Making digital happen

WHITEPAPER

INDUSTRIAL REMOTE MONITORING

The concept of Industrial Remote Monitoring has emerged as a straightforward but essential requirement. The ability to monitor assets and plant operation from anywhere removing the need to be physically present is an essential part of the Smart Factory agenda in the IIoT universe. Some of the earliest implementations of Remote Monitoring included the use of Remote Terminal Units (RTU) in public utilities such as power grids and water purification plants. However, RTUs mainly supported data acquisition from the process and its transmission to remote control centers. Earlier versions did not sustain any built-in intelligence, and they were limited to simple alert systems like a machine breakdown.

In the 1990s, with advancements in manufacturing technology and control systems, Remote Monitoring became more sophisticated with the introduction of numerous protocols, high data transfer requirements and non-compatibility of assets from various vendors. The industries that often operate in remote sites or extensive facilities have been facing system availability, worker safety and value chain visibility issues.

For example, in the mining industry running complex operations at remote locations is becoming difficult owing to challenges in attracting experts to work at these sites. The security at such sites is also becoming an area of increased focus, and managing emergency incidents in a complex operation is almost always hampered by the lack of rapid information sharing among multiple parties, both onsite and off-site.

Similarly, in industries such as manufacturing, energy, aerospace, defence, and oil & gas, one commonly focused area of improvement is the centralization of the ecosystem across the acquisition, processing, and analysis of large amount of data. Instead of multiple systems for different business functions and locations, the trend in these industries is to collate as much of information as possible into fewer operations centers that can be located remotely from the site.

Today it is estimated that 94% of Fortune 1000 companies observed disruptions due to the COVID challenge. The movement and the placement of workers on the shop floor to enforce social distancing is the need of the hour. The new WFH model has also created newer variables in the decision-making process around production capacity and planning.

Now more than ever, implementing a Remote Manufacturing strategy has become critical to ensure resilient operations. A robust business continuity plan and a remote monitoring solution can minimize the impact on manufacturing operations. At the same time, AI and machine learning-based predictive and optimization models can help improve performance and reduce overheads.

In this whitepaper, we will explore the challenges, solutions, and components of Remote Monitoring and Operations.

Industry Challenges

Interoperability – Complex Ecosystem of Assets

The production environment is heterogeneous, supporting multiple OEM and multiple protocols designed with an interoperability focus. Despite its critical importance, IoT interoperability for many enterprises is still a goal to work towards. Many existing solutions are proprietary and designed to operate only within a pre-defined hardware or infrastructure environment. The lack of IoT interoperability means that data can't be effectively exchanged across disparate, sometimes overlapping devices and systems. Enabling this interoperability and breaking production silos is key to remote operations.

Employee and Environment Safety

Every year 2.78 million workers die from occupational accidents and work-related diseases (of which 2.4 million are disease-related), and an additional 374 million workers suffer from non-fatal occupational accidents. No job should take away a worker's life, yet many of these deaths occur because of poor workplace health and safety conditions. Also, every day nearly one million people get hurt at work, impacting workers economically, physically, and socially.

The industry needs to establish robust connectivity channels with remote production assets and environmental parameters to improve the safety of operations and reduce risks and exposure (catastrophic failures, leaks, emergency shutdowns).

Total Cost of Ownership (TCO)

A siloed view of operations causes several challenges like unplanned downtime, impact on quality, ineffective decision making, and emergency expenses on spares, safety incidents, etc. all resulting in an increased costs of ownership. Contextual insights, on the other hand, can improve situational awareness, and prevent unplanned downtime by 5-20%, maintenance costs by 5-10% and drive standardization of best practices.

Industrial IoT led Remote Monitoring

Establishing Remote Monitoring

Figure 1 Step-by-step approach to establish Industrial Remote Monitoring

The first step towards Remote Monitoring is to establish the industrial connectivity in the field by making them Industry 4.0 compliant with upgrades or additional sensors. This makes way for automated data collection around process conditions and asset health, helping in assessing the operations and machine performance.

The data collected from the sensors need a robust bridge that connects the hardware with software applications for further processing. This bridge is provided by connectivity platforms, which act as a key in getting the data. Further, adding compute capabilities at the device or asset site, also known as 'Edge Computing,' translates the data into secure and efficient protocols before leaving the local network. Edge computing makes it much easier, more secure, and cost-effective to send that data to remote monitoring & control applications and IoT platforms.

