SIERRA WIRELESS E-BOOK

SIERRA WIRELESS®

Tackling Industrial IoT Challenges

New AirLink RX55 Delivers End-to-End Connectivity Solution for Industry 4.0 Adopters.

What do oil and gas companies, power and utility organizations, farmers and manufacturers have in common? They all use industrial IoT (IIoT) to lower costs, improve productivity and quality, and implement Industry 4.0.

Reliable and secure wireless connectivity is the key ingredient to making IIoT work. Ruggedized wireless routers connect remote machinery with the cloud as well as each other, enabling real-time automation and control. New edge computing capabilities reduce response times and required network traffic.

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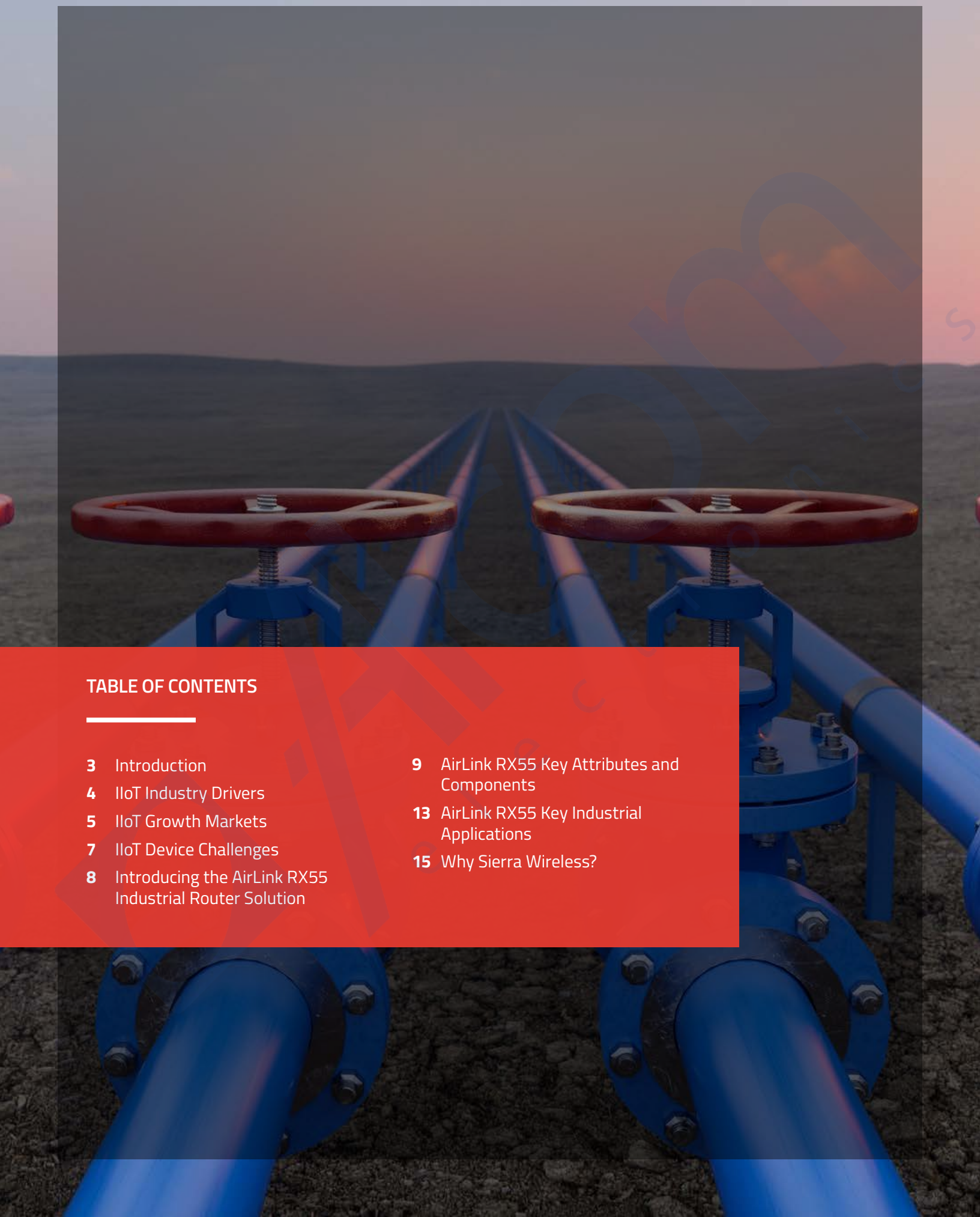

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Introduction

Connected devices are now mainstream in our daily lives. Our phones tell us when people are at our doorstep, when our printer is running out of ink and even when our car is ready for service. In a similar paradigm, the industrial community is using IoT to connect equipment and assets in oil and gas, energy, utilities, agriculture and manufacturing. This is the world of Industrial IoT.

