Critical Wireless Communications for SCADA

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Geographical Challenges

Industrial sectors that depend heavily on Supervisory Control and Data Acquisition (SCADA) applications, such as mining, energy generation, and especially water/wastewater, face complications resulting from the need to connect geographically remote locations. Traditionally this challenge was solved by utilizing unlicensed wireless radio equipment to connect devices serially or, in some cases, via Ethernet. With the advent of Ethernet connected devices, some traditional wireless frequencies, such as 900MHz radio communications, are not capable of supporting high-speed and high-bandwidth Ethernet traffic. Most 900MHz wireless radios can achieve a maximum data rate of 1024 Kbps, which is extremely slow compared to Wi-Fi (802.11) and 4G LTE data rates. The relatively slow data rate of 900MHz wireless radios may result in the delayed communication of alarms, supervisory commands, graphical updates, and PLC-to-PLC messages. This issue is compounded by implementing repeater radios, inefficient PLC messaging schemes, flat networks, and excessive polling rates. These speed and performance limitations are not ideal for critical applications that control and monitor equipment remotely.

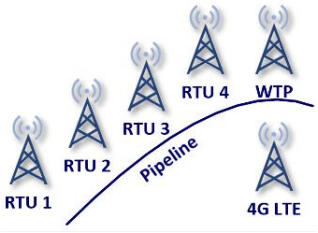
Technology	Typical Speeds
900MHz	0.5 Mbps
4G LTE	10 Mbps
Wi-Fi (802.11n)	200 Mbps

The limitations of 900MHz radios can be overcome by transitioning to 4G LTE or Wi-Fi wireless networks for a more modern wireless communication infrastructure.

Successful 4G LTE Application

A municipality operates an 11-mile pipeline which traverses through two other cities to deliver water to a treatment facility. Four pump station RTU cabinets are located along the pipeline to control and monitor the flow of water. Six 900MHz radios were originally implemented to provide communications between the individual RTU PLCs and water treatment plant HMI graphics. Over the years, urban growth began to impact the performance of the wireless network. An elevation difference of nearly 650’ between the first RTU and treatment facility already presented communications challenges along this path. Ultimately it became nearly impossible to control the four pump stations remotely due to inconsistent and unpredictable communications between the treatment facility and pump station sites. The town determined that these communications problems presented a potential risk to water production and delivery to residents that could no longer be ignored.

Quantum provided consulting resources to the town and recommended that the 900MHz wireless radios be abandoned in favor of a 4G LTE cellular network. The goal was to leverage existing infrastructure and modern technology to ensure more reliable communications along the entirety of the 11-mile pipeline. Quantum procured the necessary 4G LTE equipment, worked with a cellular provider, and deployed the successful architecture. Once implemented, the new architecture now provides the town with nearly instantaneous control and monitoring capabilities, reducing the risks associated with remote control of the pipeline to the water treatment plant.



By converting from a self-managed 900MHz wireless network to a 4G LTE network, the town is no longer responsible for managing an unsustainable wireless radio infrastructure. This marks the beginning of the town’s journey toward leveraging the latest technology in the Industrial Internet of Things (IIoT) and allows them to focus their resources on providing fresh clean drinking water!