- **Easier**: connectivity platform can natively consume protocols like OPC UA and MQTT
- **Secure**: uses modern encryption
- **Cost-effective**: pre-processes data and only sends data when it changes, decreasing bandwidth usage

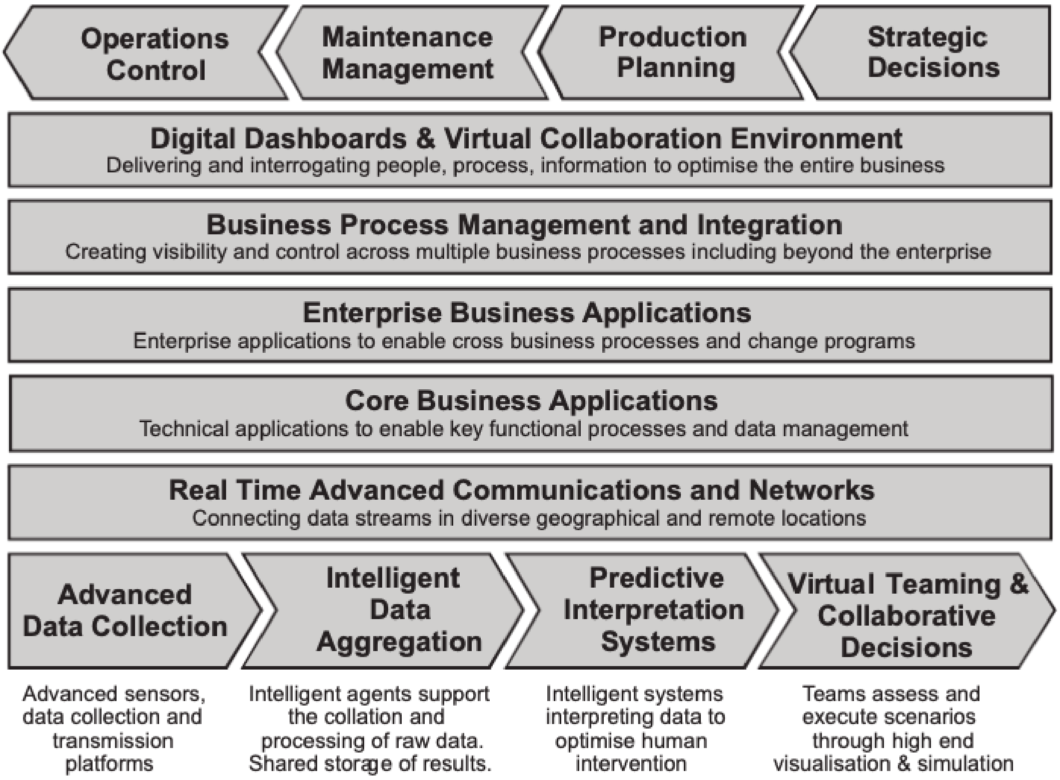

Figure 2 Key technology layers for Remote Monitoring

These systems also have the necessary storage. In the event that the network connectivity fails, then the machine data can be stored for a pre-defined buffer, usually for a few hours until the network gets restored.

Getting everyone on the same platform: To provide larger context and insights, factory data from machines need to be aggregated and seen along with data from ERP, MES, LIMS, and other systems over a single pane of glass–Industrial IoT Platforms in this case. Once this centralization information is available, it can be viewed and analyzed, and displayed through various data visualization or exploration tools. These in turn, allow remote employees to compare manufacturing performance across lines, shifts, products, and more. The visualized dashboards are also tailored to various personas like maintenance, plant manager, machine operator, higher management, etc. The data is also used by machine learning and advanced analytics models to identify bottlenecks and provide predictive alerts.

Remote Performance Management

Asset health monitoring provides real-time visibility into the health and status of critical factory assets by continuously monitoring essential parameters of connected equipment to detect problems before they cause downtime. Operators/Service technicians can remotely monitor, troubleshoot, and respond to potentially unfavorable conditions related to assets in operation. Operators can also track KPI across global sites.

It brings transparency to asset health, KPIs and insights across factories, and maximize production output by taking proactive measures to address early warning signals. It also further improves asset uptime and lower maintenance costs by preventing unplanned downtime caused by a violation of safe operating guidelines

Predictive maintenance techniques transform maintenance by identifying potential issues before they happen. Maintenance technicians can leverage this to effectively estimate when the maintenance activity needs to be performed. A paradigm shift from reactive to predictive maintenance promises significant cost savings because tasks are performed only when warranted and assuring almost no downtime. ML/AI techniques are used in building models for the asset-based on historical data.

