



FREEWAVE

PROBLEMS, **SOLVED.**
SMART OPERATIONS, **ENABLED.**

How the right **edge computing platform**
can transform industrial environments

Connected devices are giving industrial enterprises the ability to gain more insight than ever into the state of their remote operations, and how they can optimize performance in real time. **But how do you acquire all of this new data without dragging down the network?**

FreeWave solves the problems that traditional centralized computing creates from high bandwidth demands and latency challenges. Our **IQ** edge computing platform provides a smarter solution.

By distributing data capture and processing to the edge, you can optimize bandwidth and mitigate lags in decision making caused by latency—deriving more value from more data, more quickly, and without overburdening the network or replacing existing infrastructure.

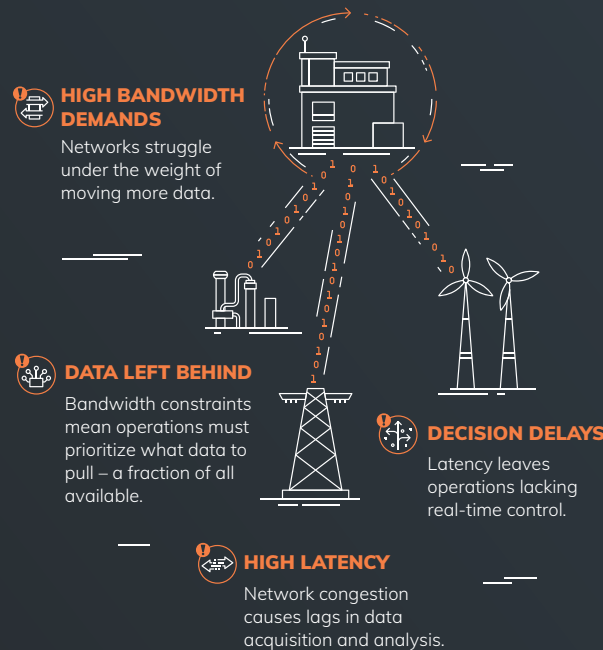
THE CURRENT WAY

VS

THE IIoT WAY

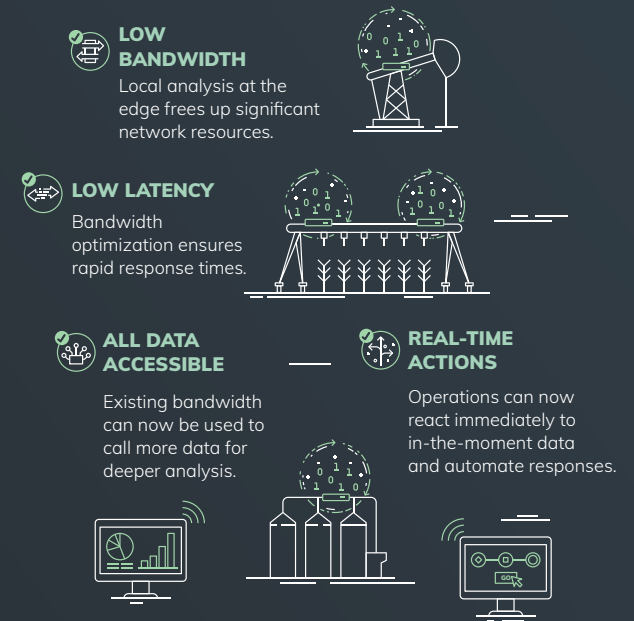
Centralized Computing

Data from remote locations must traverse the entire network to reach the closet or the cloud for analysis.



Edge Computing

Processing is distributed to the edge of the network, where data is being generated in real time.



What makes our platform smarter?

FreeWave has taken our rugged OT products, designed for low-power operation across wide temperature ranges, and **infused them with IQ Application Environment**, an open source development platform to deploy and run applications in any Linux-compatible language.

This **IQ** is delivered through our Zum family of products, including the:



ZumIQ™ Edge Computer

- Includes ARM Cortex CPU
- 1 GB of RAM and 1 GB of storage
- Low-power, hardened solution
- Flexible to deploy in wired or wireless networks



ZumLink™ IQ Edge Intelligent Radio

- ZumIQ with connectivity built-in
- Single solution to deploy and connect edge applications
- Enables wireless communications in the unlicensed 900 MHz spectrum

When combined with FreeWave's edge sensing solutions, you can create a complete edge ecosystem to drive transformative gains.

FreeWave's wireless modular endpoints, managed by an integrated gateway, are easy to configure and enable data transmission not feasible with conduit.



The Solution to Growing Network Pain Points



Extends the life of networks by 3 to 5 years for significant cost-savings



Enables IIoT solutions **without replacing** existing radios, controllers, or devices



Optimizes existing bandwidth—**up to 80% reduction**



Delivers an **open source Linux operating system**



Reduces latency by **processing on the edge**



Delivers a **low-power, ruggedized industrial** solution



Comes **C1D2-certified** at the enclosed or board-level



Provides for **serial and Ethernet interfaces**



Connects agnostically across frequencies and platforms: ZigBee, Wi-Fi, LoRa, Bluetooth, Cellular



Converts protocols like Modbus, MQTT, and DNP3

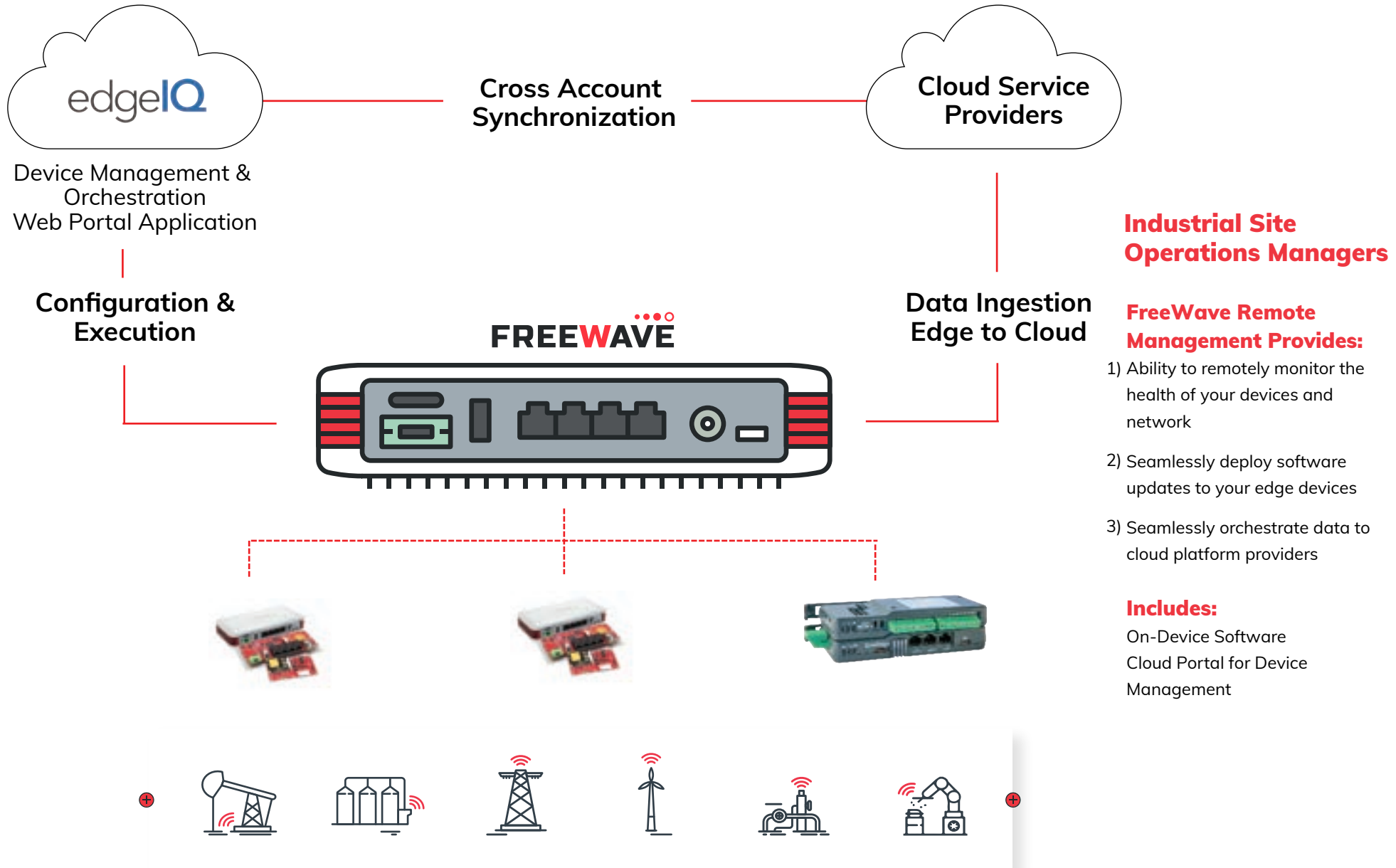
Get Cloud-Enabled



FreeWave's platform also provides a **turn-key solution to seamlessly extend Amazon Web Services (AWS) computing to the network edge**, allowing industrial devices to act locally on the data they generate while enabling you to leverage the cloud for management, analytics, and durable storage.

Now, you can unify data silos and enable rapid data-sharing across OT and IT functions for better problem-solving and decision-making.

Remote Management



Problems Solved

While the **IQ** edge computing platform has been deployed across industrial verticals and diverse environments, it consistently delivers the same results: **new operational value derived from real-time insights, edge automation, and predictive optimization.**

What's Enabled with Edge Computing:

- ✓ **Remote visualization,** monitoring & control
- ✓ **Machine learning &** predictive analytics
- ✓ **Edge to cloud** data distribution & management
- ✓ **Protocol conversion**
- ✓ **Latency & bandwidth** improvements
- ✓ **IIoT edge software integration**

Let's take a closer look at all the ways FreeWave's platform puts industrial data to work more efficiently.

PRECISION AGRICULTURE

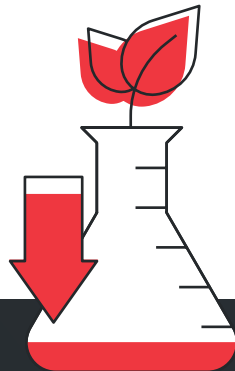
More yield from fewer resources: that is the problem that farmers worldwide are looking to solve.

With FreeWave, farms can seamlessly deploy an industrial IoT (IIoT) solution across their remote environments. ZumIQ and ZumLink IQ easily integrate with legacy devices and are able to operate continuously with limited power consumption to run advanced analytics and automation applications at the rural edge.

