Real-Time IoT Data Helps Protect Remote Workers

Two hundred miles off shore, in the Gulf of Mexico, oil workers scramble through a maze of pipes, valves, and tanks, adjusting and repairing heavy equipment to keep production humming. In a control room, a supervisor communicates with individual workers over a radio for updates on their locations and to ensure that everyone is safe. Each day, the supervisor dispatches engineers to adjust machinery based on business workflows generated from SAP® software in the office back on the mainland.

Most of the time, this system works reasonably well. But what if a worker collapses from an accident or hazardous fumes? How can the supervisor know quickly enough to dispatch help? What if a mechanical failure leads to production issues or even hazardous conditions? Ideally, both supervisors and workers would be notified of the issue immediately, with multiple alerts, regardless of their location.

Immediate notifications and real-time data are now an affordable reality. By using innovative Internet of Things (IoT) products and technologies from Intel and SAP businesses have the ability to implement real-time analytics and alerts at the edge, close to the source.

Intel® IoT Platform Drives IT/OT Integration

SAP technologies, such as the SAP HANA® Cloud Platform, are already providing opportunities for historical analysis and trending of big data for useful insights. SAP software also makes it possible for information technology/operational technology (IT/OT) to converge in the cloud, delivering analytical insights from IoT data to help drive run-time business processes.

The IoT is enabling new opportunities by expanding the variety and quantity of useful data you can collect for better analysis, automation, and response to challenges. But you can’t always wait for back-end analysis of data to take action. Sometimes you need to analyze data at the edge for faster response times. For example, it isn’t always practical to send massive data across a slow, high latency, or intermittent wide-area network (WAN) connection to remote sites. Satellite backhaul technologies can provide remote

Intel® IoT Platform Powers Real-Time Analytics from SAP at the Edge

Smart and connected devices powered by Intel® processors feed data to the network and to Intel® IoT Gateways, which are running SAP® real-time analytics and Intel data management solutions. SAP® Streaming Lite technology provides complex event processing capabilities at the edge. At the same time, an application server hosted on the Intel IoT Gateway provides data visualization and a browser interface for the business application. SAP® Remote Data Sync software ensures synchronization of data with the SAP HANA® Cloud Platform over slow or intermittent WAN links, for cloud-based reporting and back-end SAP integration (see Figure 1).
connectivity, but can also be complex and costly—and they don’t eliminate delays for providing critical information on site.

Now, there’s an easier, faster, and less costly alternative. With combined offerings from Intel and SAP, you can collect, normalize, process, and analyze critical data close to the source and still share data with your back-end systems for additional analysis and business workflows when the network is available.

By using the Intel® IoT Platform for smart and connected things as a foundation, Intel is collaborating with SAP to provide products and technologies integrated with SAP products and services to deliver end-to-end IoT solutions. Sensor modules based on the Intel® Quark™ SoC, along with IoT gateway platforms, device management, security, and connectivity capabilities all provide a way for smart, connected things to send data to the cloud in a secure, scalable way. SAP works to solve the IoT challenge of ingesting and processing the massive amounts of data generated from millions of smart things (OT) so that existing business processes, applications, and practices (IT) can consume the data and analytical insights to enable automation and transformation. Together, SAP and Intel products can accelerate the time to market for customers building end-to-end IoT solutions in industrial, retail, transportation, and other vertical markets.

Additionally, the combined Intel and SAP technologies bring run-time business applications and IT data to the edge where the OT data is being generated. That lets you get real-time IT/OT integration and interaction with business systems, even when connectivity to the cloud is limited or unavailable. IT/OT convergence at the edge enables real-time notifications based on customer business logic, automated work orders, inventory management, and incident reporting.

**Edge-to-Cloud Analytics**

Smart sensors powered by Intel technology can collect data from a wide range of sources, across almost all industries. Intel Quark SE SoC microcontrollers with Bluetooth® low energy (BLE) and onboard analytics enable innovative sensor capabilities. For example, factories use sensors to detect anomalies on assembly lines. Sensors in retail stores and warehouses track product inventory and movement, and devices on trucks collect data on fuel efficiency in the shipping industry. An emerging portfolio of IoT devices with Intel technology can collect and feed data over a wide range of protocols directly onto a network for remote ingestion, or to an Intel® IoT Gateway for local collection, processing, storage, and integration with SAP analytics and business software hosted right on the gateway. The Intel IoT Gateway also synchronizes data with systems running in a remote data center or in the cloud.

Remote synchronization is useful for analyzing large data sets for trends, but may be less useful for determining critical issues near the source. For real-time analysis at the edge, the Intel IoT Gateway supports lightweight SAP software that can process and analyze data sets close to the source.

