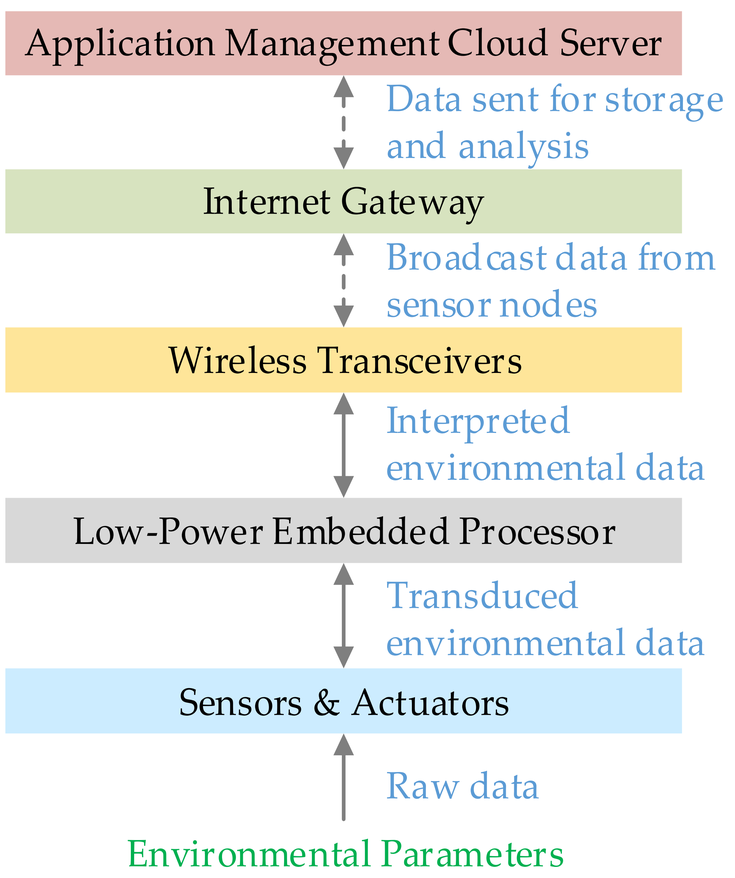
Contributions

- Proposed a compact, scalable, secure and modular IoT architecture

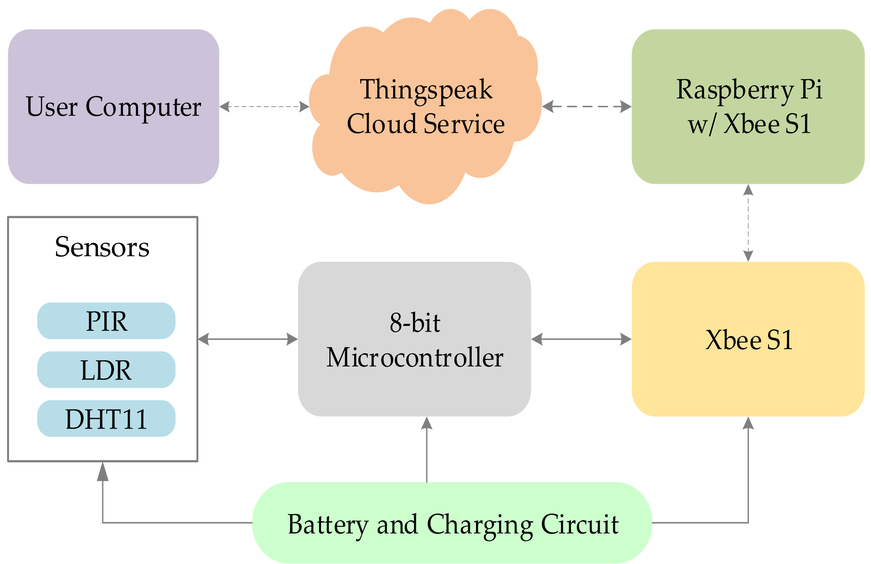
IoT Implementation Challenges

- Different components and layers make designing system complicated.
- Set up and deployment of IoT platforms require setup time and technical expertise.