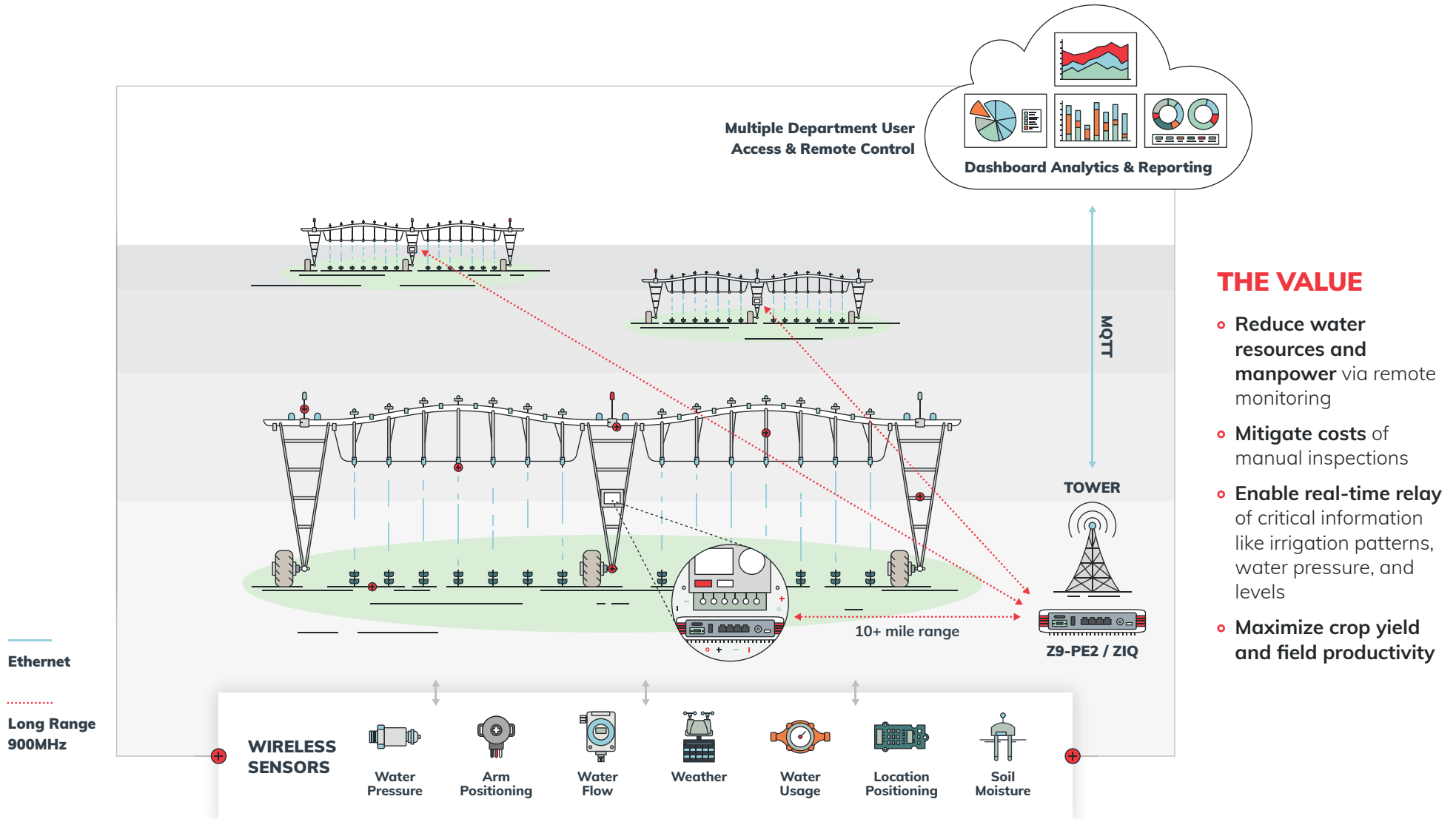
The use of **automated equipment**
and **agricultural robots** can **reduce**
agrochemical use by as much as

90%.

—Machine Design, 2018



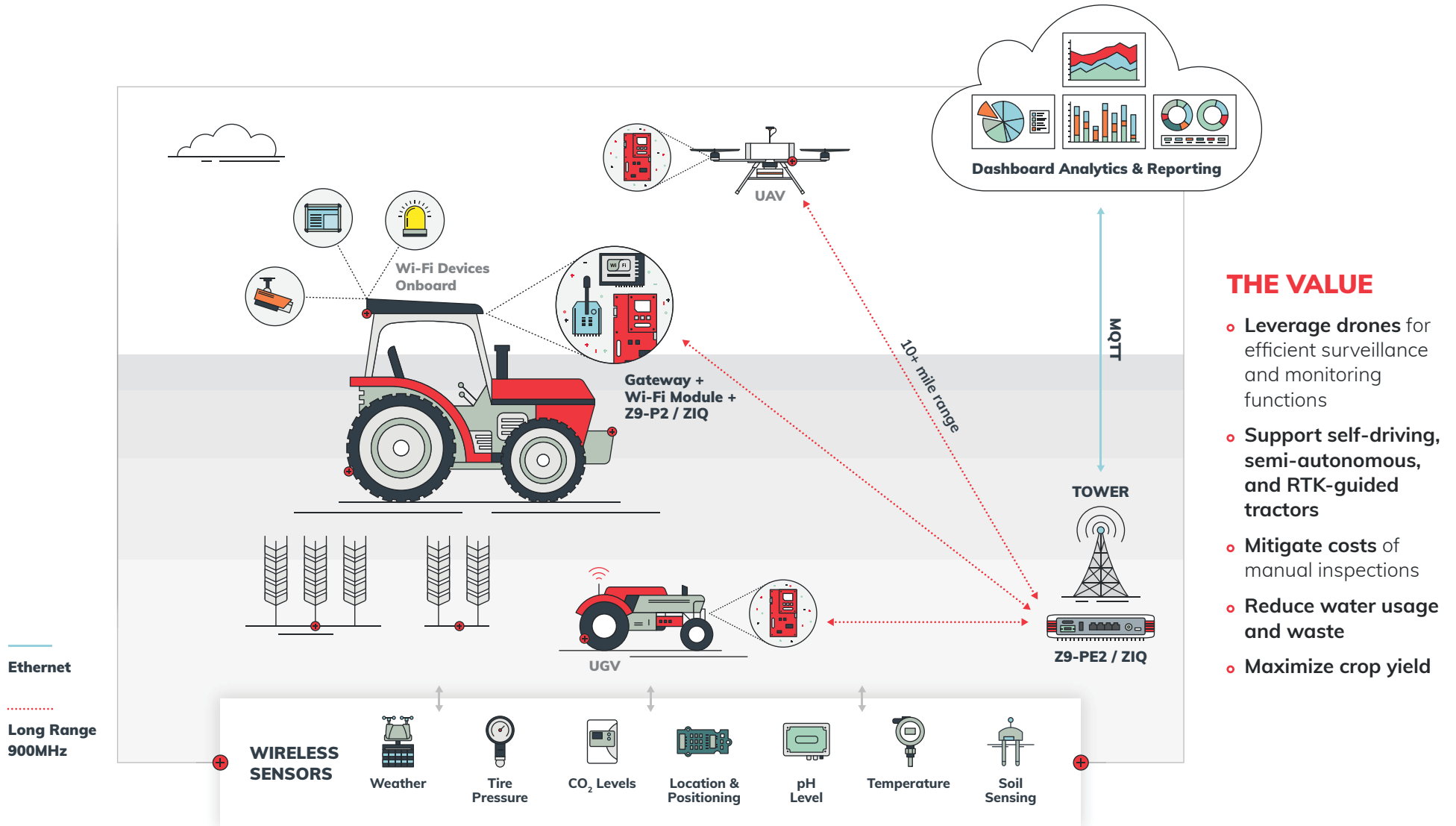
Center Pivot Irrigation Automation



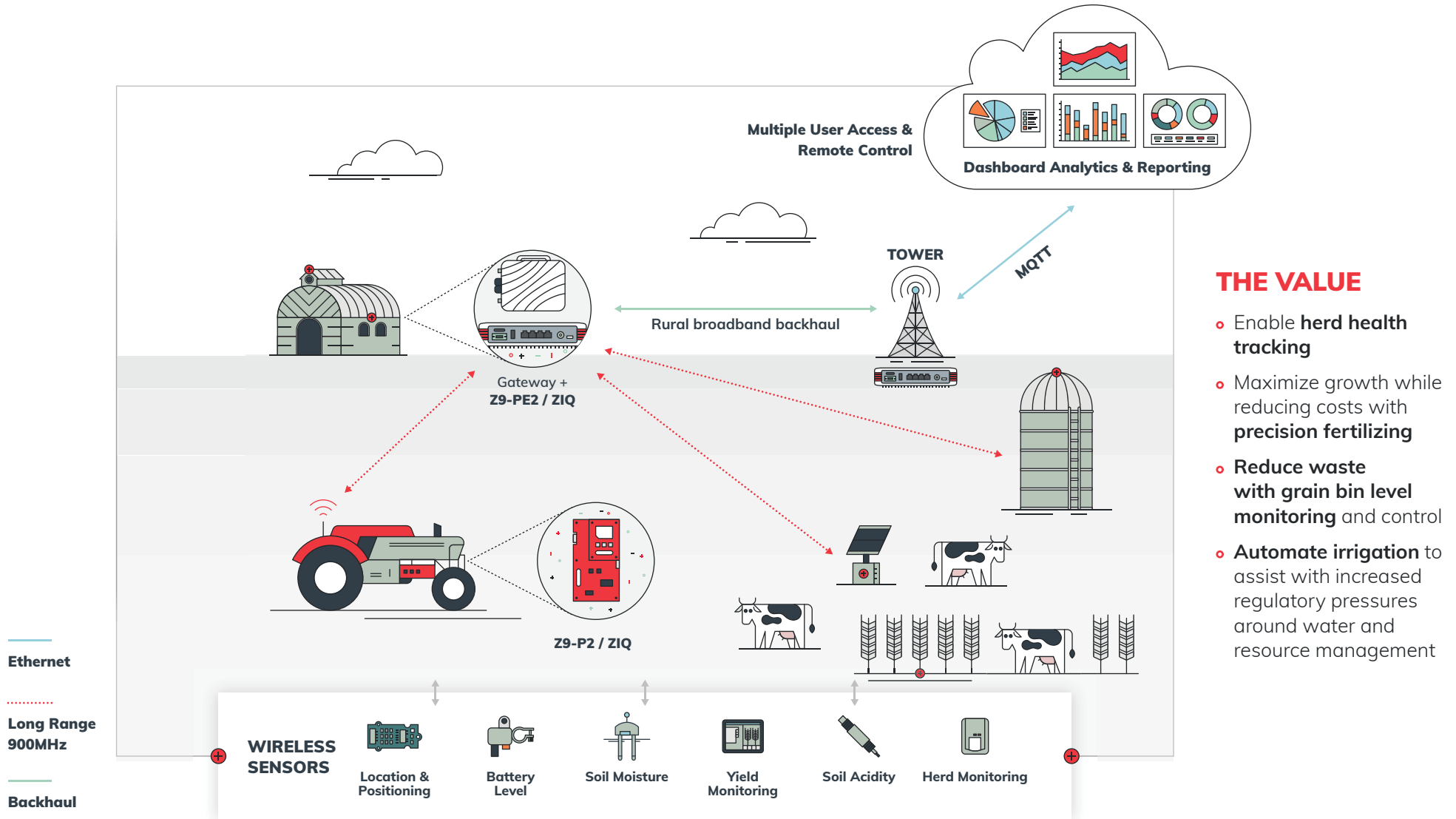
THE VALUE

- Reduce water resources and manpower via remote monitoring
- Mitigate costs of manual inspections
- Enable real-time relay of critical information like irrigation patterns, water pressure, and levels
- Maximize crop yield and field productivity

