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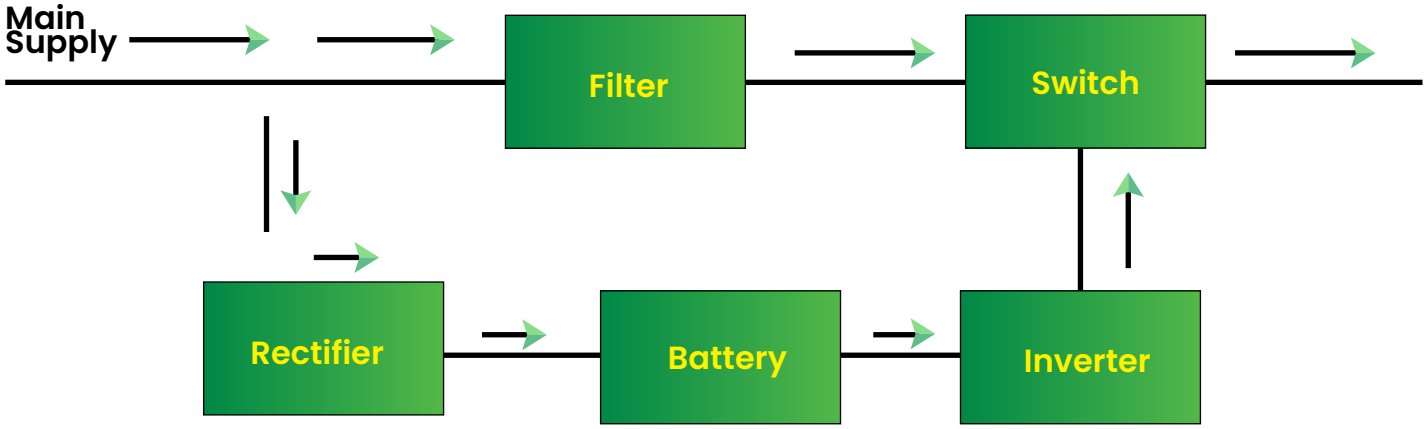
Industrial UPS Monitoring Solution using Azure IOT

INTRODUCTION

In today's industrial landscape, Uninterrupted Power Supply (UPS) systems are mission-critical components, ensuring seamless operation of vital equipments. However, the traditional approach to UPS management often leads to reactive maintenance, potential unplanned downtime, and underutilized asset lifespan. In order to overcome these obstacles, this white paper explores a cloud-based solution that enables remote monitoring, management, and optimization of UPS systems across multiple locations and tenants' application for remote monitoring, predictive maintenance, and proactive service. The advantages of this approach are highlighted in terms of reduced costs, increased operational effectiveness, and improved asset management.

