



REMOTE DIAGNOSTIC & PREDICTIVE MAINTENANCE SYSTEM

RDPMs FOR RAILWAY SIGNALING AS PER RDSO/RDPM/FRS/2021



JMV LPS LIMITED

Introducing Remote Monitoring & Predictive Maintenance for Railway Signaling Systems

Remote Diagnostic & Predictive Maintenance System (RDPMS) is an **IOT based** maintenance system that enables the monitoring, analysis and advance maintenance of various types of signaling devices remotely. It collects **real-time data** from various signaling gears to monitor parameters like temperature, voltage, current, power consumption etc. which is transmitted to **edge computing** via station gateways for **real-time data** analysis by using **AI & Machine Learning algorithms**. The analyzed data is then transferred to a **Central Cloud hub** where the historical trends and real time data patterns are preserved to generate **alert insights**. This predictive maintenance feature of the system sends early **warning signs, alerts or faults** to web server and mobile applications. On the basis of those alerts the maintenance activities and preventive measures can be taken

Safety of Maintenance



REACTIVE

Fix the system when it fails.



PREVENTIVE

Regular Maintenance to avoid complete failure of the system



PREDICTIVE

Prediction of failures in advance to resolve them proactively.



PRESCRIPTIVE

Self-Diagnostic system to avoid the Predicted Failures

How Preventive & Prescriptive Maintenance is Better?