Enabling Smart Agriculture



Monitoring the Rural Edge



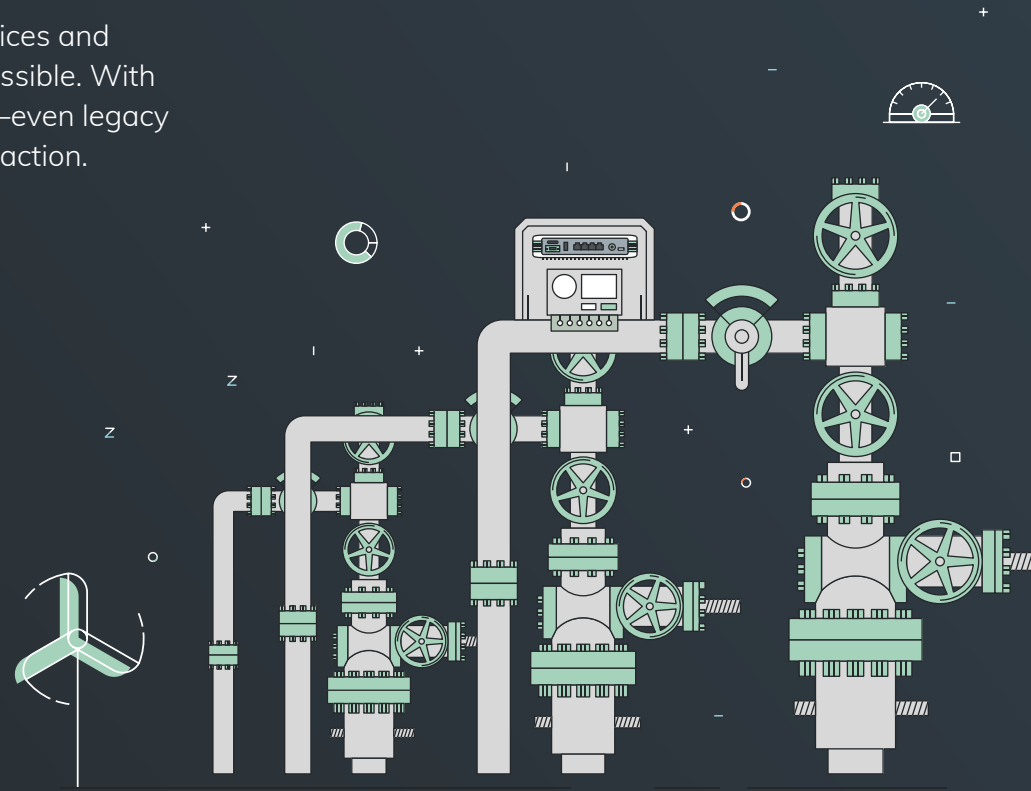
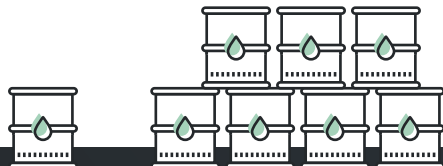
ENERGY

Oil & gas and other energy operations are deploying smart devices to digitize operations. The problem is that much of the new data they generate gets left stranded in the field, too much for the network to transport.

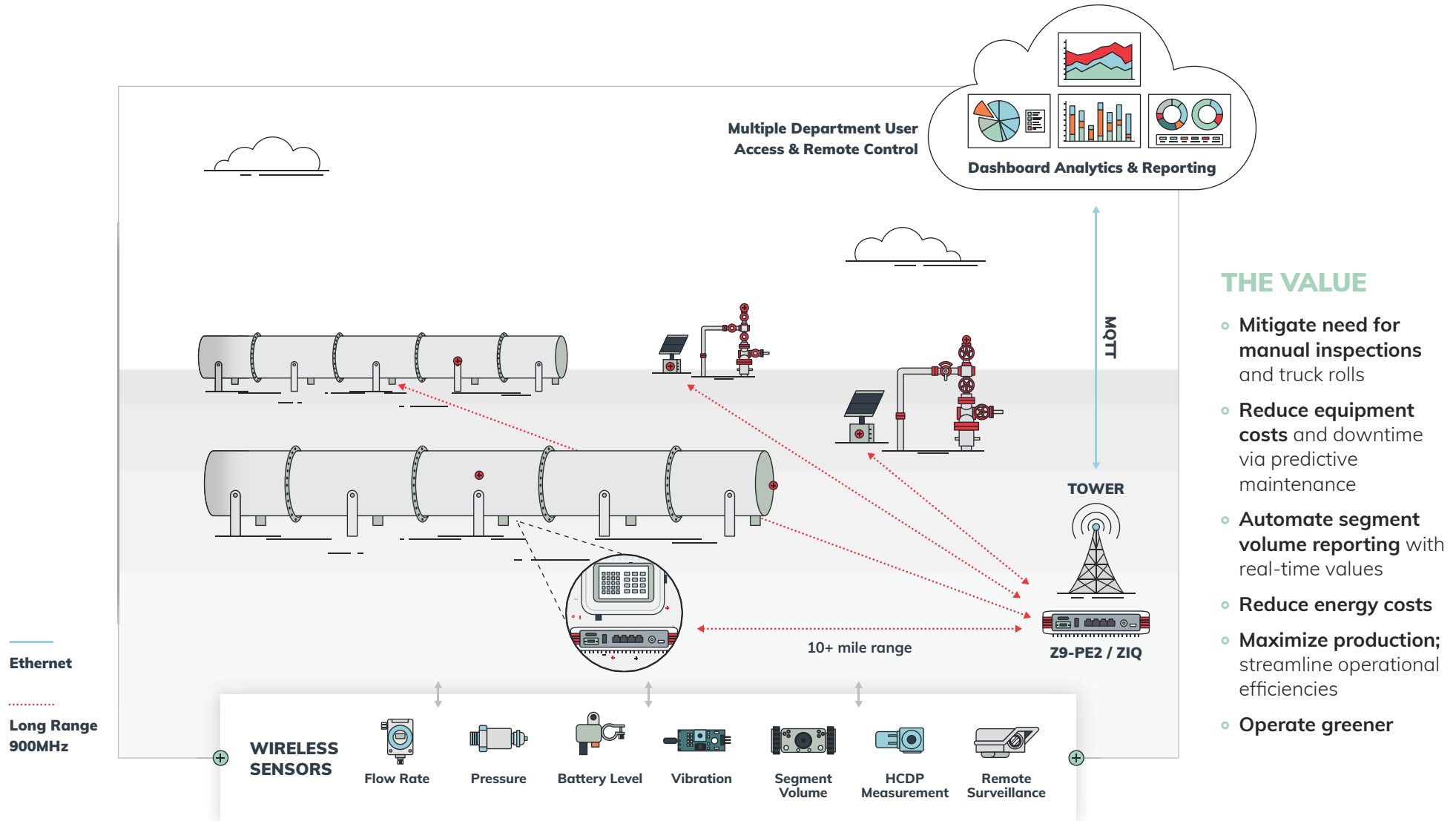
FreeWave enables energy leaders to capture the full value of new IIoT devices and applications by allowing data to be processed as close to the source as possible. With edge computing, operators can extract more data from the same devices—even legacy PLCs and RTUs—and deliver it all to the cloud for immediate analysis and action.

With oil & gas companies today **using less than 1%** of the data they have available, the **production potential of their assets is not being maximized.** Industry-wide, this shortfall represents around **10M barrels per day.**

