SOLUTION BRIEF

Telecommunications
Intel® IoT Gateway Technology

Optimize Cellular Tower Operations with Intelligence at the Edge

azeti Software on Intel®-Based IoT Gateways Lowers Costs and Strengthens Site Security.

While businesses in many other industries struggle to attract more consumers, telecommunication companies are in the enviable position of having an immense and ever-growing consumer base with a seemingly bottomless appetite for products and services. For these businesses, the challenge is to keep pace with consumers' growing demands for more bandwidth and more services on more devices, while also reining in costs to stay competitive in one of the world's most dynamic and fiercely competitive industries.

The estimated eight million cellular towers worldwide provide one area of significant opportunity for the telecom industry to increase efficiencies and lower costs. By adding intelligence at the edge, companies can optimize the operation of equipment ranging from batteries to HVAC systems, perform timely and proactive maintenance that extends equipment life, and greatly strengthen on-site security.

Intel and azeti Networks AG worked together to develop and refine an intelligent edge solution that makes it possible to integrate Internet of Things (IoT) capabilities into existing cell tower environments. With azeti's remote asset management software on gateways built with Intel® IoT Gateway Technology, companies can run more efficiently, reduce costs, and ultimately compete more effectively.

Business Challenge: Sustain Growth While Cutting Costs

Cell towers are subject to many of the same threats as other remote sites, from equipment failures to natural disasters and criminal activity. The challenge for tower operators is to deal with each of these challenges cost effectively when they often lack sufficient visibility into events and are unable to respond quickly with a local resource.

In a typical scenario, a cloud-enabled sensor at a cell tower might detect that a generator is not working properly. The tower operator will receive the general information or alert, but without the ability to accurately define or fix the problem remotely, the operator will have to send out a maintenance crew—losing time and money as the crew drives out to the site. Even a minor issue could result in hours of downtime, and if the problem is more time critical, further damage could result while the crew is en route.

In addition to the direct costs of slow and sometimes unnecessary dispatches, companies effectively lose money each month due to inefficiencies and a lack of equipment optimization. Without detailed, real-time data on equipment health and performance at individual towers as well as across potentially hundreds or thousands of deployments, maintenance is reactive, equipment life may be shortened, and energy consumption is likely higher than necessary.

Another constant concern at cell towers is security, including issues with theft as well as access control. Fuel, batteries, and copper are especially attractive targets for thieves, creating a need not only for remote surveillance but also active deterrents. Limiting access to certain individuals at particular times of day, often only in specific areas, is a further challenge for tower operators.

Solution: azeti Remote Asset Management Software on Intel-Based IoT Gateways

Through a collaborative effort at the Intel® IoT Ignition Lab in Munich, Germany, azeti and Intel developed a solution that addresses the challenges of remotely monitoring, managing, and securing equipment at cell towers and other distributed locations.

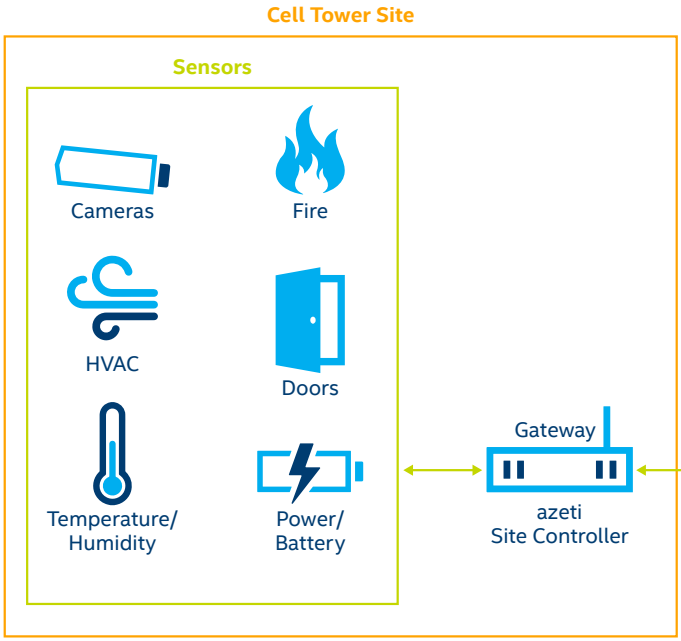
The solution begins at the cell towers, where nonproprietary IP or non-IP sensors can be retrofitted to legacy equipment such as HVAC systems, batteries, generators, temperature gauges, cooling units, and beacon lights. IoT-enabled surveillance and access control equipment including cameras, keypads, and motion detection sensors can also be deployed to provide added site security.

To speed responses, data from the sensors is not sent to the cloud but rather to a nearby gateway built with Intel IoT Gateway Technology, powered by Intel® Quark™ processors or Intel® Atom™ processors, and running on Wind River Linux Intelligent Device Platform XT*. The gateway stores, analyzes, and filters the sensor data, using azeti's remote asset management software.

Remote Asset Management Challenges

- Unnecessary truck rolls
- Slow response times
- Lack of insight into equipment health
- Theft, vandalism, and access control
- Lost energy savings potential

Actions at the Intel®-based IoT gateway take place depending upon rules set using the cloud-based azeti control panel at the network operations center (NOC). The control panel provides single-pane visibility into up to thousands of gateways, so operators can examine individual tower operations or select and filter data from multiple gateways to identify interrelationships, correlations, and trends that could lead to optimizations.