Specifically, SAP software solutions provide:

- **Transaction Availability for Remote Sites (TARS)**, which allows enterprise resource planning (ERP) transactions at remote sites even when connection to the IT data center is slow or absent
- **SAP SQL Anywhere® suite**, which enables the rapid development of database-powered applications for server, desktop, mobile, and remote office environments
- **SAP® Streaming Lite technology**, for complex event processing and analyzing sensor data in real time on the Intel IoT Gateway
- **SAP HANA® Remote Data Sync technology**, which synchronizes edge data with your existing SAP back-end infrastructure, whether you use the SAP HANA Cloud Platform or SAP® Business Suite 4 SAP HANA (SAP® S/4HANA) in your data center

The Intel IoT Gateway also provides integrated security with device management capabilities. Specific Intel and Intel Security technology running on the Intel IoT Gateway include:

- **Wind River® Intelligent Device Platform (IDP)**
- **Wind River Helix Device Cloud® agent** and back-end hosted services for device management
- **Intel Security software**

*Figure 1. The Intel® IoT platform collects real-time data from things and processes data at the edge for real-time insights. The technology also syncs with back-end SAP® systems for trend analysis and predictive insights.*
With the Intel IoT platform, you can collect data from multiple types of sensors, and then ingest and process that data in real time (see Figure 1). The integrated SAP software provides a full business application suite for work order management, inventory management, incident reporting, and other services. On-site managers or supervisors can use a mobile device to access data hosted on the Intel IoT Gateway—to monitor conditions, receive alerts, and view real-time data visualization and trends, without waiting for data to synchronize across slow or unreliable WAN links.

Whenever WAN connections to back-end SAP HANA systems are available, SAP HANA Remote Data Sync synchronizes data between the SAP SQL Anywhere database on the Intel IoT Gateway and existing back-end big data systems, such as the SAP HANA Cloud Platform. This gives you the ability to contribute to wider data sets across regions for deeper batch analysis in the data center or cloud, so you can identify trends and generate predictive insights.

**Use Cases: IoT at the Edge Helps Protect Workers and Increase Customer Engagements**

The following two use cases demonstrate the power of the Intel IoT platform for improving industrial safety and maintenance and for increasing retail customer engagements and sales. While these specific scenarios are hypothetical, they are realistic examples of implementations you could deploy with existing technologies.

**Use Case: IoT Improves Safety and Performance on an Offshore Oil Platform**

Back on the oil rig in the Gulf of Mexico, engineers are still hard at work maintaining equipment under harsh conditions. But now the oil company has implemented an Intel IoT Platform with SAP software, so employees all carry wearable safety devices to monitor their health status and to detect hazards in the environment. For example, wearable sensors detect the presence of hydrogen sulfide gas, and posture monitors note when a worker is prone or non-moving for long periods. Sensitive machinery is equipped with IoT sensors tracking temperature and pressure data to identify potential problems before they occur. These devices all provide real-time feedback to software running on Intel IoT Gateways. A supervisor can check worker and equipment status from a dashboard on his tablet device but is also alerted immediately when a problem is detected (see Figure 2).

At the same time, SAP HANA Remote Data Sync is periodically uploading and synchronizing data with the company’s back-end SAP S/4HANA system, where it is combined with data from several other oil rigs to enable deeper, long-term analytics and trend reports.

During a night shift, one of the worker’s wearable hydrogen sulfide sensors suddenly triggers audible alarms and visible flashing lights in the vicinity of the leak. The worker receives a real-time personal alert message indicating that the exposure level he received with readings from the sensor. A supervisor is also alerted and consults his dashboard application from a tablet where he sees from the posture sensors that all workers except one are running away from the hazardous area. The exposed worker is currently showing in a “prone” body position and has been motionless for more than a minute. Thanks to real-time sensor data, incident monitoring, and interpretation, emergency personnel in hazardous material gear can be dispatched to rescue the unconscious worker before he is irreparably harmed. Real-time alerts and monitoring turned a potentially dire situation into a successful recovery. With his employee safe and the situation under control, the supervisor can now complete an automatically generated incident report to comply with safety reporting standards. Much of the data in the incident report is automatically pre-populated, including date, time, employee name, location, and even IoT data, such as readings from the gas sensor. The report is logged in the SAP health and safety incident tracking system.
Use Case: IoT in Retail Stores Improves Engagement and Sales

A regional chain of successful clothing stores has recently struggled to keep up with increasing competition against decreasing sales margins. They don’t have a centralized way to assess inventory and distribution information across stores and warehouses. That makes it difficult for managers to properly stock their stores, which leads to a loss of revenue as customers take their business elsewhere.

The retail chain also seeks a way to better engage customers through loyalty programs and targeted sales, but they don’t have a way to quickly identify which items customers prefer in individual stores.

To keep the company innovative and competitive, the regional manager deploys a network of smart sensors and IoT gateways in each store, in conjunction with data analytics software in the cloud. Data is gathered from barcode scanners, point-of-sale (POS) registers, low-cost inventory tags, and traffic flow detectors. The collected information is fed to Intel IoT Gateways for processing, analysis, and synchronization with back-end systems in the cloud. SAP SQL Anywhere database software enables real-time intelligence at the point of sale location, which can be accessed by store managers on tablet devices. Data is also passed on to the SAP HANA Cloud Platform, so regional analysts can make smarter decisions and learn more about individual customer preferences than ever before.

Now, the retail chain can better ensure stock matches customer demand. Store managers can take advantage of deeper insights to offer a more engaging customer experience. For example, managers can use customer data to modify the store layout to improve traffic flow, display pairings of products more strategically, identify slow-moving inventory, and set up alerts about up-to-the-second shopping trends.

They can also deliver a unified retail experience between the website and the brick-and-mortar store by using loyalty programs, targeted sales assistance, and more.

Collaboration Makes the IoT Promise a Reality

Through close collaboration, SAP and Intel are giving you the ability to make better, more informed decisions in real time. Together the two industry leaders are continuously working to accelerate time to market for IoT technologies in industrial, retail, transportation, and other vertical markets. Their combined innovative portfolios allow you to generate actionable, data-driven intelligence at the edge and in the cloud for real-time IT/OT integration with security, privacy, and compliance from edge to cloud.