—McKinsey, 2017



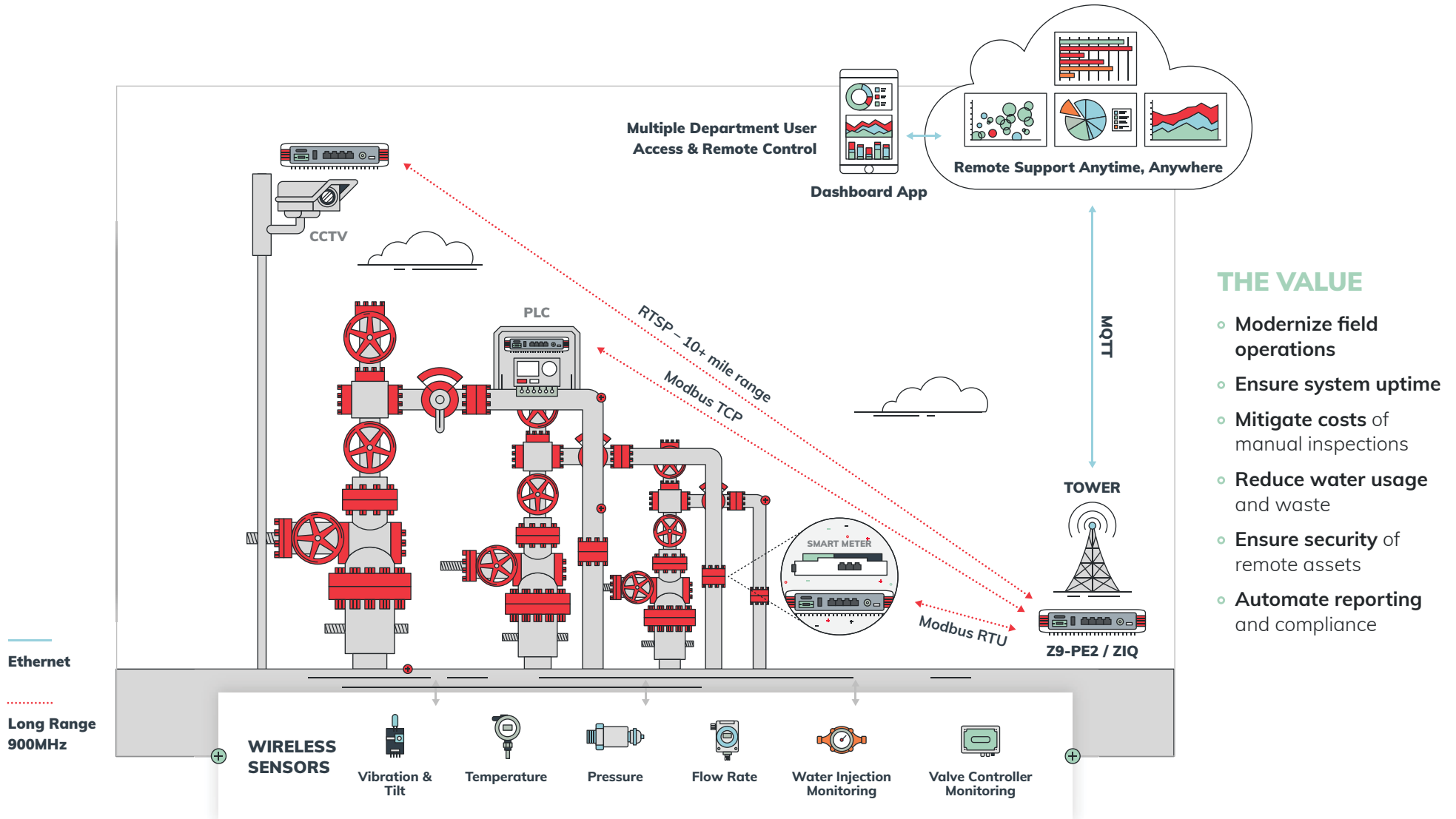
Well & Pipeline Gas Measurement



THE VALUE

- Mitigate need for manual inspections and truck rolls
- Reduce equipment costs and downtime via predictive maintenance
- Automate segment volume reporting with real-time values
- Reduce energy costs
- Maximize production; streamline operational efficiencies
- Operate greener

Real-Time Remote Monitoring



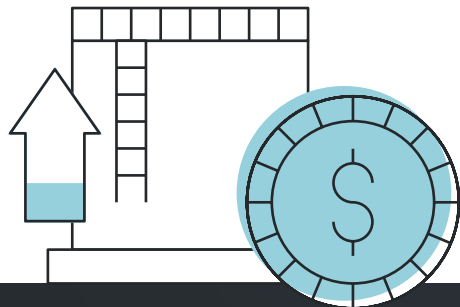
WATER & WASTEWATER

How can water and wastewater operations **meet rising energy conservation and regulatory demands** without completely overhauling their legacy infrastructure?

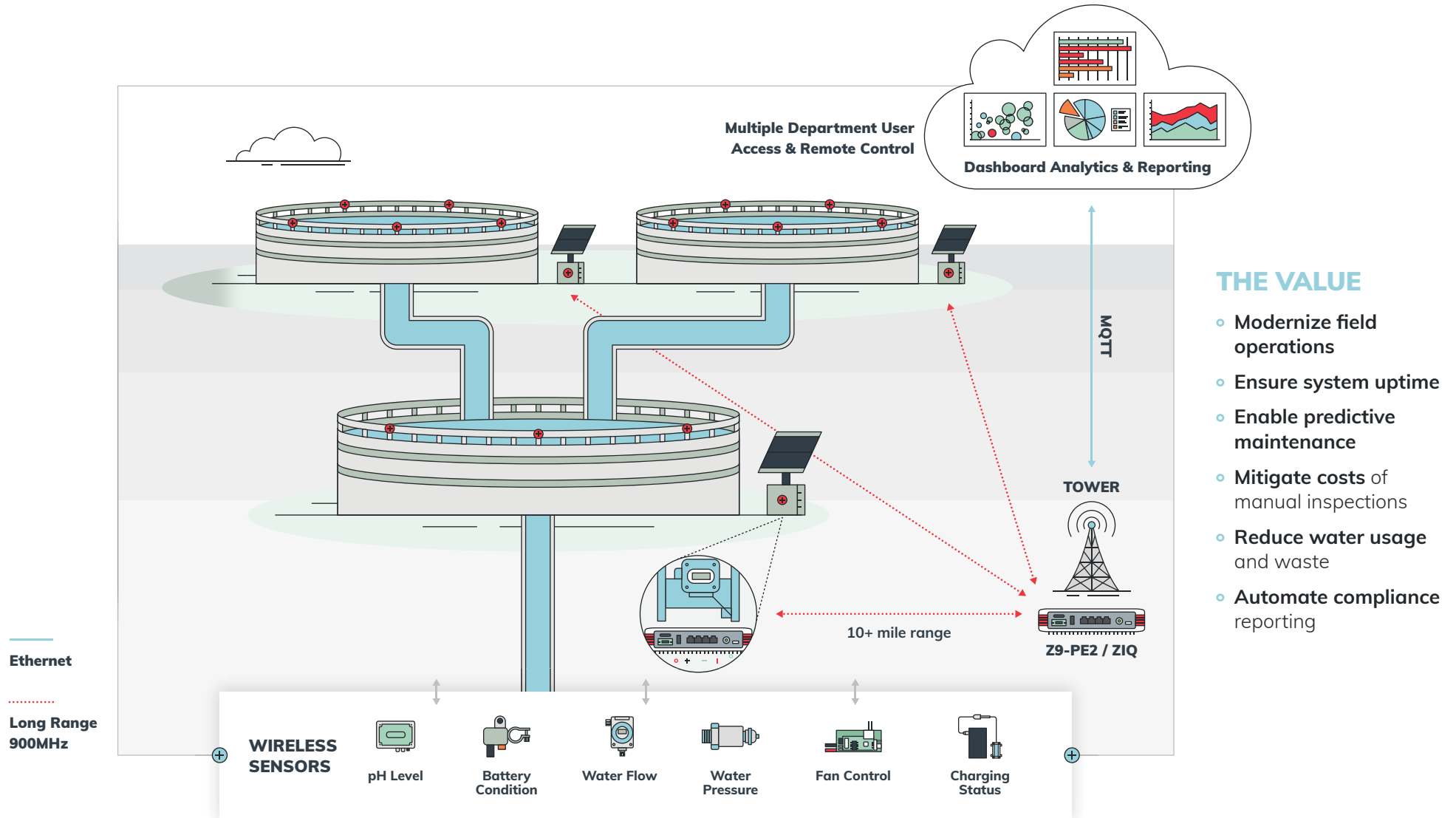
FreeWave helps water treatment and distribution plants solve the problem of system modernization by enabling them to immediately get more data from their existing assets and devices. Our platform can be deployed alongside PLCs and RTUs in the field to run advanced analytics and automation applications at the pump-, tank-, and station-level—at a fraction of the cost of system replacement.

As much as
30% of water utility OPEX
can be immediately **improved with**
dynamic and real-time system
monitoring.

—Bluefield Research, 2017



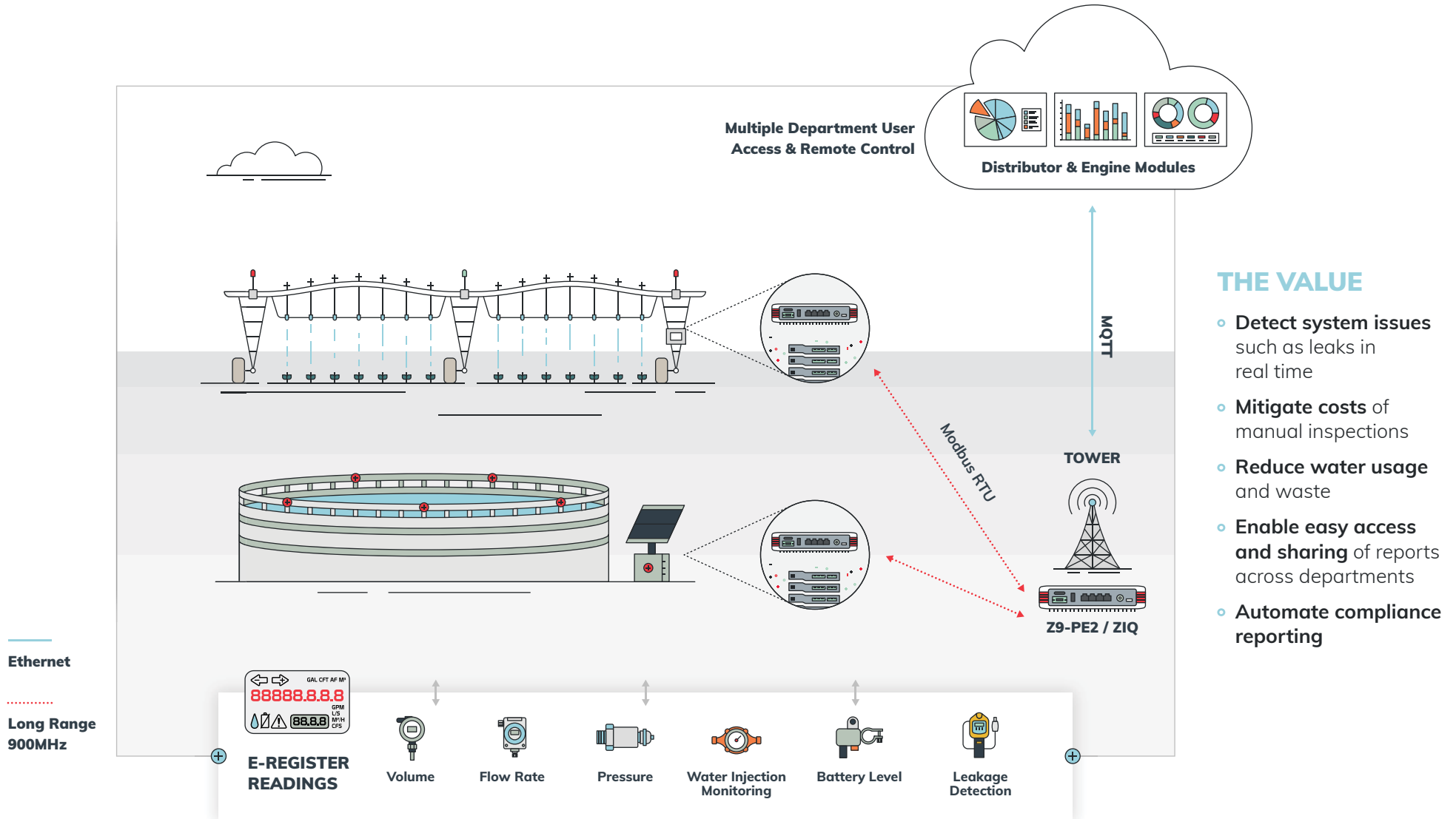
Smart Water Management



THE VALUE

- Modernize field operations
- Ensure system uptime
- Enable predictive maintenance
- Mitigate costs of manual inspections
- Reduce water usage and waste
- Automate compliance reporting

Remote Water Meter Reading



THE VALUE

- Detect system issues such as leaks in real time
- Mitigate costs of manual inspections
- Reduce water usage and waste
- Enable easy access and sharing of reports across departments
- Automate compliance reporting

SMART CITIES

As cities grow, so too do their problems related to infrastructure management, energy efficiency, and ensuring public safety.