According to Grand View Research, the Industrial IoT (IIoT) market is expected to expand at a compound annual growth rate (CAGR) of 22.8% from 2021 to 2028[1]. Key market drivers include cost reduction, productivity and quality improvements. In addition, IIoT is critical to leveraging new technologies such as private networking and edge computing, and following the Industry 4.0 roadmap.

In this paper, we will look in depth at the IIoT industry drivers, markets that are benefitting most from IIoT and the challenges in connecting a network of IIoT devices. We'll also look at how the new Sierra Wireless AirLink RX55 cellular router solution delivers ruggedized, secure connectivity for IIoT applications.

IIoT Industry Drivers

LOWERING COSTS

Adding smart sensors and actuators to machinery and plants enables operators to remotely monitor and control their equipment based on real-time data. Operators can now benchmark their plants and perform predictive maintenance. This enables them to reduce unnecessary maintenance cycles, reduce personnel and travel costs and address issues before they become catastrophic.

IMPROVING PRODUCTIVITY AND QUALITY – LEVERAGING INDUSTRY 4.0 ADVANTAGES

Comprehensive monitoring of operations whether in a plant, pipeline or grid can help streamline operations and improve overall quality. The benefits of data gathering align with the goals of Industry 4.0 which ultimately leverages machine learning and automation to improve operational processes and performance. Gathering, communicating and processing data play a key role in driving better business decisions.

COVID-19 has caused many operations to increase their IoT usage to lower dependence on workers and improve tracking of limited assets. According to a survey from Inmarsat, "84 percent of the respondents said they have either accelerated or plan to accelerate their adoption of IoT in response to COVID-19 challenges."[2]

BENEFITING FROM EDGE COMPUTING

In a traditional industrial data stream, data is collected from a machine and communicated to a data center or cloud. Some computational work is performed, and an action is sent back to the machine. With edge computing, some of the computational work can be done locally near the machine where the data is generated. This eliminates the delay of moving data from the machine to the data center and back, and helps to reduce network traffic.

One example involves performing camera image recognition at the edge, only alerting the cloud when a package, face or car is identified. It reduces data traffic, eliminates the need to perform image recognition in the cloud and potentially saves battery power for remote device applications.

IIoT routers can act as an edge computing device since they are often close to the devices they communicate with. And they typically communicate with multiple devices that all work together. This enables edge computing routers to greatly speed up computational response times which translates into lower overall system latency and drives real-time automation.