Production intelligence monitoring (KPI Dashboards) rapidly unifies disparate sources of operational data to provide real-time visibility into production status and critical KPIs such as availability, performance, quality, and OEE. This helps in uncovering hidden inefficiencies and improving the production output.

Objectives for enterprises to build their remote operations strategy

1. A one-stop-shop for assets management with a detailed view of asset properties and operating parameters
2. Automated alerts when irregular conditions are detected
3. Remote access to troubleshoot and resolve issues
4. A unified view of factory performance and KPI, measuring and monitoring production KPI
5. Detailed view of the line performance and associated KPIs
6. Critical machine health for connected equipment

Operations Center

Factories depend on operators to keep machines running, and it's simply not possible for them to work remotely. However, with the advent of streaming data technologies and robust OT networking that provide access to machine-level data, several manufacturing functions at the factories that have largely been seen essential to be present at the factory could potentially be reimagined as remote functions in future working 24x7 out of remote operations centers.

Examples of functions that have always been on-premise but could be switched to remote:

- Production planning team: Historically they were supposed to be next to the production lines but could use digital platforms for line scheduling
- A part of the Production monitoring team: with remote operations possible, the whole production does not need to be in the factory for real-time monitoring. Process engineers and a part of the production team can leverage the remote model and work seamlessly
- Maintenance team: They have always been on site to date; there is no reason they could not be fully remote. The only technicians who need to be onsite are those who will fix the machine on the ground. They can be connected to remote SMEs and leverage AR/VR technologies to send machine vitals and perform remote troubleshooting.

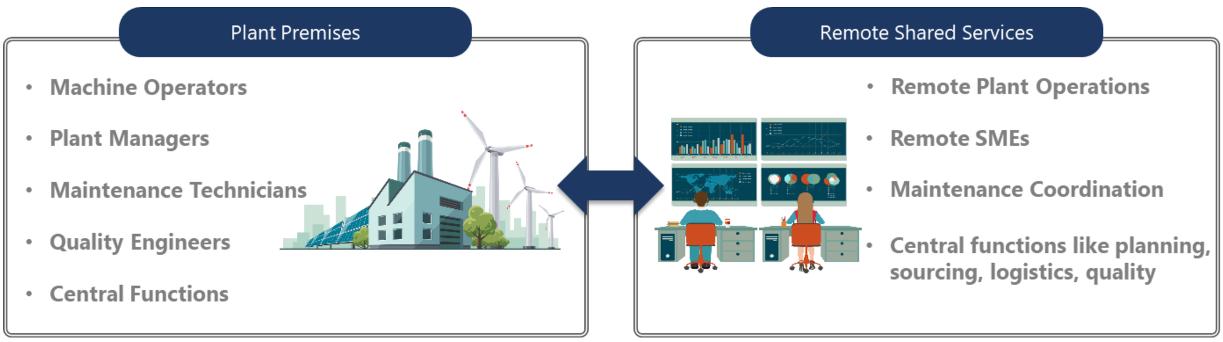

Figure 3: Reference Remote Powered Plant Operations

This model is scalable and help teams monitor and optimize processes across factories.
On-site presence will always be a big part of any process, but centralized monitoring brings learnings and optimizations shared and implemented across several factories. The core of the work around these efforts can be centralized and digitized.