With FreeWave's **IQ** platform, cities and municipalities can address these challenges in a smart, automated manner. With edge connectivity, edge sensing, and edge computing combined, we connect multiple stakeholders to real-time data from distributed assets across the city, supporting automation, remote control, and robust analytics for better decision-making.

A recent global study revealed that of **cities deploying smart environmental and energy initiatives:**



45%

are improving
citizen health



44%

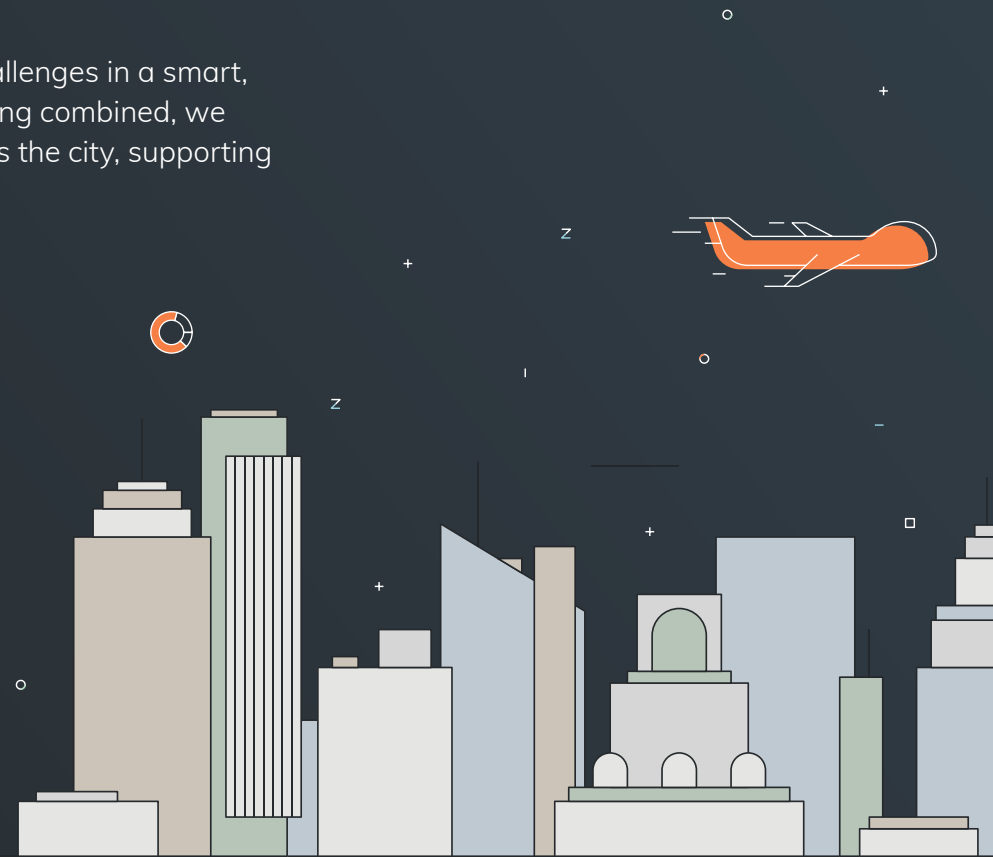
are reducing
pollution



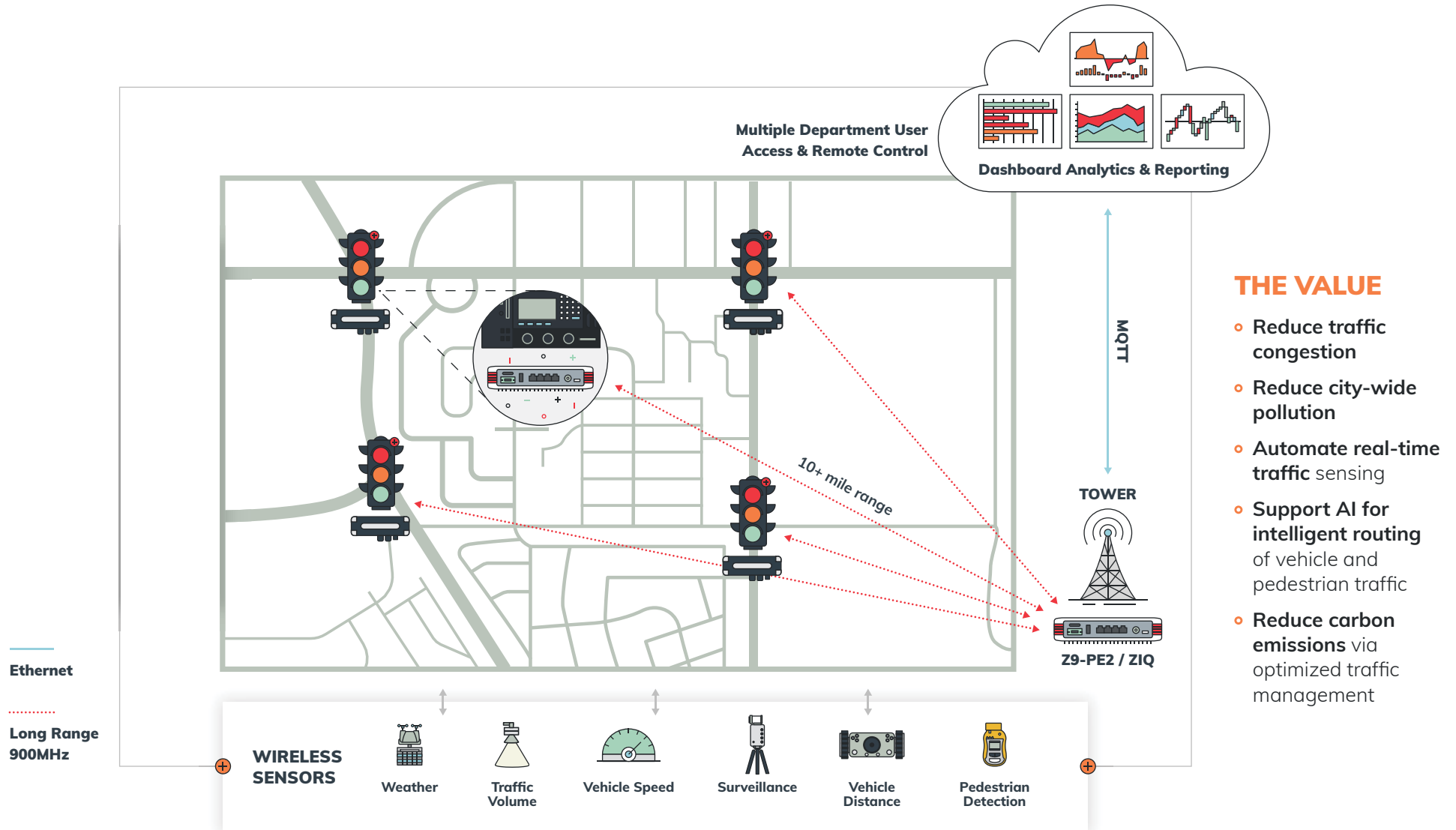
43%

are stabilizing
energy prices

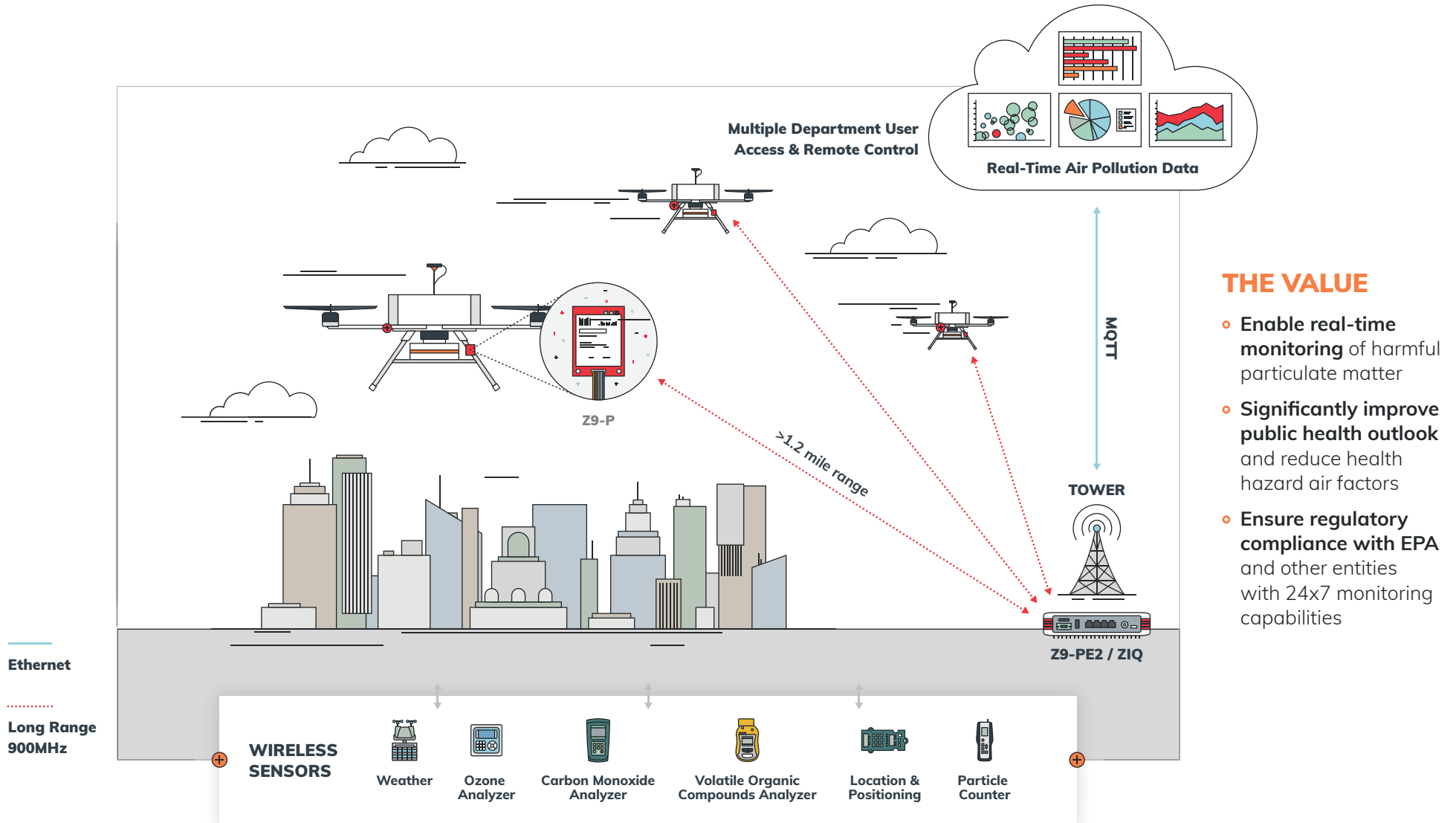
—ESI ThoughtLab, 2019



Smart Signaling Systems



Real-Time Air Pollution Monitoring



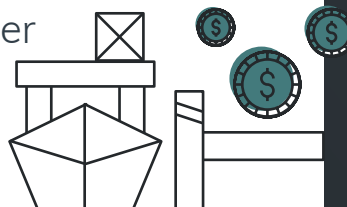
PORTS

To solve the problem of remaining efficient and competitive in a real-time world, ports must modernize the technologies they use to move, track, and monitor cargo.

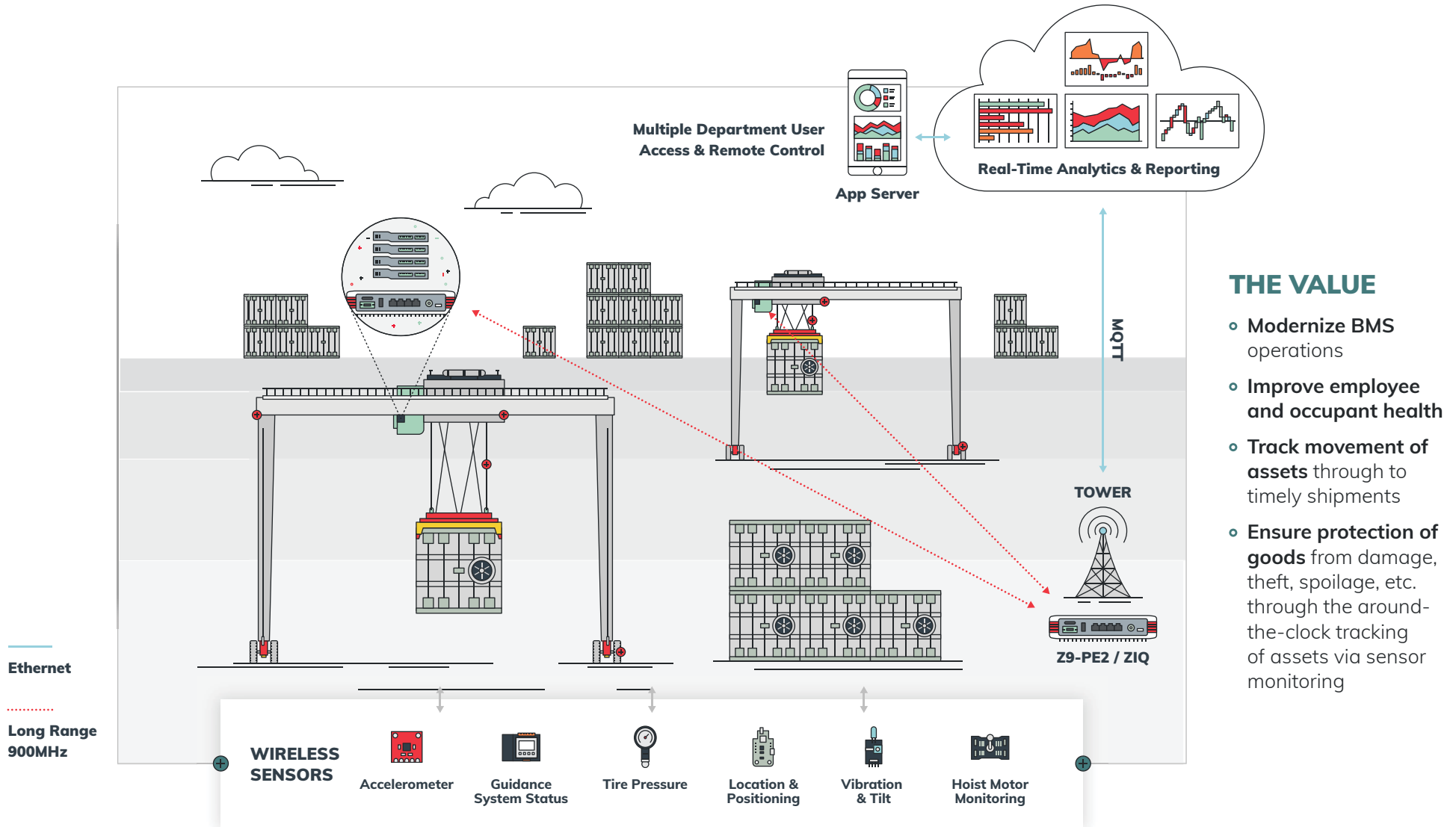
FreeWave's ruggedized, low-power platform is made to operate continuously in the harsh portside environment and integrates seamlessly with legacy devices to enable a true IIoT implementation, powering applications for real-time asset tracking, remote condition monitoring, autonomy, and more.

Technologies that enable shipping companies and the port to **save even 1 hour of berthing time** can amount to almost **\$80,000 in savings** for ship operators, and enable the port to increase the number of ships docked per day.

