

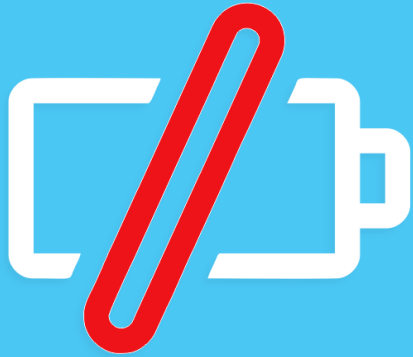
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Problems faced by IoT startups
& their solutions

01

Hardware draining out **battery** really fast



CHOICE OF **WIRELESS** TECHNOLOGY

Use Bluetooth Low Energy (BLE) as it consumes lower power compared to Wi-Fi, and is supported by almost all mobile devices.



RIGHT **HARDWARE** SELECTION

- Configure wireless range to be as low as possible.*
Lower the range, lower the power
- Select BLE chips from the leading low-power solution vendors# in the industry



FIRMWARE OPTIMIZATIONS

- Use DC-DC converter to minimize system power and shut off peripherals when not in use
- Maximize sleep time by synchronizing peripherals to run alongside BLE

*100 feet LoS (Line of Sight) or lesser

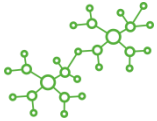
Dialog Semiconductor and Nordic Semiconductor are presently the leading low-power solution vendors in the industry

02

Unable to send **data to cloud**
due to network congestion



This problem primarily occurs
on a star network



REPLACE STAR WITH **MESH TECHNOLOGY**

A mesh can incorporate multiple gateways for data entry/exit, it can scale up to accommodate more data, by adding new nodes and gateways.



SCALABILITY

Scaling up a mesh is easy and has no adverse impact to existing setup



RELIABILITY

A single data packet can traverse through multiple gateways, to guarantee reliability



CONNECTIVITY

Using a mesh, a device can connect to other far-away devices via intermediary nodes

03

Hacked gateways communicating to cloud posing a potential threat



MAN IN THE MIDDLE (MITM) ATTACKS
Listen to private data flow between two devices

DENIAL OF SERVICE (DOS) ATTACKS
Flood the network with redundant data



IMPLEMENT **ENCRYPTION** AND AUTHENTICATION

- Use TLS protocol when communicating with internet servers
- Use ECDH technique to encrypt and authenticate BLE connections

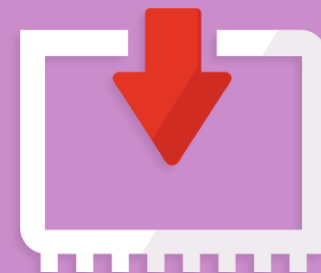


DENIAL OF SERVICE (**DOS**) ATTACK

- Servers detect malicious users with too much traffic and expunge them
- Firewalls protect privacy and prevent security breach

04

Find **firmware upgradation**
extremely challenging



WITH **OTA** AS SOLUTION,

a device can be modified through two types of changes



BEHAVIOUR CHANGES

Transmit power or Beacon ID by establishing a BLE connection to send new parameters



FUNDAMENTAL CHANGES

- Design the firmware in layers (Bootloader and Bootloadable)* to allow future upgrades
- Establish a BLE connection with the device in the field via the Bootloader
- Download the new functionality to the Bootloader
- The Bootloader replaces the existing Bootloadable with new functionality

* Bootloader is a device upgrade mechanism; Bootloadable is the actual device functionality