IIoT Growth Markets

Oil and Gas

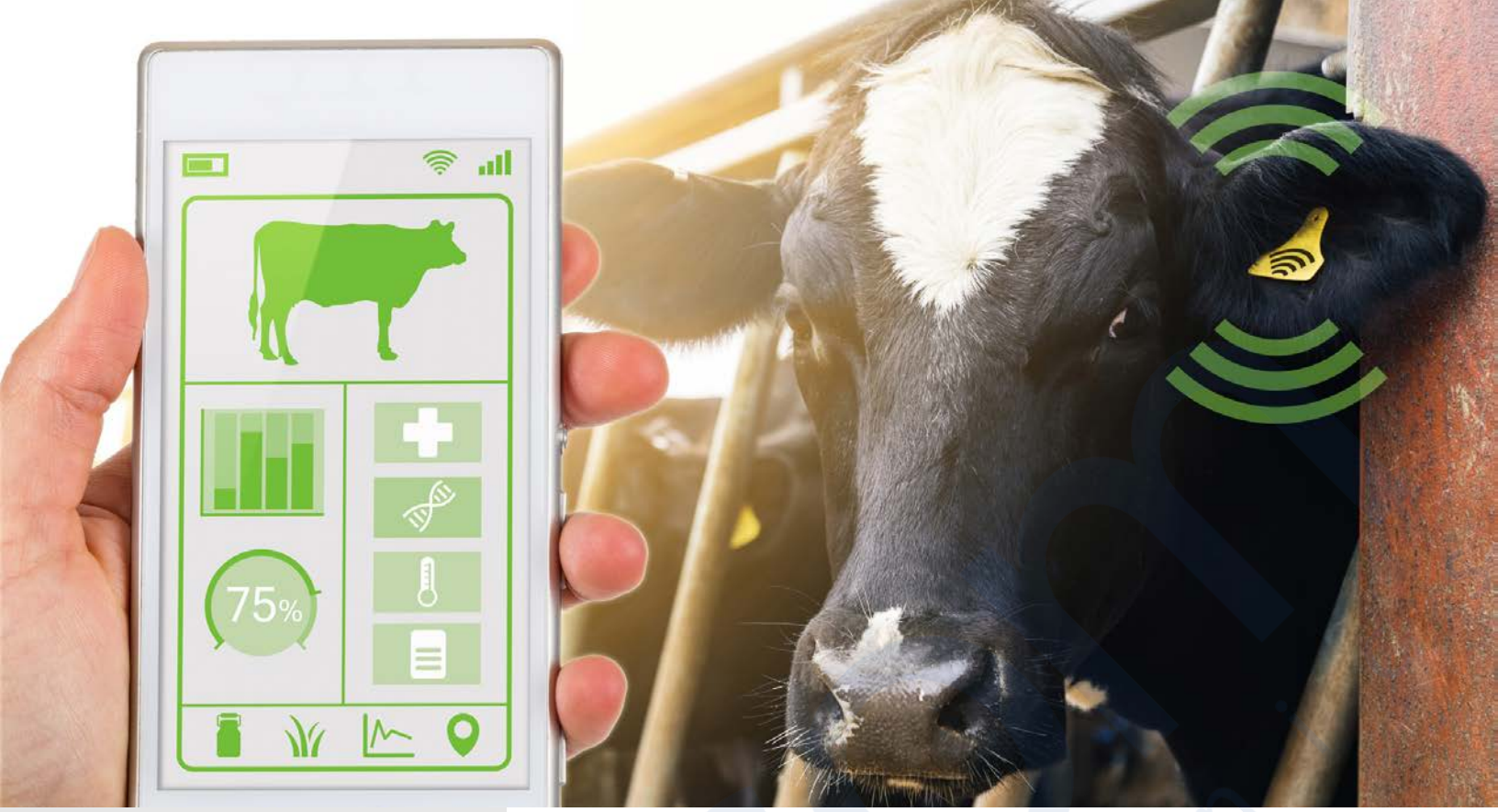
COVID-19 and recent dramatic fluctuations in prices have caused oil and gas companies to look at increasing their investments in digital technologies. According to IIoT World, the top four IIoT advantages for the oil and gas industry include managing emergency conditions, asset monitoring and preventive maintenance, establishing workers health and safety, and supply chain management.[3]

IIoT allows oil and gas companies to remotely monitor conditions throughout the production environment despite the remoteness or conditions of their assets. Understanding the operational state of equipment can lower maintenance costs by predicting failures and facilitating repairs prior to failure, saving travel costs when maintenance is not needed and reducing employee exposure to hazardous conditions. Using low power monitoring and communication devices can reduce battery power and solar panel footprint.

Power and Utilities

IIoT in the power and utilities market is aimed at maximizing operational efficiency, minimizing downtime and efficiently integrating renewable energy sources into the power grid. Smart meters, load breakers, re-closers, meter concentrators and secondary substations are just a few examples of how IIoT can impact utilities, bringing a deluge of new data sources from operational technology (OT) into the world of utility information technology (IT).[4]

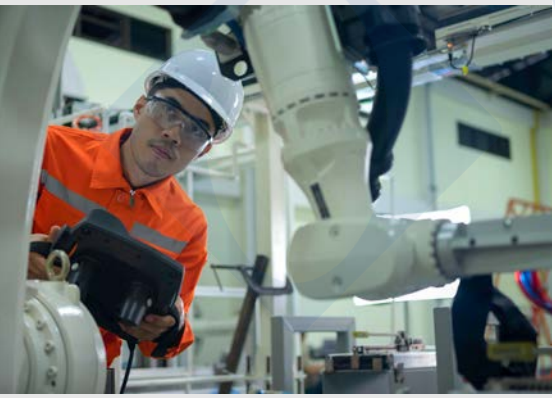
Utilities face IIoT challenges in the areas of security, scalability and ruggedized form factors. Secure communications and protocols are needed to protect the power grid from a wide range of cyber-attacks. And utilities need ruggedized, low-power devices to bring data collection to all parts of the energy grid.



Agriculture

The agricultural IIoT market size worldwide is expected to grow from $4.0B in 2021 to almost $7B in 2025.[5] Factors including population growth, climate change and labor challenges are causing farmers to use IIoT to improve agricultural manufacturing efficiencies by implementing precision agricultural practices.