LiB architecture

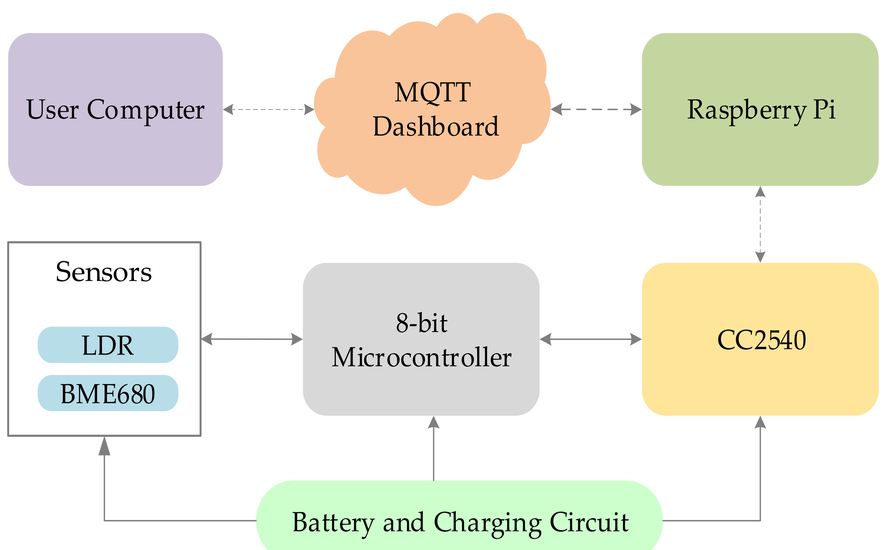


LiB: Occupancy Detection



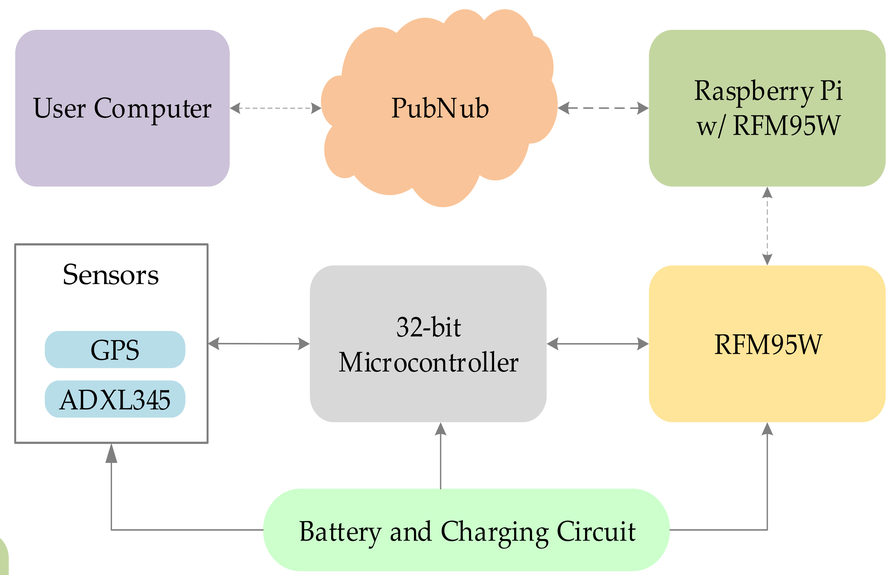
Component	Active current (mA)	Sleep current (mA)
8-bit MCU	0.2	0.06
CC2540 BLE	30	0.3
BME680	0.1	0.01
LDR	0.4	0.4
Total	30.7	0.77

LiB: Indoor Environmental Monitoring



Component	Active current (mA)	Sleep current (mA)
8-bit MCU	0.2	0.06
CC2540 BLE	30	0.3
BME680	0.1	0.01
LDR	0.4	0.4
Total	30.7	0.77

LiB: Fall detection for elderly



Component	Active current (mA)	Sleep current (mA)
32-bit MCU	4	0.8
RFM95W	50	0.8
ADXL345	0.2	0.01
Total	54.2	1.6

Future Works

- Implement the proposed architecture across variety of IoT applications.
- Collect real time data for machine learning based analysis.