Key Components of UPS

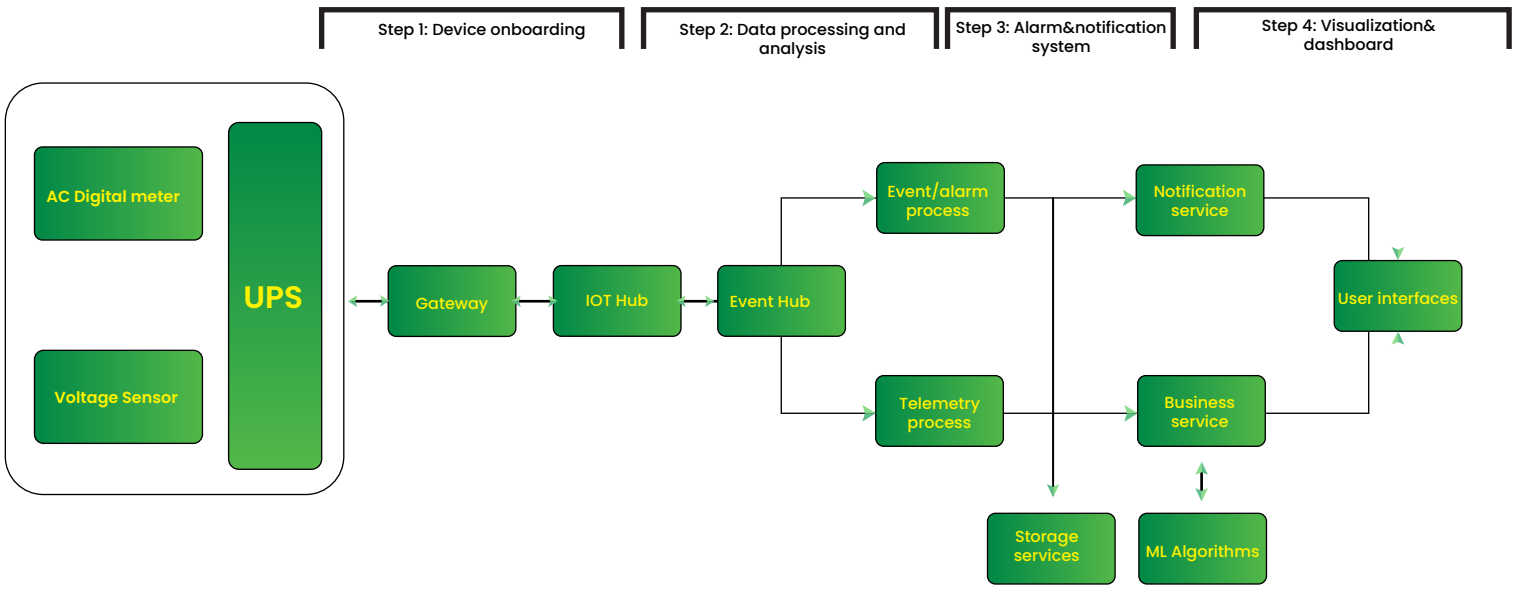


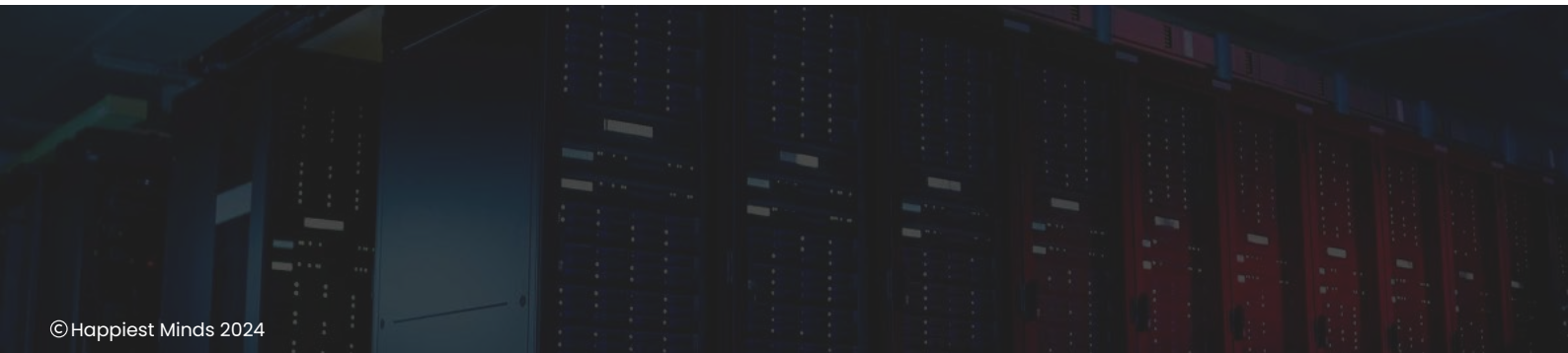
- **Battery:** The main backup power source that provides energy during electrical outages, ensuring continuous power supply to connected devices.
- **Inverter/ Rectifier:** Inverter and Rectifier allows for proactive maintenance, optimizing energy consumption and reducing operating costs.
- **Output Voltage and Frequency:** Output voltage and frequency ensures that the UPS is delivering clean and stable power to critical equipment, reducing the likelihood of power-related issues and equipment failures.
- **Switch:** Allows for immediate transfer of power directly to connected devices in the event of UPS system failure or overloading, managed without disrupting power supply.