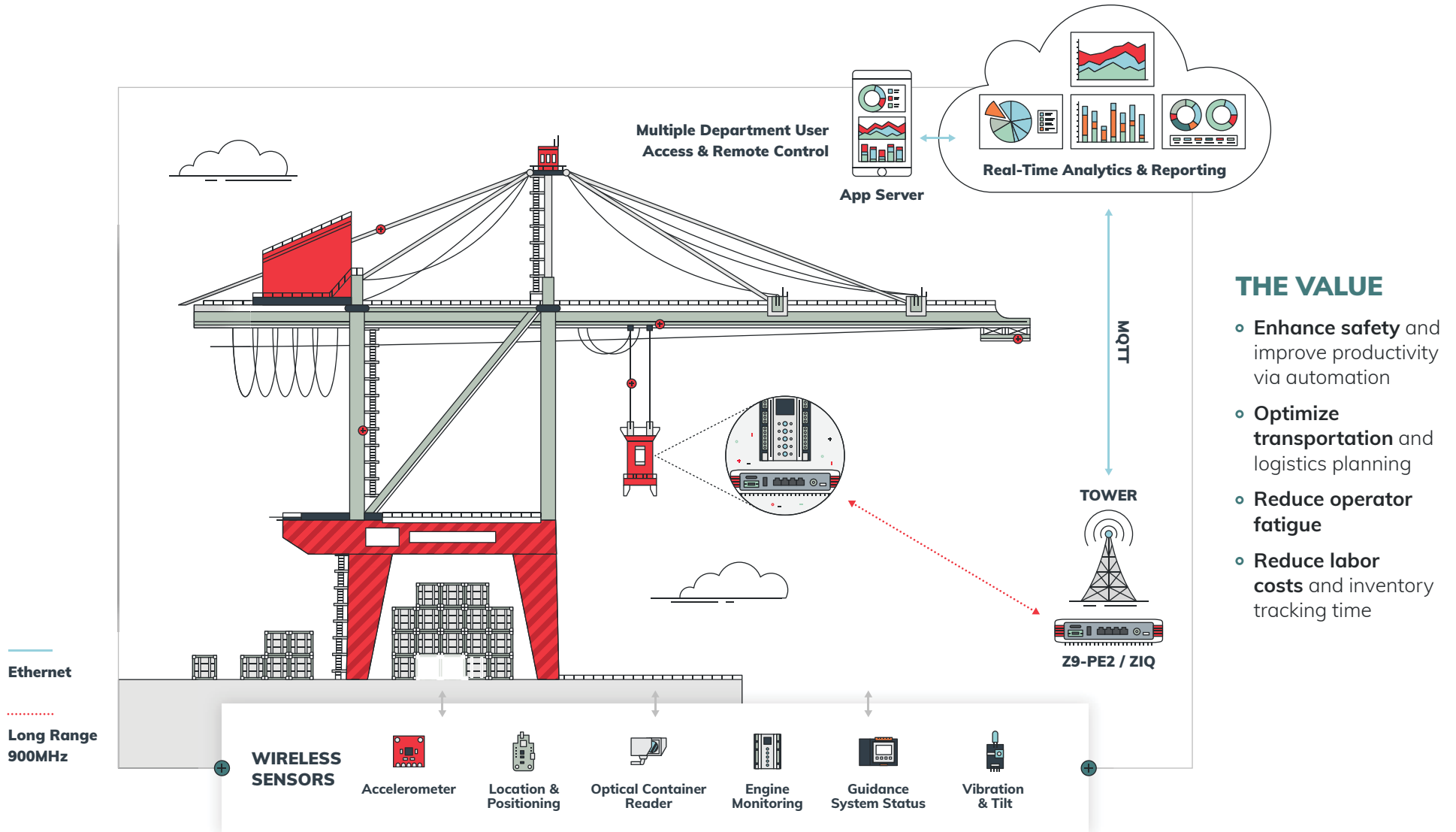
—IBM, 2018



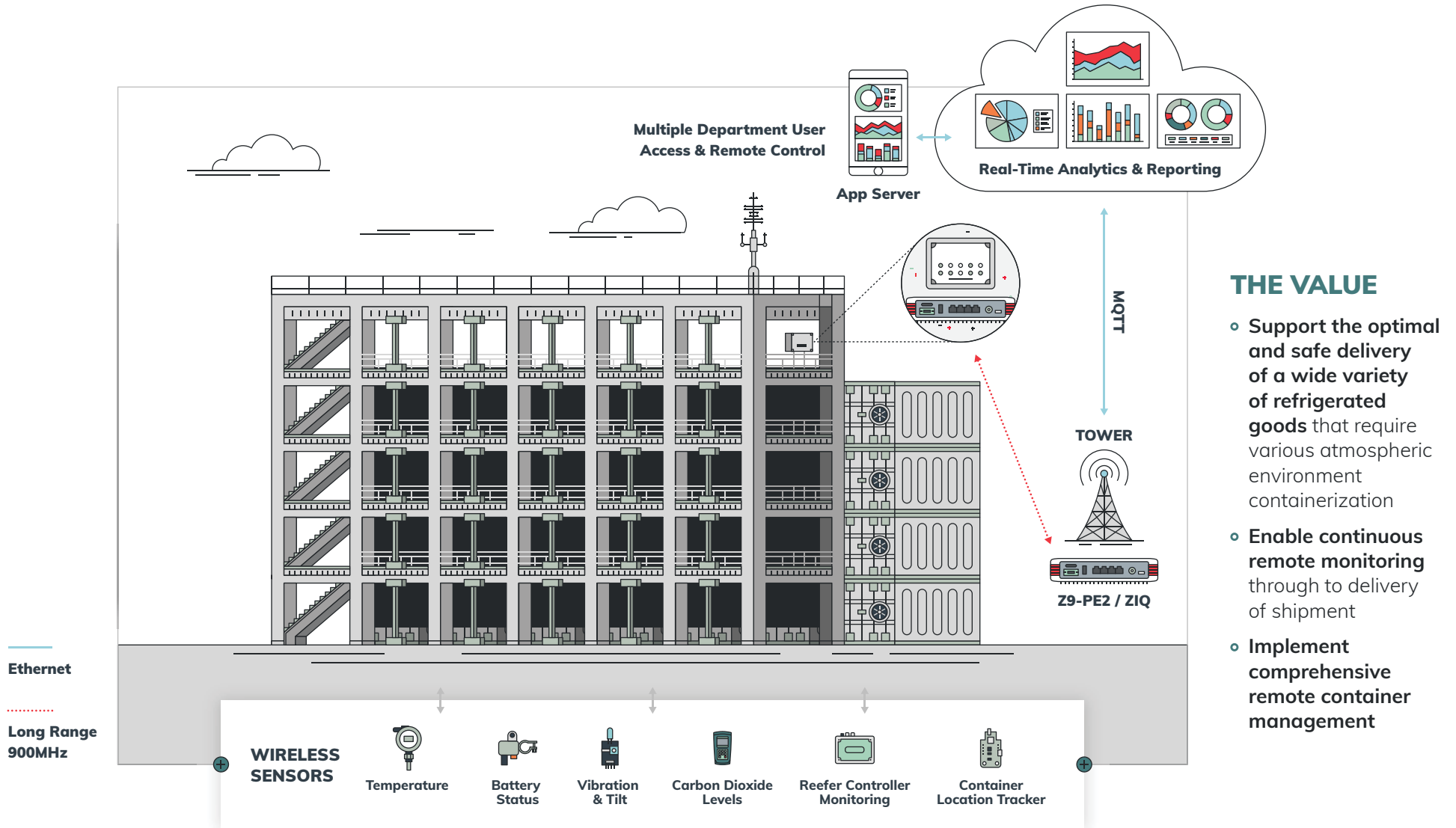
Hoist & Trolley Management



Crane Automation & Control



Refrigerated Container Management



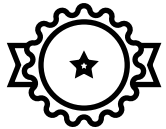
THE VALUE

- Support the optimal and safe delivery of a wide variety of refrigerated goods that require various atmospheric environment containerization
- Enable continuous remote monitoring through to delivery of shipment
- Implement comprehensive remote container management

Government and Defense

Situational awareness and intelligence to ensure a successful mission and keeping vital resources optimized: that is the problem that government and defense agencies worldwide are looking to solve.

FreeWave's military-grade wireless, edge computing and sensing solutions bring intelligence, command and control to Unmanned Platforms. ZumEdge and ZumLink integrate with existing infrastructures and are able to operate continuously with limited power consumption to run advanced analytics and automation applications in the remotest of mission environments.



26 Years

providing **combat proven wireless solutions** for military applications