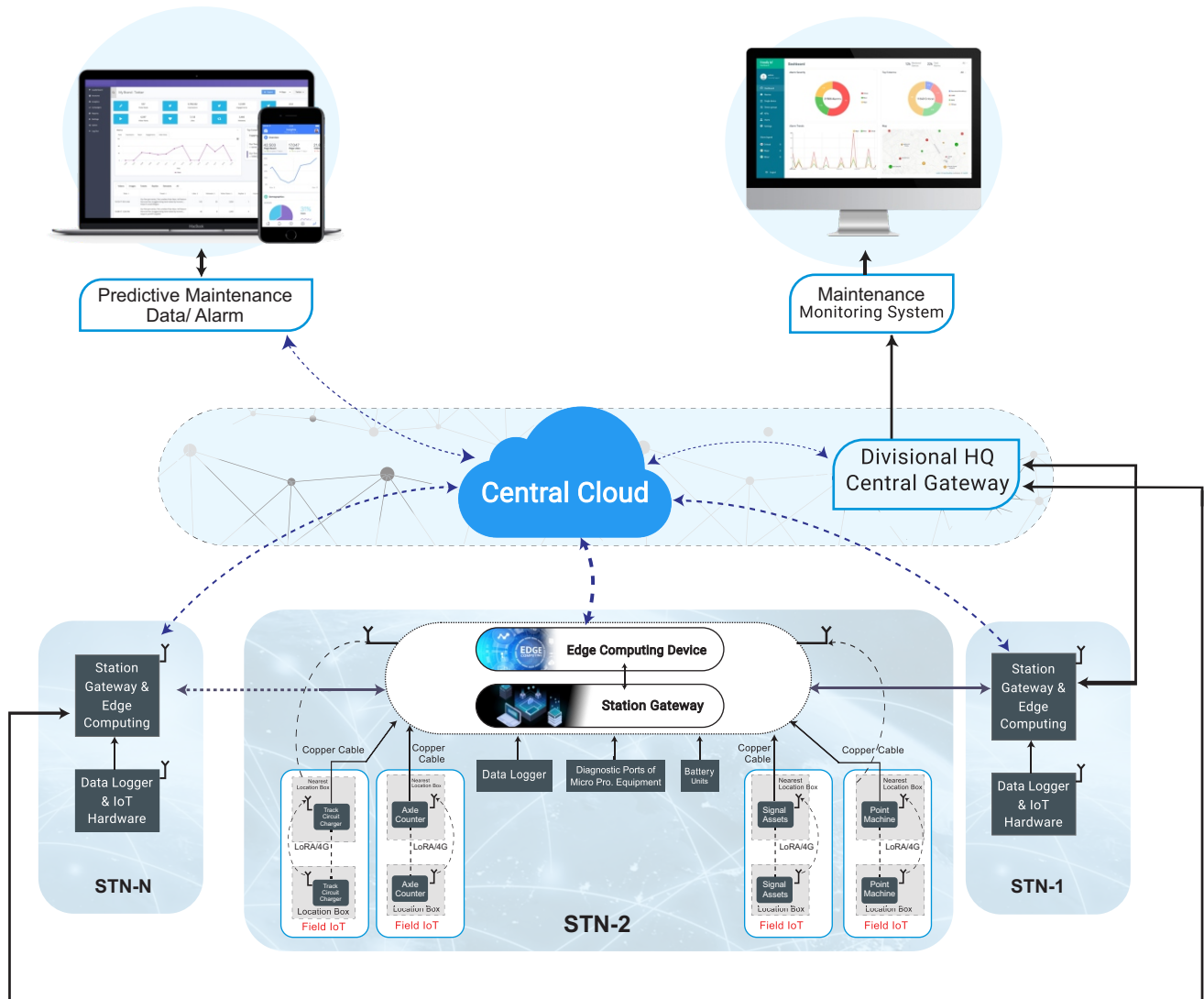


- **Remote Monitoring: Anytime, Anywhere**
- **Predictive Maintenance: Stay Ahead of the Curve**
- **Enhance Reliability and Efficiency with Advanced Maintenance Solutions**
- **Monitor the real-time data values remotely.**
- **Check and print the history records of particular date and time.**
- **Plan advance maintenance scheme based on alerts.**
- **Get instant overview of all signaling gears at a glance.**

The primary operations of **Remote Diagnostics & Predictive Maintenance** center on:

- Gathering & analyzing the data.
- Enabling remote access, conducting diagnostics, and facilitating proactive maintenance planning.
- Enhancement of equipment performance, minimizing downtime, increasing reliability, and optimizing maintenance activities as shown below:

SOFTWARE & DATA ANALYTICS



Salient Features



Monitors the **remote health parameters** of signaling devices



Analyzes health data to deliver **actionable insights**



Sends alert notifications to the designated **Central Location or person in charge**



Reduces maintenance effort by making diagnostic data available to higher officials remotely

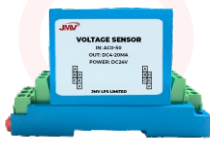


Helps in **better decision making** and taking preventive measures proactively

Hardware Components



Current Sensor



Voltage Sensor



Temperature Sensor



Vibration Sensor



Field Transmission Unit (FTU)



Gateway



Embedded CPU



UPS for Backup



Visual Display Unit



Router for Connectivity



Signal Isolator

Software Components



AI & ML for Data Analysis



Divisional/Sub Divisional Server Cloud (Optional)



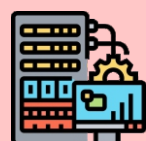
Central Cloud



Local Edge Server & Edge Cloud (Optional)



Database



Web Server & Mobile Application



Web Portal & Mobile Application



Solutions For Monitoring Asset Conditions Remotely in Real Time:



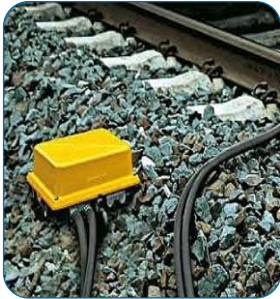
DC Track Circuit Health Monitoring

- DC feed end and relay end voltage
- Input Voltage & output current of Track feed battery charger
- Voltage & charging /discharging current of battery.



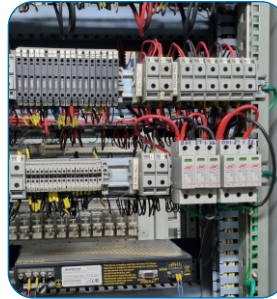
Point Machine Health Monitoring

- DC operating Current
- DC operating Voltage
- Vibration



MSDAC Health Monitoring

- Diagnostic data from Di-agnostic port of Axle counter evaluator shall be captured.
- Current and status of vital relays
- Input Voltage



SPD Health Monitoring

- The potential free contacts of SPD devices where available shall be monitored
- Care should be taken to keep sensor wiring from SPD such that (electrically) dirty cable in SPD box is not in parallel to sensor wires



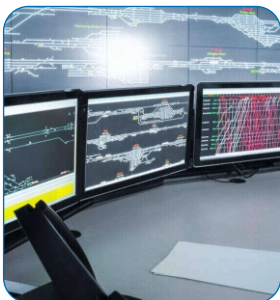
Earth Resistance Monitoring

- Resistance value
- Live Earthing Status
- Alerts for low resistance values



Control Room Temperature

- Live Operating Parameter status
- Status Monitoring of Control Panels
- Ambient Temperature and Humidity of Control Room



Electronic Interlocking Monitoring

- Data from Diagnostic port of Electronic Interlocking.