Current Challenges in Industrial UPS Management

The challenges faced by industrial UPS systems are:

- **Reactive Maintenance:** Industrial UPS systems have historically been maintained reactively, leading to unexpected downtime and higher service costs, thus impacting productivity.
- **Limited Visibility:** The lack of real-time insights into UPS's performance suffers from hidden problems, increased risks, and poor decision making.
- **Cost Inefficiency:** Maintenance and service costs tend to be higher due to unexpected component failures and system downtime and organizations are forced to address issues after they have already caused disruptions and damage.
- **Asset Lifecycle Management:** Poor visibility into UPS assets hinders their optimal use and leads to lower efficiency, shorter lifespan, and higher costs





Step 1: Device On Boarding

· Install sensors in the UPS systems to gather data such as voltage, current, temperature, and battery status.

· Register and provision the UPS devices to the IoT Hub

Step 2: Data Processing and Analysis

· Deploy the IoT Edge modules to the UPS devices to enable local data processing, data filtering, and transformation of the telemetry data using the MQTT Modules.

· The Event/Alarm logs are processed by the notification service, which categorizes the data and acts according to the alert level and informs the user for immediate action.

Step 3: Alarm & Notification System

· Configure the system to send alerts and notifications via email, SMS, or other communication channels.

· Ensure that the right personnel are promptly informed of any concerns about the UPS system.

Step 4: Visualization & Dashboard

· Web API to expose the endpoints for the application logic and data access.

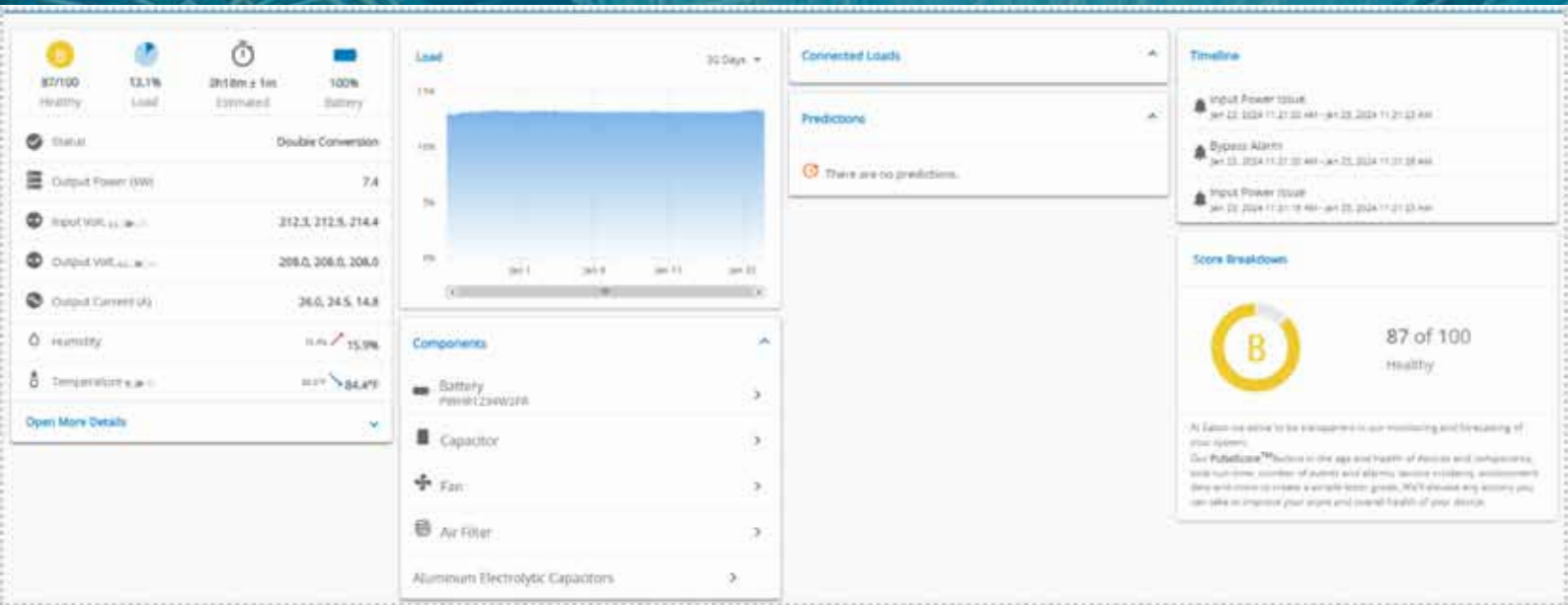
· Visually engaging dashboards with essential KPI's of UPS system performance such as Input/Output Voltage, Temperature, Output Current.