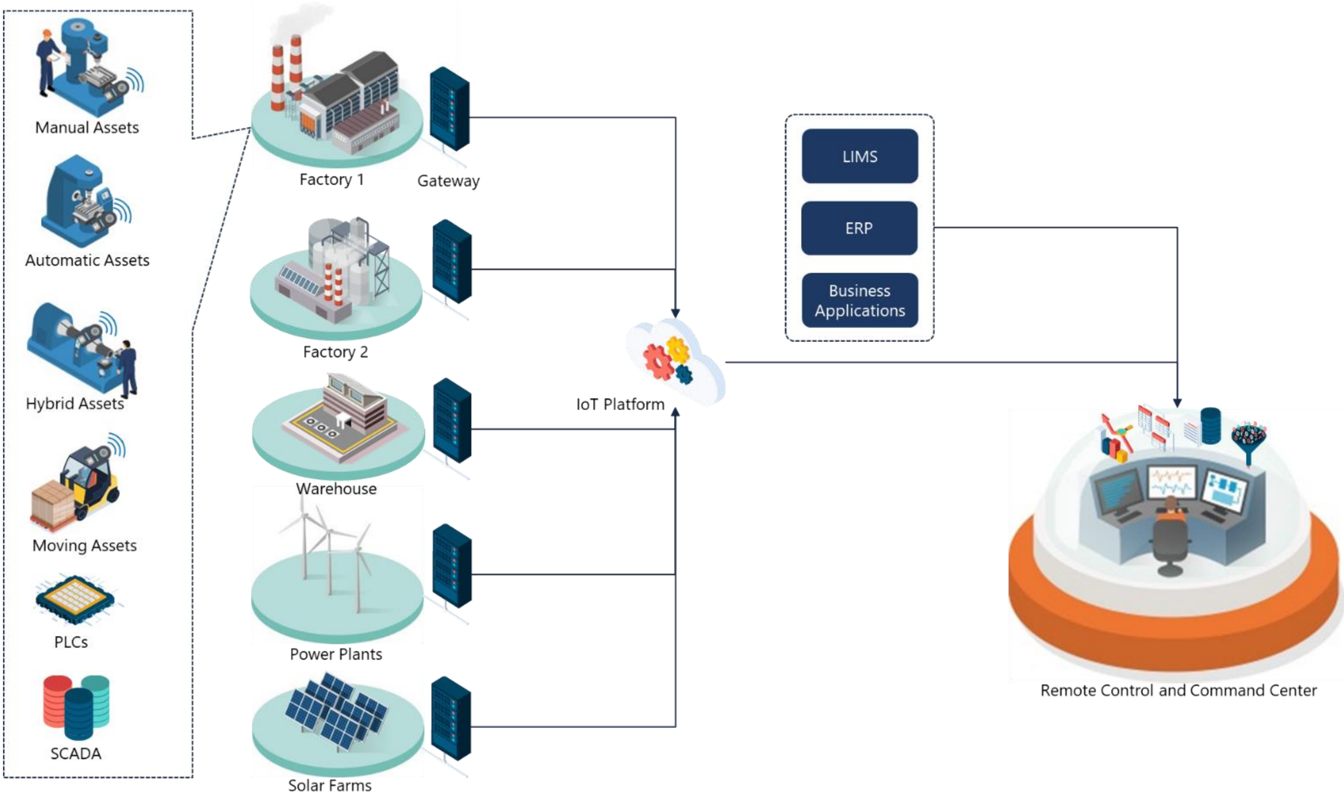

Figure 4 High-level reference architecture connecting enterprise-wide entities and bringing a holistic view to the operations performance

How can Microland help?

Microland's Remote Industrial Monitoring Solution enables visibility to remote production assets and operations. The solution is designed to monitor the health of remote industrial assets, detect anomalies, and predict potential degradation, providing a seamless interface to global operators and management.

Connected Assets: architect and implement connectivity and data interoperability for remote assets. Leverage industrial-grade OT networks and edge solutions to securely transmit data to a data center or cloud.

Asset Monitoring & Management: asset monitoring solutions enabled by condition-based monitoring, AI based anomaly detection and alerting workflows. Further advance asset management and integrate advanced analytics to drive operational predictivity.

OT Infra Managed Services: leverage Microland’s over three decades of experience with managed services to centrally monitor components of the IIoT ecosystem including industrial assets, OT network & security, OT data centers, IIoT platforms. Bring end-to-end operational visibility across multiple industrial facilities via Command and Control Centers to improve efficiency, agility and cost to production.

Key Capabilities:

- **Real-time Insights:** Global view of the installed base with real-time insights on asset health, operating parameters, and trends, asset history.

- **Events Management:** Single pane of glass for viewing, managing, notifying and tracking alerts and events.

- **Anomaly Detection:** AI-based anomaly detection engine for early warning of potential anomalous and/or unknown conditions

- **Predictive Analytics:** Leverage historical patterns to predict future degradation and failures. This enables JIT maintenance plans.

- **Integrated Workflows:** Integrate the value chain, tying in operational data with other enterprise data like services/work orders, maintenance, and trigger automated workflows.

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Manjanath Nayak holds ultimate responsibility for Microland's strategic accounts and is the Customer Success Leader for the North America region. Based out of Atlanta, Georgia, he also leads Microland's Global Industrial IoT business -- a significant and growing focus area.

About Microland

Microland's delivery of digital and "Making Digital Happen" allows technology to do more and intrude less. We make it easier for enterprises to adopt nextGen Digital infrastructure. We enable this using our expertise in Cloud and Data Centers, Networks, Digital Workplace, Cybersecurity and Industrial IoT, ensuring the embrace of brilliance is predictable, reliable, and stable.

Incorporated in 1989 and headquartered in Bengaluru, India, Microland has more than 4,500 digital specialists across offices and delivery centers in Asia, Australia, Europe, Middle East and North America.