2 Million+

mission-critical UAV flight hours
logged without ink failure

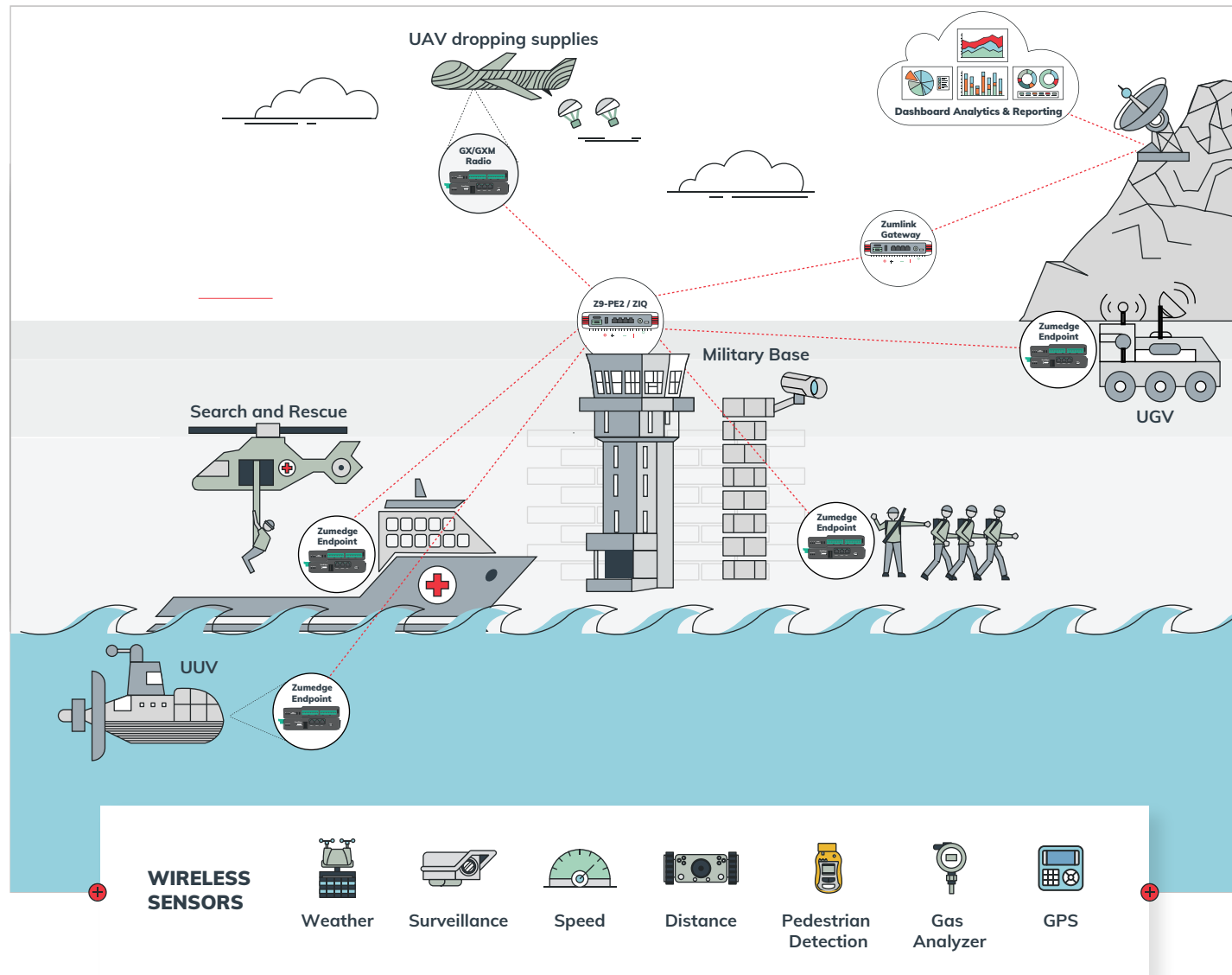


5,000+

customers with
deployments across 32+ countries



Government and Defense



THE VALUE

- Long Range**
 Our Long Range reliable communications provide 60 miles (97 km) with clear line of sight
- Future Ready**
 Enables G&D to take immediate advantage of IIoT and edge computing efficiencies
- Real-Time Speed**
 Pushes data processing to where the action is occurring; no delay in mission-critical decision making
- Mission-Critical Intel**
 Provides real-time data insights to keep pace with the rapidly-changing realities of missions and mission-critical operations
- True Autonomy**
 Onboard processing provides new compute power for autonomous applications – where G&D is heading

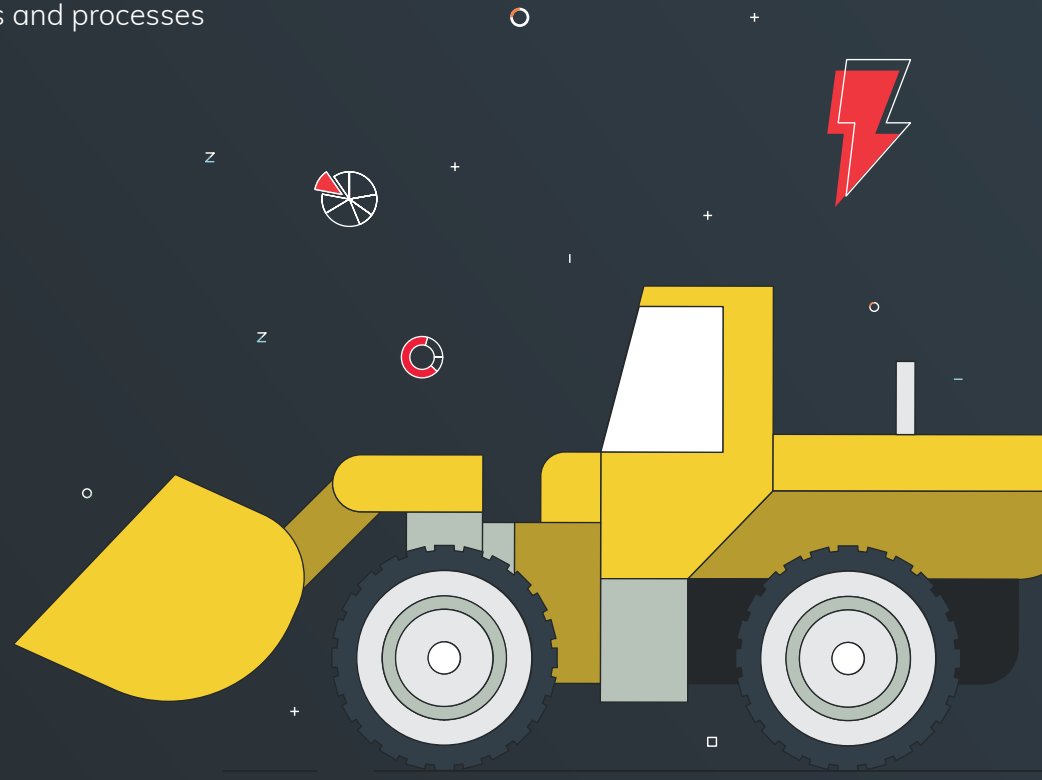
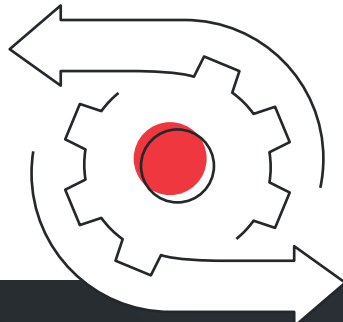
OTHER APPLICATIONS

With deployments in over 32 countries, **FreeWave's products are leveraged across diverse verticals to solve industry-specific problems** in ways that enable smarter actions, significant efficiency gains, and immediate cost savings.