Farmers are looking towards IIoT to improve livestock management through better monitoring. Smart irrigation can reduce over-watering and the need for irrigation channel flooding and manual spraying. Remote industrial sensors, robotics, high-precision autonomous tractors, drones and smart warehouses are some of the tools farmers use to plant, monitor and harvest crops. This greatly increases farm efficiency, lowers costs for fuel, fertilizers and pesticides, and reduces labor costs.



Manufacturing

Manufacturing is expected to have the largest growth in the IIoT market. Per Meticulous Research, the growth of IIoT in manufacturing "is attributed to the growing need for centralized monitoring and predictive maintenance of assets, increasing smart factories, the advent of Industry 4.0, and the increasing adoption of autonomous robots for industrial automation."[6]

IIoT will help manufacturers reduce operational costs through continuous monitoring and benchmark comparisons. IIoT can also help manufacturers improve quality, asset management and worker safety while optimizing resources.

IIoT Device Challenges

Security

IIoT devices are endpoints that attackers can use for malicious purposes. Attackers can create data breaches using IIoT devices or routers as a door into a corporate network. Data can be siphoned off a network via IIoT devices, and these devices can offer a focal point for a distributed denial of service (DDOS) attack. It's critical to have security protocols in place for all IIoT devices and routers.

Device Management Including Patch Management

Another critical IIoT function is device management. A device management solution helps to organize all IIoT devices and keep them current with firmware updates and security patches. A well-designed device manager simplifies the task of adding new devices and deleting old devices from the network. The system must be able to check to see that all devices have current firmware and establish an update schedule that does not interfere with operations.

Maintaining Operation in Harsh Environments

IIoT devices are often required to work in harsh environmental conditions including wide temperature extremes, high moisture and even high vibration. Many of these remote devices must operate on battery or solar power for long periods of time.

Introducing the AirLink RX55 Industrial Router Solution

Leveraging Sierra Wireless' industrial leadership, the new AirLink® RX55 end-to-end router solution is specifically designed and purpose-built for IIoT and Industry 4.0. The AirLink RX55 is an ultra-low power, ruggedized router that delivers next-generation networking capabilities leveraging AirLink Complete and the new AirLink OS.

The AirLink RX55 enables IT/OT managers to connect, manage and gain intelligence from critical assets in challenging, harsh and distributed environments. The router includes flexible software-defined routing functions and a future-proof design enabling new edge applications through container support and centralized remote management services. A serial option makes it ideal to connect with legacy industrial equipment.

The AirLink RX55 is available in three distinct variants for use in North America, APAC and EMEA:

- AirLink RX55 Base
- AirLink RX55 Wi-Fi
- AirLink RX55 Wi-Fi Plus

Learn more about the AirLink RX55

AirLink RX55 Wi-Fi

AirLink RX55

AirLink RX55 Key Attributes and Components

AirLink RX55 Key Attributes and Components

Rugged Design for IIoT
The AirLink RX55 is designed for mission-critical applications in extreme harsh environments. The router utilizes a cast aluminum housing and is rated to MIL-STD-810G for shock, vibration, thermal shock and humidity. It is also rated to IP64 for ingress protection and is Class 1 Division 2 (C1D2) certified for hazardous conditions operation. Operating temperatures are 40°C to +70°C / -40°F to +158°F for the base unit and -30°C to +70°C / -22°F to +158°F for the Wi-Fi variant.

Low Power Consumption
The AirLink RX55 is one of the lowest power industrial wireless routers on the market using less than one watt of power consumption in standby mode. Combined with a wide operating voltage range, the AirLink RX55 is well suited for battery or solar powered remote operations.

Supports Private Networking
The AirLink RX55 supports private networking bands including Band 48, the CBRS (Citizens Broadband Radio Service) in the U.S.

Security
Sierra Wireless takes an end-to-end approach, from device to network to the cloud, to provide the most secure IoT cybersecurity solutions available in the market. AirLink RX55 security features include:

- Remote Authentication (LDAP, RADIUS, TACACS+, DMZ)
- Inbound and Outbound Port filtering
- Inbound and Outbound Trusted IP
- MAC Address filtering
- PCI compatibility
- Secure firmware updates

Learn more about Cellular WAN Security

AirLink RX55 Services and Support

AirLink Complete for AirLink RX55

AirLink Complete includes access to AirLink Management Service (ALMS) and delivers 24/7 technical support to detect, diagnose and troubleshoot issues quickly and remotely. It also includes extension of the hardware warranty for up to 5 years, unlimited firmware updates and security patches to ensure the longevity of the solution.

