



School Emergency Communication System

Customer needed a reliable communication system during emergency events at schools

Project Size: 7 members

Project Duration: 16 months

Technology Used: MQTT, ZigBee, TI Z-stack, BLE, Nordic NRF51xxx, iOS/Android

Legacy Communication Challenges

- Delay in communication of events throughout the entire school building with several hundred classrooms
- Unable to customize alerts for specific events
- Lack of location in case of alerts generated from staff members

Solution

- GadgEon designed an end-to-end IoT system that included a badge, hub for every room, gateway, mobile app and cloud.
- Result is the first classroom alert system to incorporate instant two-way messaging, staff position locating, and visual alert notifications for emergencies. Uses BLE for location identification and ZigBee for large mesh network for instant communication

WHAT DID GADGEON DO?	PLATFORMS/ TECHNOLOGIES USED
1) Architecture for complete system including ZigBee based end node, ZigBee Hub, Gateway, Cloud and Mobile App	Requirements Gathering & Analysis, Uses cases, Architecture development identification of functional components.
2) Hardware design, prototyping, boardbring up for ZigBee based Hub	Cadence allegro, optimized for battery powered operation. Custom designed ZigBee hub with CC2538 interfaced with nRF52 based BLE stack via UART.
3) Embedded firmware for end node, Hub and its integration and testing on reference platform and on Target platform	Z-Stack configuration for large network operation using Many To One routing, IAR embedded workbench, Keil MDK, SmartRF Flash Programmer, Ubiqua protocol analyzer Optimization for battery operation, Location identification using BLE, button interface on badge.
4) Embedded Linux based Gateway application, which manages hub Zigbee mesh network on one side and communicates with cloud application over MQTT	Off-the-shelf Hardware (beaglebone Black) was used with the Linux application(cpp), CC2538 interfaced via UART for ZigBee protocol, MQTT over SSL for cloud communication, LCD Display (7 inch) & touchscreen for the visual alert notification and alert generation, Firmware upgrade initiated from the cloud server.
5) Mobile App design and development for controlling and managing School Security System - both iOS & Android – native	<p>MVC architecture, encrypted databases, real-time notifications using MQTT & GCM, REST API based alert generation, Followed the recommended design patterns from Apple and Google.</p> <p>Walkie-talkie based emergency communication from mobile and web, between responder and crisis management team</p>
6) Cloud application	Provisioning of multiple Gateways and associated Hubs and badges, User management, Generate escalate and close alerts, Status and statistics collection, Floor view for location of events, Communication of events to mobile apps. Firmware upgrade for Hubs and Gateways.





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