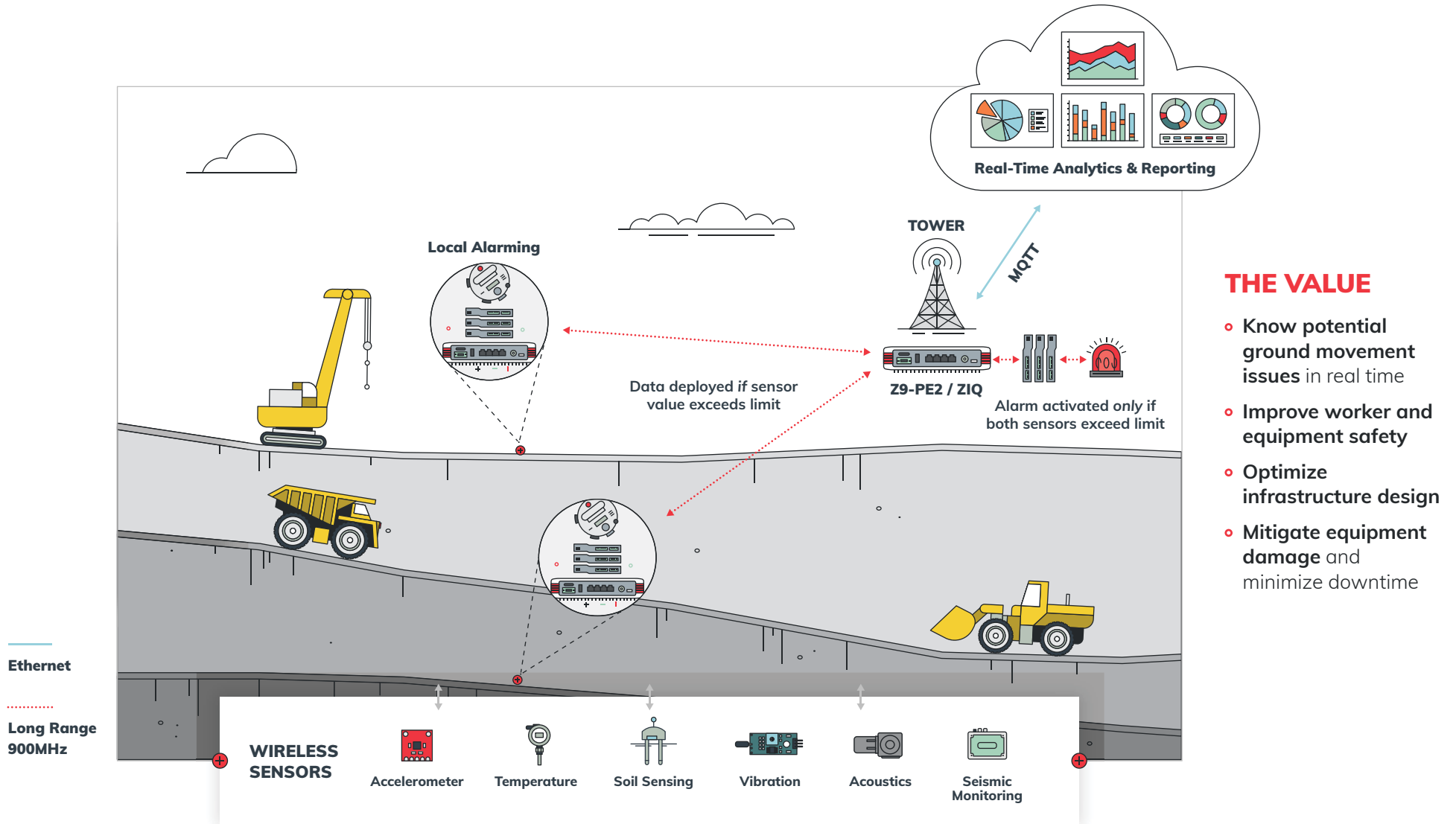
Any enterprise seeking to connect, control, and optimize remote machines and processes will benefit from the **IQ** that FreeWave's platform brings to operations.

By 2022,
75% of enterprise-generated data
will be created and processed
outside of a traditional
centralized data center.

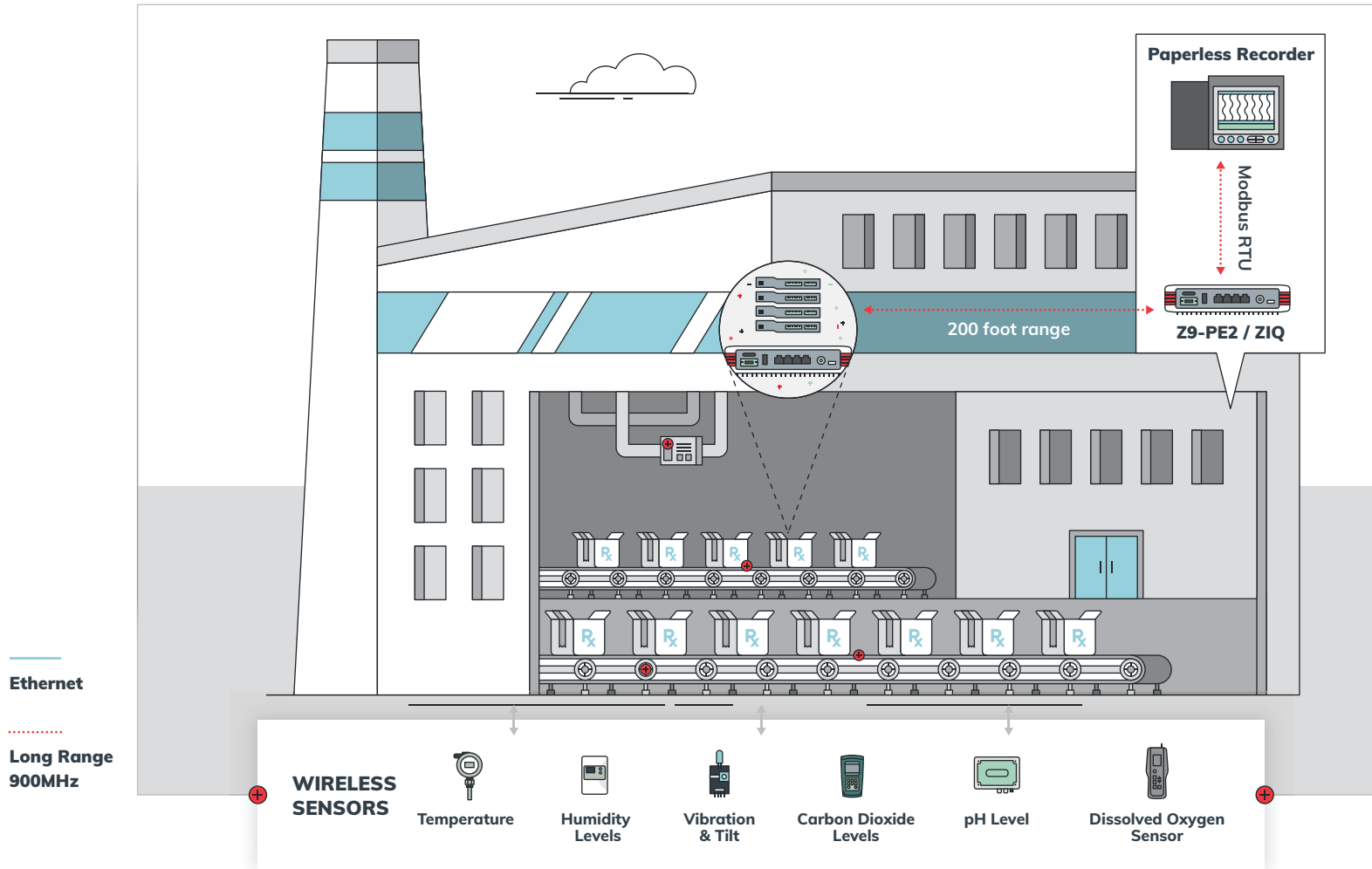
—Gartner, 2018



Earth Movement Monitoring



Pharmaceutical Manufacturing



THE VALUE

- Mitigate pharmaceutical drug loss due to supply chain deficiencies
- Improve consumer and patient safety with trackable and effective monitoring of pharmaceuticals from manufacturing to destination
- Use analytics-enabled data management to benefit the entire pharma supply chain

Smart Operations Enabled

To achieve transformative operational optimization, you need data visibility, but that is only part of the battle. You also need to ensure that every relevant stakeholder has the ability to access, assess, and act on that data too.

FreeWave gives you the power to do it all, delivering a complete, cloud-enabled edge ecosystem.

Designed to build upon and enhance existing infrastructure, our **IQ** platform immediately provides expanded capabilities for high-fidelity industrial data capture, analysis, control, and automation. Readily scalable as edge computing needs evolve, it provides a future-ready solution to solve today's pressing operational problems, and to capitalize on future opportunities that come with a smart edge.

Get started with FreeWave.

Become an authorized FreeWave partner and start solving your customers' problems today. **Click to download our Partner Application.**



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