One of the primary benefits of AirLink Complete is that ALMS allows for managing router deployments and updates. ALMS supports over-the-air device registration, configuration and software updates. Configurable dashboards display up-to-date views of the entire device fleet, and custom reports can be set up to monitor critical events and prevent downtime.

The interactive monitoring dashboard and map shows the status, signal information, and location of all AirLink routers deployed. Users can drill down to quickly troubleshoot devices or update older versions of firmware with one-click. Advanced heartbeat reporting and custom alerts can be set up to notify when devices go offline, resulting in faster issue identification, less downtime and fewer field trips.

For more information visit: AirLink Complete

AirLink OS

AirLink OS is the Sierra Wireless next-generation, web-based, multi-network router operating system. It enables industrial customers to create multiple concurrent data sessions using multiple APN support, intelligently direct traffic across these WAN links with Cognitive Wireless, and isolate different traffic types across these links with a zone-based firewall. AirLink OS seamlessly integrates with ALMS to remotely manage these features and configure, recover, reboot and update a router as needed.

The AirLink OS intuitive user interface simplifies implementation and enables changes/updates in real-time reducing router administration time and costs. It provides fast, seamless networking with application-based configuration and tight connection with the cloud.

AirLink OS delivers industry-leading end-to-end security capabilities including multi-layered device-to-cloud security with unique cryptographic keys that connect the router to ALMS, a hardware-accelerated VPN for secure transport, secure boot, secure firmware updates and use of the Wi-Fi Protected Access 3 (WPA-3) protocol.

Always-On Cognitive Wireless

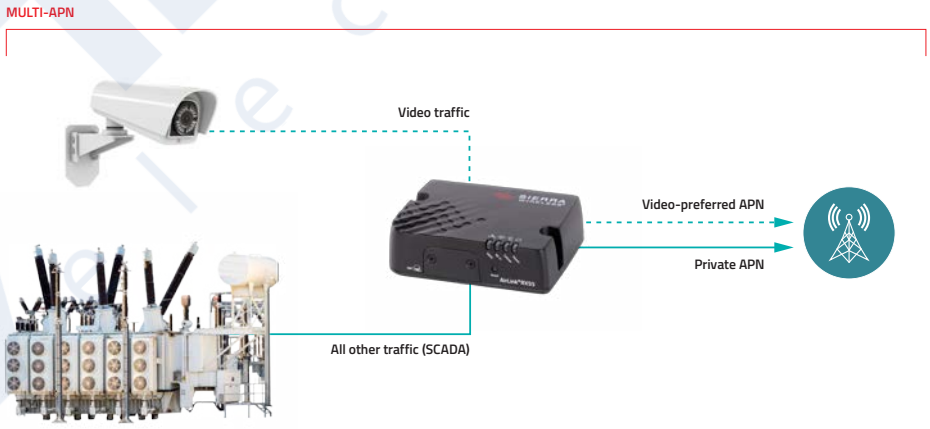
Cognitive wireless technology is a software-defined WAN (SD-WAN) technology built into AirLink OS. It intelligently steers traffic across multiple WAN links, delivering always-on connectivity and cost/bandwidth optimization. Users can set up detailed rules for their routers that direct them to use cellular, Wi-Fi or Ethernet networks, or split traffic between these networks depending on the type of data they are transmitting, changes in the network and where the routers are. As an example, a service vehicle might use cellular connectivity when driving through a city and automatically switch to Wi-Fi when arriving at the service depot.

Multi-APN (Access Point Name) Support

AirLink OS delivers multi-APN support through a new private APN solution. In the diagram below, SCADA serial traffic is routed through one APN and video is streaming over Ethernet through a different APN.

All specific APN configurations are done in the cloud, shortening time to deployment. All APN specifics are confined within Sierra's core network with total independence, making it more robust and less prone to errors generated by reconfigurations like the classic APN model. Multi-APN can improve network security by routing critical data through a private connection while routing Internet-designated data traffic through a public APN.

