

Energy metering & charging (Energy as a Service)

Business Need:

With the growing energy thirst for a country like India, energy availability and efficiency is of prime importance. To keep up with the demand and powering the communication back-bone, mobile tower companies are facing challenges to meet the energy requirement as roughly third of the sites receive less than 12 hours of Grid power. Lithium ion batteries are critical secondary source which not only ensures availability but also saves a lot of fossil fuels burnt to ensure generator powers in remote locations for enabling cellular communication.

There is a huge demand for managing this energy storage solutions for half a million mobile towers across the geographical spread of India. Companies are engaging smart solutions to deliver secondary source of energy at low TCOs. The focus is shifting from investing in batteries and maintaining them to Opex model of being charged for energy consumed.

My organization sensing this market need and a pioneer in energy storage solution; developed an IoT solution for managing this business model.

Solution Overview:

A remote device gateway unit was developed which could take signals from multiple sources in a typical Mobile tower installation. Sensor input was available for Grid monitoring, battery health & consumption monitoring, control room gate open/close, load sensing of mobile towers, AC temperature control and other related parameters.

The RTU (Remote Telemetry Unit) was installed at the tower site and wired to monitor battery health, grid readings and rectifier unit. For some specific sites, additional sensors were connected to this RTU through a Bluetooth module. The device gateway is able to connect to the *Cloud* through the RTOS which takes care of device provisioning, data security & encryption and transmission. A memory card module is also enabled in the RTU to act as temporary data storage in case of connectivity failures and transmit only the recent data stream collected from the on-site sensors.

The device gateway is able to connect to AWS IoT Cloud service, and data is stored in Data Lakes. Edge computing at the gateway ensures basic functionalities of Alarm/Fault trigger, SMS gateway for urgent notifications based on critical sequence of events as configured for the business process. The application layer of the AWS IoT platform is able to report the gateway specific time series data and other KPI dashboard. The use of virtual state of the devices (*lambda*), enables to trigger specific actions from application layer like AC switch ON/OFF instructions.

The application also has the key metrics which are required for metering and billing. At the end of the billing cycle; an automated report with the kWh (Kilo Watt Hour) of battery power delivered per site, SLAs, uptime report is delivered to customer and also integrated to the ERP digital core (SAP ReFX module) for billing run. The application layer is also connected to a payment gateway for some business scenarios where pre-paid account is to be used for energy delivery. An example in this case is battery charging

stations for e-Rickshaws where the user can park his vehicle for charging. The mobile app (GUI for the user) is connected to the application layer for real-time interactions with the system.

The IoT architecture delivers the following capabilities –

1. Central NOC (Network Operations Center) with the hierarchical and geographical spread of its asset locations.
2. Mass device provisioning using certificate based authentication.
3. Secured Communications using Transport Layer Security (TLS) protocol to ensure best in class Information security and cryptography concepts.
4. Ability to add other use-case specific sensors to this device gateway (use of standards) to ensure common IoT stack for remote site monitoring.
5. Edge computing capability on the device gateway to take specific basic actions/notifications in absence/disruption of cloud connectivity.
6. The large amount of data and the pattern/reading before failures can be used to train a Machine algorithm for predictive analysis (future roadmap).
7. The IoT data can be integrated to customer's specific digital applications for field force/service management through available web-services.
8. Complete audit trail and ability to have archiving of data as per customer's need.

Business Outcomes

Providing a virtual view of the remote sites and ability to monitor large number of similar sites from a click of mouse, is delivering a lot of value in managing operations, improving uptime, maintenance & repair, saving from pilferage and increasing the site profitability (higher uptime ensure higher revenues while reducing the cost per site on operations).

Transforming how Energy is Managed

This IoT solution has enabled my organization to *transform* the business model from providing Industrial grade Energy storage devices to delivering reliable Energy solutions. This single back bone architecture can deliver the following use-cases –

- ✓ Managing the remote assets for the telecom tower business and reducing the CAPEX investment on secondary energy devices to OPEX energy solutions
- ✓ B2C model for delivering low cost energy solution for EVs (Electric Vehicles)
- ✓ Solar and wind turbine management system and energy metering
- ✓ Energy solutions for buildings, ATMs and Datacenters