

IoT Capstone project

Smart IoT Bluetooth sensors Scaling and Integration

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Overview:

IoT applications that require scaling and multiple sensors several meters apart require the use of IoT gateways and integration with cloud apps and a local IoT controller. Bluetooth devices and beacons offer a variety of options and thus applications that allow scaling easily and cost-effectively. In this Smart IoT Bluetooth project I use different Bluetooth sensors in a system that can scale as needed. One application can be asset tracking using RSSI.

Requirements:

- Measure valuable asset movement and send message if RSSI signal indicates it's moving beyond a threshold with several asset tag sensors (Bluetooth sensors)
- Send notifications for RSSI if beacons move after a predefined value (Bluetooth sensors)
- Implement a Learning mode to register beacons to be tracked/monitored/observed.
- Display (and refresh periodically) in a Dashboard the overall state of beacons: Total number of beacons, number of beacons that have gone into alarm state depending on a predefined value in dBm, number of beacons that have stopped to Advertise either because they're far away, or they were stolen or the battery power drained.
- Particle Argon for local controller
- OLED display
- GPS module to display current GPS location
- Button component to trigger learning (discovery) or normal operating mode.

Features:

Bluetooth devices broadcast services based upon their services. Usually asset locator BT devices broadcast every 6-8 seconds, but the time can be adjusted, and they don't go into sleep mode. Therefore, the system will be constantly scanning for devices in the loop every 5 seconds to measure the RSSI and monitor the state of a beacon.

Implementation:

1. There will be a learning mode triggered by the push of a button to save in EEPROM the UUIDs of the beacons used so that if powered on/off, their UUIDs are there and

furthermore, no other UUIDs are considered in the case that other Bluetooth devices are near passing by.

2. In the loop scan every SCAN_INTERVAL for a Bluetooth Advertising packet (data), look for the corresponding services and execute related callback.
 - a. Define an array of tracked assets (beacons), to keep track of their real time condition: stationary, moving, moving beyond a threshold system value (alarm state), non-advertising for a predefined time ("lost" state).
 - b. Define an array of beacon timers implemented with a class to keep
 - c. Use RSSI to estimate movements of assets tracked and notify global movements in OLED and publish movements depending on "objective", send push notification to Mobile App in detail by beacon with the state that triggered the message, may sound a buzzer in the smartphone if necessary.
RSSI is based in the signal strength (dBm is the unit of power for RSSI)
3. In the loop check GPS coordinates every 10 seconds, if it changed update position in DASHBOARD and send email or text message
4. Every predetermine system time display summary in Dashboard...
5. Optional: calculate and send ACx values of a Bluetooth beacon that supports it