Learn more about Multi-APN Solutions



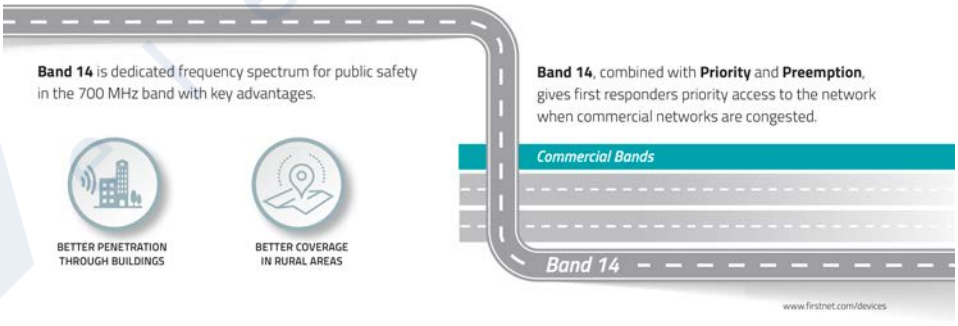
Edge Computing Capabilities (Beta)

The AirLink RX55 delivers edge computing capabilities enabling customers to both decrease latency for critical applications and reduce network traffic. AirLink OS includes a Docker container layer and customers can write their application using programming languages and libraries of their choice.

Moving intelligence to the edge improves the overall security of the solution by reducing the amount of data transmitted and the impact of a security breach. The AirLink RX55's edge computing and flexible routing capabilities allow industrial customers to create rules and encryption mechanisms to securely identify and transmit only specific needed data.

Multi-Band Network Support

The AirLink RX55 delivers multi-band, world-wide support providing extensive public network coverage and best-in-class private networking coverage. The router also supports T-Mobile Band 71, CBRS Band 48 and AT&T FirstNet Band 14.



AirLink RX55 Key Industrial Applications

The AirLink RX55 rugged and compact design makes it ideal for use in industrial applications including power and water utilities, oil fields, pipelines, mines, agriculture, manufacturing, private networking and SCADA applications. With low power consumption it is perfect for remote battery/solar applications, and the dual-serial option simplifies interfaces to legacy industrial equipment.

Mobile applications are also supported with the AirLink RX55. It is designed to operate from vehicle power and has a CAN bus option to collect vehicle telemetry data for engine diagnostics and vehicle health monitoring. When coupled with Sierra Wireless Advanced Mobility Reporting (AMR), reports such as coverage trials, vehicle reports and driver behavior can be obtained.

Case Studies - AirLink RX55 for Industrial IoT

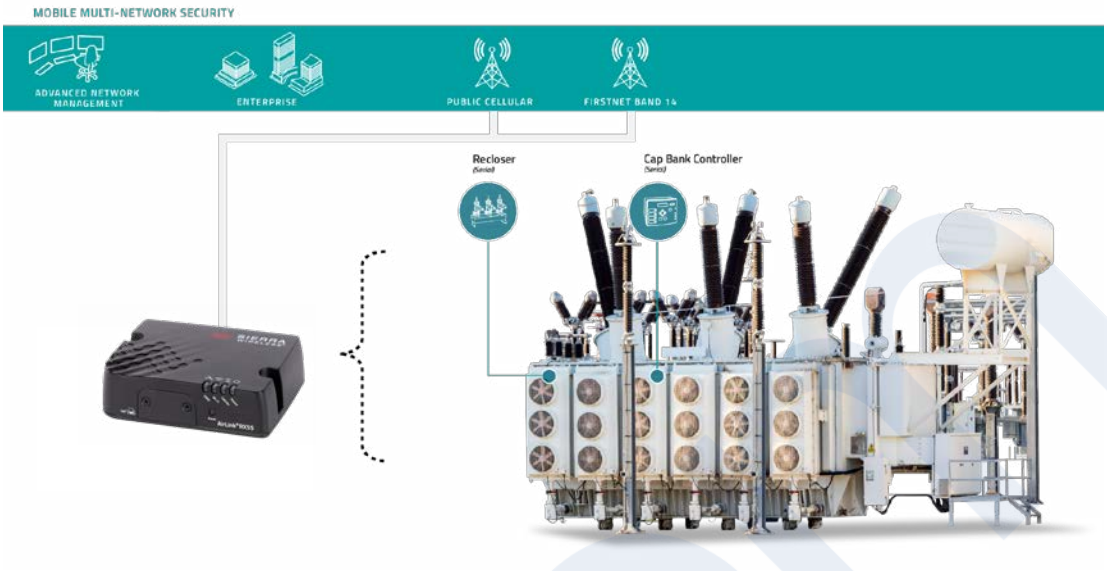
LARGE INVESTOR-OWNED UTILITY

A large investor-owned utility is committed to reducing their carbon generation through the addition of solar and wind power resources. This power will come from both large solar and wind farms, as well as from individual homes and businesses through energy buy-back programs.

