Energy, manufacturing, construction, warehousing, field services, utilities, and public safety are just some of the segments challenged by rapidly evolving technological, economic, and social forces. These pressures are creating business mandates to improve worker safety, accelerate productivity and efficiency, and lower costs.

Intel and Rice Electronics collaborated to develop a smart, end-to-end, Internet of Things (IoT) connected worker solution designed to increase industrial worker productivity and safety. The Rice Electronics Connected Worker Solution* with Intel IoT technology combines smartphones from Rice Electronics with gas sensors used for toxic gas monitoring. Intel® architecture-based IoT gateways, connected worker applications, and an expert/supervisor online portal. It brings near-real-time insight to workers on the job—providing a vital range of capabilities from environmental monitoring to emergency alerts to remote training. Together, Intel and Rice Electronics provide an integrated, affordable solution for industry that can be deployed quickly and tap into the benefits of the Industrial IoT (IIoT).

Challenges
Industrial workers are at increased risk for accidents, exposure to environmental hazards, security threats, and health emergencies. These workers are found in mines, oil and gas refineries, factories, construction sites, warehouses, and in the field maintaining, inspecting, and repairing equipment, and providing services to customers. They often work in settings outside the reach of traditional and cellular communication networks, leaving them without reliable voice or data communication. Twenty-six percent of energy sector workers alone experienced an injury or were responsible for someone injured on the job requiring medical care in the last year.1 The U.S. economic burden of worker injuries and illnesses is estimated to be more than USD 225 billion annually, with the bulk of the expense incurred after the accident happens.2

When outdoors or in isolated settings, risks to industrial workers increase—their exact location and the local environmental hazards they face are seldom known to remote supervisors. Even when workers in factories, warehouses, or other fixed locations are monitored by video surveillance or through access tracking systems, their exact location at a given moment or the status of related health factors (e.g., environmental toxins) may not be known. Furthermore, they may encounter communication gaps due to working in confined or hazardous spaces.

Intel conducted an extensive study, interviewing end users in the manufacturing, energy, public safety, warehouse, field service, and constructions sectors.1 Findings on key challenges revealed that many industrial organizations:

- **Are unaware of imminent threats** (e.g., toxins, weather risks) to worker health and safety until after safety has been compromised.
- **Lack real-time awareness of man-down situations or other incidents impacting worker well-being**, resulting in delays in workers getting necessary help and putting them further at risk.
- **Do not know real-time worker locations** (versus where they are expected to be). Companies are often unaware when unauthorized workers enter potentially dangerous areas, compromising security, and risking injuries or fatalities.
- **Lack real-time access to current information**, so they may not be working with the latest data or miss key updates, resulting in costly rework or delays.
The productivity and safety of industrial workers are critical in managing overall OPEX. Businesses are looking to IoT technologies to improve both worker efficiency and safety.

Solution

Intel and Rice Electronics have jointly developed an end-to-end, integrated IoT connected worker solution designed to significantly improve the productivity and safety of industrial workers. The solution combines:

- Rice Electronics Android*-based ruggedized smartphones with external sensors (e.g., gas sensors)
- Intel Atom® processor-based IoT gateway
- Intel® security technologies
- Connected worker application on the Rice Electronics smartphone
- Expert/supervisor online portal

Data flows between the smartphones and sensor hub, gateway, and the remote command center, with the back-end software providing remote analytics. The solution provides robust two-way communication between workers and remote operation centers, while simultaneously sharing vital near-real-time sensor data about the work environment.

According to the International Labor Organization, every 15 seconds, 151 workers have a work-related accident. The global number of nonfatal occupational accidents reaches a staggering 317 million, annually. Even more concerning, 321,000 people die each year from occupational accidents. Work accidents remain a huge, cross-industry problem, despite safety regulations and procedures. Intel and Rice Electronics integrate smart technology to offer a cost-effective solution for industry.

How it works in brief

This end-to-end connected worker solution is composed of IoT devices and smartphones that are ruggedized for harsh environmental conditions and certified to be intrinsically safe (Class 1, Division 1/ATEX Zone 1). The Android-based smartphones are worn by the workers and connect seamlessly to a remote command center through an IoT gateway powered by an Intel Atom processor. Connected worker applications, combined with an expert/supervisor online portal, provide back-end analytics and visualization support.

With the Intel architecture-based IoT gateways, data is aggregated from various Rice Electronics smart devices across an entire work site and relevant data is forwarded to the cloud. The gateway also filters data based on defined rules and conducts local analytics before passing relevant data to the cloud. Intel software running on the gateway enables the local edge analytics and visualization.

Multiple connectivity protocols are supported on Intel architecture-based gateways, including Wi-Fi, 3G, and LoRa*, to enable connectivity requirements for various domains.

This solution is delivered to end customers in manufacturing, energy, and public safety verticals by Rice Electronics in the role of system integrator, along with Level 1 and Level 2 support.
In the case of a man-down situation where a worker has a problem requiring immediate assistance, an alert can be generated to help ensure timely assistance for the worker. With toxic gas monitoring capability, workers can be informed (without any latency) when thresholds are exceeded. This near-real-time responsive capability is critical to save precious lives, as well as reduce collateral damage in terms of insurance and equipment costs.

Solution components

- Rice Electronics Android-based ruggedized smartphones with external sensors (e.g., gas sensors)
- Intel Atom processor-based IoT gateway
- Intel security technologies
- Connected worker application on the Rice Electronics smartphone
- Expert-supervisor online portal

Solution summary

The Rice Electronics Connected Worker Solution with Intel IoT technology for industrial segments enhances safety and supports increased productivity. Robust communication, near-real-time insight based on holistic analytics, and ease of use combine to work effectively in complex workflows and industries. Based on a pilot conducted at a utility company, Intel observed that location tracking and timely weather alerts speed responses to workers and can save lives.

With Intel and Rice Electronics, companies have a feasible IoT solution to support, protect, and optimize work.

Sample use cases

- Man down alerts (predict imminent threat)
- Worker location tracking
- Toxic gas monitoring
- Push 2 talk
- Geofencing/fence workers
- Imminent weather forecasting
- Local and remote analytics

Results

With the Rice Electronics Connected Worker Solution with Intel IoT technology, workers are accounted for and their safety monitored with near-real-time location tracking. Geo fencing helps supervisors to ensure that contract workers are not trespassing into prohibited areas and putting themselves into danger.

Learn more:

intel.com/connected-worker
intel.com/iot
riceelectronics.com

1. Based on a mobile ethnography study of more than 100 industrial workers in the manufacturing, energy, warehouse, construction, field service, and public safety sectors performed by Intel IOTG on behalf of Intel Corporation in 2016.
2. cdcfoundation.org/pr/2015/worker-illness-and-injury-costs-us-employers-225-billion-annually

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