BENEFITS FOR CELL TOWER OPERATIONS

- Reduced energy consumption and costs
- Less downtime with more targeted preventive maintenance
- Increased site security and access control
- Improved asset lifetimes through optimized utilization and maintenance
- Local analytics and intelligence for better, faster decision-making

Figure 1. azeti Remote Asset Management Software on Intel-based IoT Gateways.

Based on these analyses, operators can set rules to determine when actions should be taken automatically at the gateway level and when the gateway should issue alerts to the NOC. For instance, a rule could be set for sensors to send temperature data to the gateway every five seconds. If the temperature crosses a certain threshold, the gateway could issue an automatic response—such as turning on the air-conditioning system—or send an alert to the NOC requesting deployment of a maintenance crew.

The data that the gateway feeds to the NOC for more detailed analysis can be limited to optimize efficiency. For instance, rules can be set for the gateway to average the readings collected from dozens of sensors, saving all the data but sending only the average number to the NOC for analysis. Along with reducing data overload at the NOC, internal testing by azeti found that this filtering process can cut data traffic by up to 98 percent.

The solution's intelligence-at-the-edge functionality also increases safety and security at the cell towers. For example, operators can set a rule for the gateway to switch off the electricity if a smoke detector senses a fire. If the site's security perimeter is breached, a rule can trigger an automatic response from the gateway to turn on all exterior lights and issue a verbal warning that security personnel are on the way. NOC operators can also establish limited-time PINs to allow contractors to perform on-site work without triggering alarms and reactivate motion sensors after the time limit expires.

To save time, operators can use the azeti control panel to configure or update all their gateway devices at once, or they can easily establish different rules for each cell tower. To simplify and speed up the process, modules are available for managing fuel, batteries, doors, generators, and cooling units. Operators can also configure sensors, pushing new parameters down to the gateways based on changing conditions and data analysis.

Benefits: Smarter Operations Increase Efficiencies

Running azeti remote asset management software on Intel-based IoT gateways gives cell tower operators a flexible solution that delivers all the advantages of intelligence at the edge.

- **Faster responses:** Unlike cloud-based models that require all sensor data be sent to a central platform for analysis, the gateway solution filters and processes data at the edge in milliseconds. Depending on established rules, the sensor data may trigger automatic actions that speed response times and minimize the burden on tower operators and maintenance crews.
- **Energy savings:** With greater visibility into energy consumption, operators can detect deviations at individual towers and across multiple environments, and establish automated responses to reduce waste and optimize energy performance.
- **Reduced downtime:** Predictive analytics can be used to optimize maintenance schedules, reducing unexpected performance problems and service outages.
- **Lower operational costs:** Automated responses at the local level and more efficient dispatching can significantly reduce maintenance and management costs.
- **Increased asset lifetimes:** Optimized equipment utilization and proactive maintenance can extend the life of equipment and systems.
- **Improved access management:** Tower operators can establish role- and time-based access rights to automatically track entry and leave times, and detect unauthorized access.
- **Heightened surveillance:** Gateway-connected cameras, motion sensors, and door monitors can detect theft, tampering, and vandalism, and provide automated responses to reduce and prevent damage.

Key Features of azeti Remote Asset Management Software

- **Protocol conversion:** Connects directly to non-IP and IP sensors or I/O modules attached to sensors
- **Edge intelligence:** All intelligence takes place in the Intel®-based IoT gateway—no cloud uplink required
- **Automation engine:** Custom rule sets can be set to automate local actions based on sensor data
- **End-to-end security:** Data is protected at rest and in transit with a combination of Intel® Security and advanced features such as TLS encryption of each device
- **Easy configuration and deployment:** View and control every location from a single pane

Added Value with Intel® Architecture

- **Security:** Built-in Intel® Security helps create a security chain from device hardware, which is TLS encrypted, through the data and communication networks, where privileges can be set on a per-user basis.
- **Manageability:** The azeti control panel runs on the Wind River Helix* Device Cloud, which allows for easy configuration and integration with existing management software.
- **Scalability:** Intel® architecture provides the reliable performance necessary to remotely configure and update thousands of devices using the MQTT* publish-subscribe protocol. Internal testing shows that more than 40,000 sensor messages can be transmitted per second in a single cloud instance.

Conclusion

To maintain and expand their customer bases in a highly competitive industry, telecommunications companies depend on cellular towers to provide uninterrupted service while at the same time curbing costs. Adding intelligence at the edge can help tower operators accomplish both feats—increasing uptime and lowering costs through greater efficiencies and equipment optimization.

Remote asset management software from azeti running on gateways built with Intel IoT Gateway Technology connects legacy equipment and local sensors to provide a central overview of individual cell towers as well as up to thousands of similar sites. Operators can use that information to automate remote troubleshooting, optimize equipment maintenance and repair, and identify opportunities to reduce energy consumption.

Running azeti software on Intel® architecture provides reliable intelligence at the edge—and that gives a competitive edge to telecommunications companies and cell tower operators seeking a smart way to reduce costs without sacrificing performance.

Learn More

To learn more about azeti's remote asset management software, visit **azeti.net**.

Learn more about Intel® IoT Gateway Technology at **intel.com/iotgateway**.

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