Adding distributed energy resources (DER) from solar and wind adds complexity to a power grid originally designed to flow electricity from a few main power generation plants. Utilities must monitor and control these distributed resources to ensure reliability, power quality and safety. As these DERs don't produce energy all the time (solar only works during the day), the utility must constantly monitor and reroute power.

To meet their objectives, the utility is implementing a grid modernization program that places an emphasis on automation, digitization and edge computing. The utility is using public cellular connectivity to communicate with their distributed resources across a wide geographic area. They are using private APNs to keep utility communication traffic separated from the public internet.

With help from Sierra Wireless routers, the utility is on track to meet their carbon reduction goals. These changes are also helping the utility to better respond to increasing severe weather incidents that affect power grid reliability.

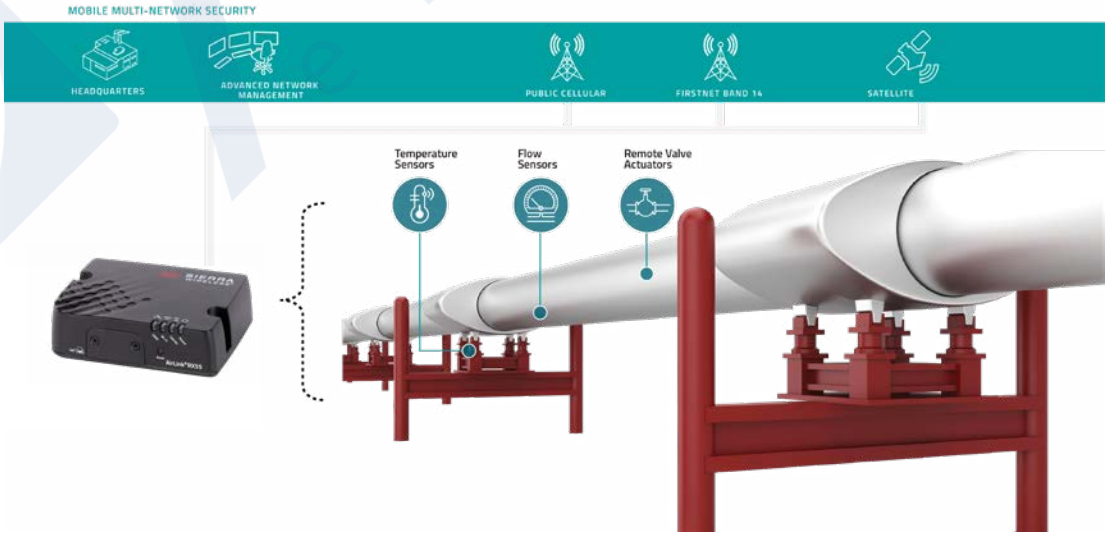


LARGE NATURAL GAS DISTRIBUTOR

A large natural gas distributor needs to continuously monitor the quality of their gas as well as the integrity of their pipeline. In addition, they need to comply with pipeline security directives from the Transportation Security Administration (TSA) to prevent incidents like the Colonial Pipeline ransomware attack in 2021.