Relay Health Monitoring

- Status (pickup or drop) of each relay in the relay room shall be recorded through data logger.
- Ambient Temperature and humidity of relay room



Battery Bank Health Monitoring

- Overall Voltage and current of 110V battery bank will be monitored.
- Ambient Temperature and humidity



Signal Aspect Health Monitoring

- Status of local signal control/ detection relays at Location boxes.
- AC Current
- DC Current



Integrated Power Supply

- Availability of standby input power supplies from Autochangeover system of IPS.
- Health of IPS modules from potential free contacts
- All voltage outputs



ELD Potential Free Contacts Monitoring

- Status of earth leakage from the ELD to be monitored.



Key Benefits of Remote Diagnostic & Predictive Maintenance System



Extended Equipment Life



Cost Optimization



Proactive Maintenance



Data-Driven Decision Making



Enhanced Safety



Increased System Availability



Efficient Resource Allocation



Historical Performance Analysis



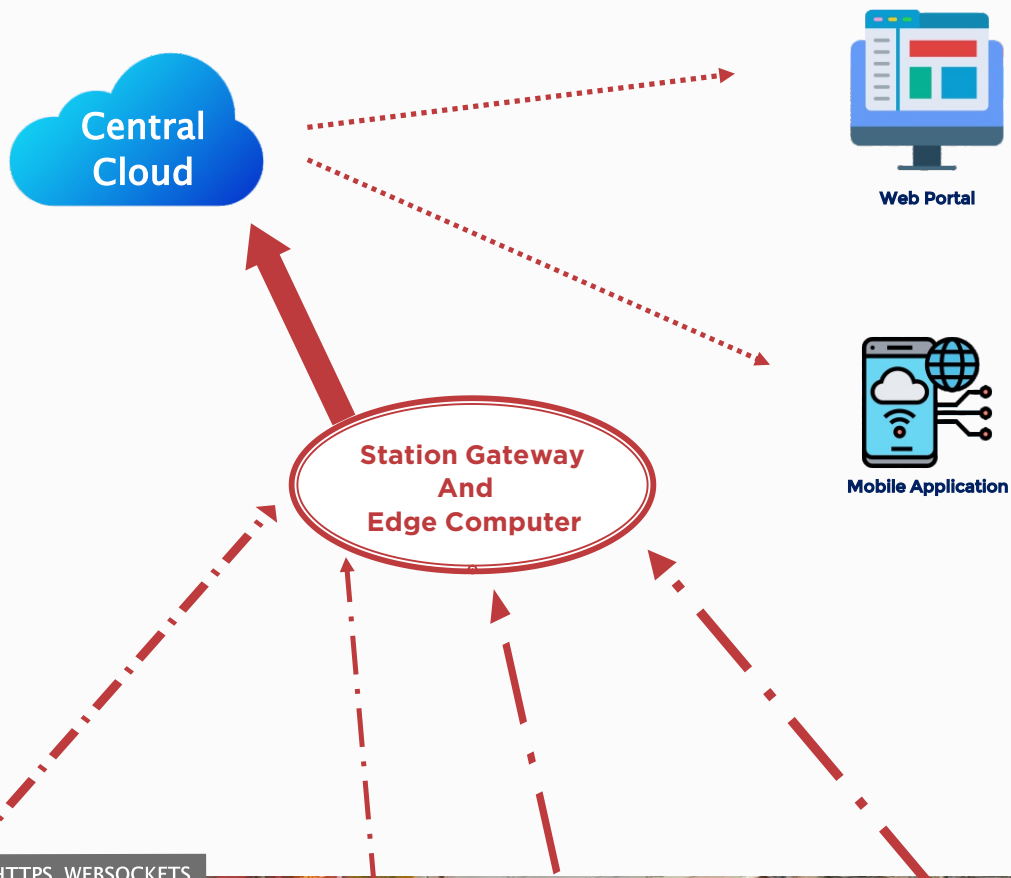
Early Fault Detection



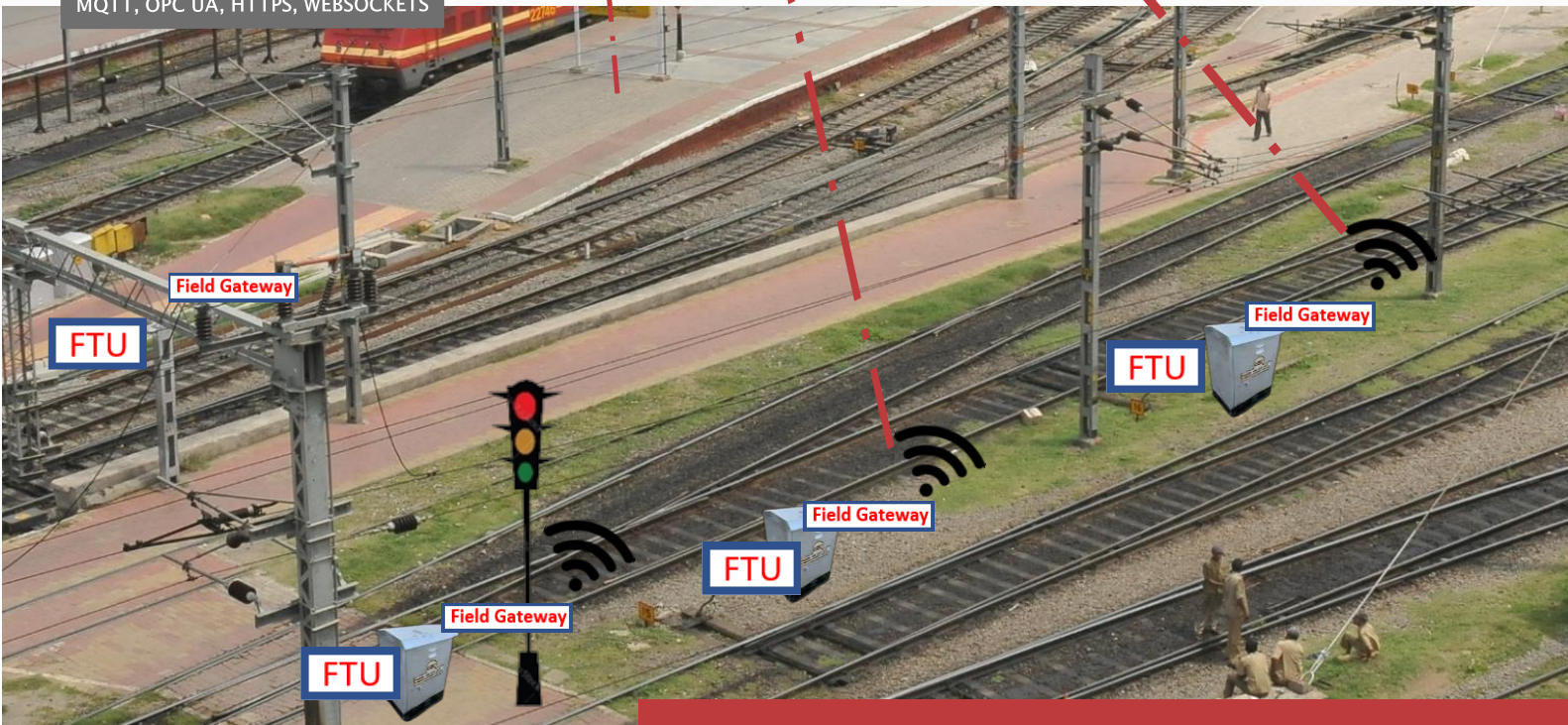
Continuous Monitoring



Real- Time Solution Mapping Framework



MQTT, OPC UA, HTTPS, WEBSOCKETS





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