MAINFLUX LABS
Solving Internet of Things Complexity

Remote Monitoring of Telecom Towers

Mainflux User Case Study

Mauritius Telecom Achieves Significant Savings With IoT

Techolution uses Mainflux to monitor hard-to-reach BST Towers and replaces expensive manual maintenance to prevent power outages.

Mainflux User: Techolution

Techolution's Customer: Mauritius Telecom

Industry: Telecommunications

Telecoms are already harvesting the opportunities that IoT technology is affording, by offering additional value to their network and services, especially to the B2B market. However, Telecom's internal use of IoT can produce substantial benefits providing more efficient processes and operations.

Background

Telecom Communication Towers (i.e. Base Transceiver Stations - BST) are essential equipment of Telecom mobile and internet networks. Their continuous and unobstructed operation has a decisive impact on the service quality provided by Telecom and its business in general. Consequently, monitoring of BST towers is critical and of utter importance.

Mainflux IoT platform user, company Techolution from USA, was engaged by Mauritius Telecom which was facing serious difficulties due to its BTS towers related issues.

Techolution's client experienced frequent outages at remote, hard-to-reach sites, leading to 5% downtime with substantial financial losses and customer satisfaction damage.

Preventing power outages is crucial and maintaining this kind of network requires high visibility of the remote BST Towers

However, the maintenance and checkup of these assets were manual, reactive, and expensive considering that they are installed across wide areas with many of them on remote locations.

Besides outages, Mauritius Telecom had also the problem with power consumption, estimating that it could be optimized up to 20% savings.

Solution

The goal was to create a vertical IoT solution for remote control of assets and equipment which will provide:

i) reduction of outages through predictive maintenance and alerting

ii) energy optimization of critical energy assets

Challenge

- Prevent power outages
- Cease downtimes
- Optimize power consumption up to 20% savings

Solution

- Real-time monitoring of active power consumption, power factor, reactive power
- Automatical switches to Diesel generator, according to power requirements
- Monitoring of voltage levels and internal resistance of Battery Bank
- Remote fuel monitoring of diesel generators
- Real-time Environment monitoring

Results

- $1,5M in total savings
- Troubleshooting time of key resources from 2hr to 5 min
- Eliminated the need for site visits of supervisors up to 130 hours per month.

Mauritius Telecom also had the condition that solutions must be deployed on their premises and not in a public cloud gaining full control of its own data.

To accomplish these goals, Techolution has implemented an IoT solution that combines their edge computing gateway Techologger, Mainflux open-source IoT Platform, and Techolution's tower monitoring application with analytics and dashboards.

Mauritius Telecom already had installed sensors on BST Towers's critical assets, grid power, battery bank, diesel generator, and air conditioning.

The private cloud of Mauritius Telecom hosts the Mainflux IoT Platform for this solution. Techolution's Techologger edge gateways are installed in tower sites collect data from these sensors and devices and transmit them to the Mainflux IoT platform over intranet network.

Data are stored on Mainflux IoT Platform, analyzed, and pushed to the Techolution's mobile/web application for data visualization and near-real-time, continuous asset monitoring.

Assets and parameters monitoring

Power monitoring
Real-time monitoring of active power consumption, load voltage, load current, power factor, reactive power, and total power consumption provides usage metrics reporting, power efficiency analytics, centralized power status visualization, and real-time power failure alerting.

As such this monitoring set up the grounds for performance optimization analytics of BST tower power consumption.

The key parameter is the power factor which helps in identifying the degradation and power losses.

Additionally, application logic is implemented which automatically switches to the Diesel generator, according to power requirements and time of the day. In this way, so that peak power charges are avoided by using a Diesel generator a secondary source of power, instead.

Battery bank
Monitoring of voltage levels and internal resistance of Battery Bank DC power to verify its availability or battery levels.

Diesel Generator Fuel Low (Yes/No)
Preventing power outages is imperative. Backup diesel generators require sufficient quantities of fuel that must remain through power outages. Therefore, remote fuel monitoring of diesel generators is critical for assuring an uninterruptible BST tower equipment operation. It enables control of fuel levels and additionally prediction of the next refill date based on current usage trends.

Indoor temperature - Environment Monitoring
The ambient temperature monitoring provides tower managers if air-conditioners are in function and if the shelter and cabinet environments have an appropriate temperature level. These measurements ensure that BST Tower equipment is working within manufacturers' limits in order to maximize uptime and avoid unexpected malfunction due to equipment stress.

After evaluating all the open-source IoT platforms, we chose Mainflux. The modular architecture, out-of-the-box support for different databases, and a wide variety of features available in Mainflux made us choose it. It is well documented so that client and subsequent application developments were easy, trouble-free, and helped us to meet our tight deadlines.

Hariharan Anantharaman
IoT Director of Techolution
Hyderabad

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Visualization and dashboards

Mainflux IoT Platform is deployed to enable sensor measurement exchange and data collection. Techolution further developed a tower monitoring application that provides UI with comprehensive visualization and dashboards. It starts with map-based navigation and an overview of the entire BST tower infrastructure.

Then, with a drill down to a granular level a tower layout-based visualization is provided of each individual tower site.

From intuitive circuit-based visualization for easy troubleshooting to customizable dashboards extensive visibility of the tower assets is enabled for ensuring zero downtime and lower operational costs.

Technology used

Project details

1. Mainflux IoT platform
2. Redis
3. Kafka
4. Influx Timeseries DB
5. Postgres
6. MongoDB
7. Angular JS
8. Java
9. Kubernetes

Tech Solution

- Tower layout based visualization to easily understand the context
- Intuitive circuit based visualization for easy troubleshooting
- User specific dashboard and features
- User customizable dashboards and reports
- Map based intuitive navigation

UI - Dashboards

- Tower layout based visualization to easily understand the context
- Intuitive circuit based visualization for easy troubleshooting
- User specific dashboard and features
- User customizable dashboards and reports
- Map based intuitive navigation

Furthermore, the solution also provided management of assets' metadata and digital historical maintenance and activity logs which were noted in a physical notebook. This capability of the platform avoided manual visits (includes savings on labor and operational expense), checking and tracking down the reading, and maintaining a log.

Integrations

- Compatible and tested with EdgeConnectX, Techolution's Edge management platform
- Proven integration with battery banks, generators, rectifiers, etc
- Easily integrated with internal systems such as ERP, CRM, etc if needed

Technical Outcomes

- Remote control of assets and equipments
- Predictive analytics on assets to prevent failures
- Operation optimization recommendation to decrease peak hour power costs

Results

Savings

Smarter edge led to prevention of Business Disruptions & improving lifetime of Assets providing $1,5M in total savings

Sustainability

Energy Consumption Savings per Site - Energy Asset Optimization - 15% and $150K

Productivity

Significant troubleshooting time of key resources improvement through platform analytics & AI boosts from 2 hr to 5 mins

Compliance

Compliance through real time asset status, eliminated the need for site visits of supervisors up to 130 hours per month.

Mainflux Labs is a technology company that offers open-source patent-free I oT platform, edge computing gateway and consulting services for the software and hardware layers of the internet of things technology.