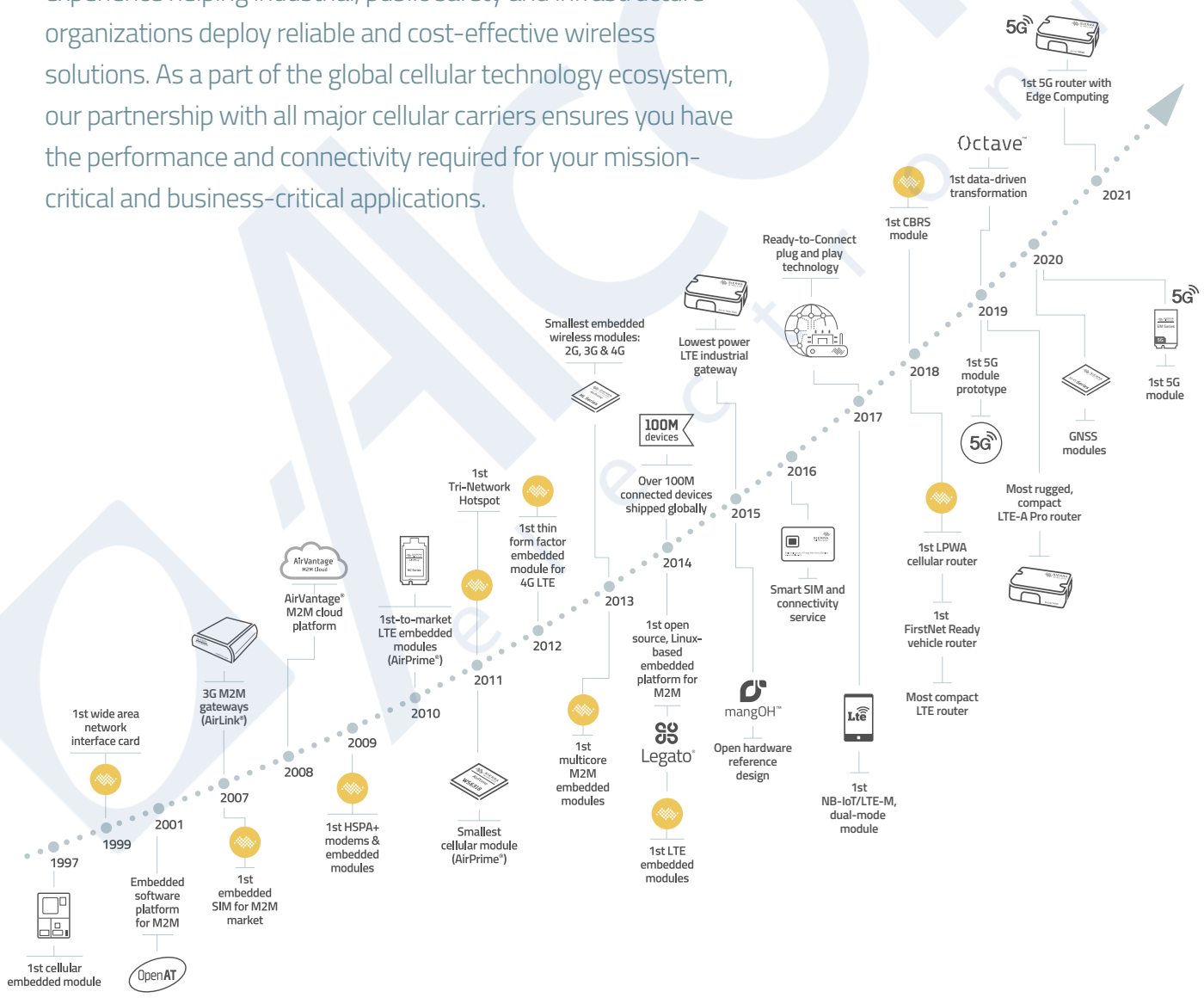
The distributor uses security control and data acquisition (SCADA) systems to measure gas pressures, flow, moisture content and impurities in the gas, and look for any possibilities of leaks or defective equipment. The SCADA system also enables the distributor to adjust equipment and quickly respond to emergencies.

The natural gas distributor teamed with Sierra Wireless to wirelessly connect their SCADA systems. The low power consumption of the routers allows them to be battery/solar operated, enabling operation in remote locations and where power is not readily available. The rugged design of the AirLink routers ensures reliable operation in the wide temperature extremes experienced on the pipeline throughout the year. The AirLink router's security systems and ALMS device management and software update capabilities enables the distributor to adhere to evolving security requirements.



Why Sierra Wireless?

Sierra Wireless has more than 25 years of cellular-first experience helping industrial, public safety and infrastructure organizations deploy reliable and cost-effective wireless solutions. As a part of the global cellular technology ecosystem, our partnership with all major cellular carriers ensures you have the performance and connectivity required for your mission-critical and business-critical applications.



Sierra Wireless has delivered innovation and leadership throughout every cellular evolution.

- **150 million** devices shipped worldwide
- **80+ networks** supported globally
- **400+ patents** in wireless technology
- **130+ countries**
- **$75M+** invested annually in cellular technology R&D

In addition, Sierra Wireless provides mission-critical and business-critical solutions where they are needed most.

- **All of the Top 10 Oil & Gas producers** rely on Sierra Wireless to keep their infrastructure running smoothly.
- **More than 80% of the Top 20 US Utilities** use AirLink routers for smart grid deployments and vehicle fleets.
- **More than 25% of the Top 50 US Transit Agencies** depend on Sierra Wireless to improve passenger services and operations.
- **More than 75% of high-performance EMS Systems** trust Sierra Wireless routers to support paramedics in the field.
- **70% of the Top 10 State Police Agencies** use Sierra Wireless purpose-built routers in their vehicles.
- **More than 50% of the Top 100 Police Departments** rely on Sierra Wireless routers in cruisers and incident response vehicles.

To Learn More

To learn more about 5G solutions from Sierra Wireless call us at **1-877-687-7795** or email **sales@sierrawireless.com.**

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