Step 5: Monitoring and Maintenance:

· Data storage to gather historical UPS system data. This data will provide insights for future trend analysis, proactive maintenance, and performance improvements

Below is a dashboard of one of the projects

Happiest Minds has implemented for monitoring UPS.



- The left side pane prominently displays recent KPIs reflecting the UPS's vital metrics, including Output Power, Input Voltage, Output Voltage, and Output Current.
- Additionally, the dashboard accurately records the percentage of Load and its hourly variance, providing insights for better monitoring.
- Detailed insights regarding the UPS's sub-components, such as Capacitor, Fan, and Air Filter, are available on the dashboard, offering an overview of their health status.
- The dashboard conveniently compiles recent system logs, along with their respective time stamps, for efficient tracking and monitoring.
- Our proactive maintenance module generates a health score for the UPS system and offers tailored recommendations to enhance its overall health and performance.

Benefits customer has leveraged.

· Remote Monitoring and Data Analytics: to provide real-time insights on UPS performance and efficiency.

· Alarm and Notification Systems: to provide real-time alert for any abnormal UPS conditions, enabling proactive responses and mitigating potential failures.

· Predictive Maintenance: by leveraging machine learning algorithms, the Azure IIoT platform predicts potential UPS failures, facilitating proactive maintenance actions.

· Automated Inventory Tracking: The solution enables automated tracking of spare parts, ensuring timely replacements and reducing the risk of unforeseen stockouts.

· Lifecycle Monitoring: Continuous monitoring of UPS components allows for lifecycle planning, optimizing resource utilization and streamlining maintenance schedules.

Summary

Our Azure-based IIoT solution enables a paradigm shift in operational efficiency, cost savings, and extended asset lifespan when it comes to remote monitoring and control of industrial UPS systems. Industrial facilities have significant gains in performance, dependability, and overall cost efficiency by transitioning from reactive to predictive maintenance strategies. The advantages are further enhanced by proactive spare part servicing and lifetime monitoring, which enable industrial UPS systems to operate seamlessly within a complex IIoT framework.

ABOUT THE AUTHOR

Shankar is a Senior Azure IOT Architect at Happiest Minds, bringing over 17 years of experience in engineering and deploying cloud-based solutions across diverse industries, including manufacturing, chemical processing, and industrial & building automation. With a 6-year tenure at Happiest Minds, Shankar stands as a seasoned Azure Architect equipped with a deep understanding of Azure IoT services and Azure PAAS service. In his role, he plays a pivotal part in aiding clients in meeting their business objectives and surmounting challenges through the potent capabilities of Azure IoT. Shankar champions the definition of IoT architecture vision and strategy, spearheads the technical design and development of IoT solutions, ensures the excellence and security of the IoT ecosystem, and offers insightful mentorship to project teams.

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