BUYER'S GUIDE | DECEMBER 2016

Purchasing Wireless Solutions for SCADA

Real time data for monitoring applications

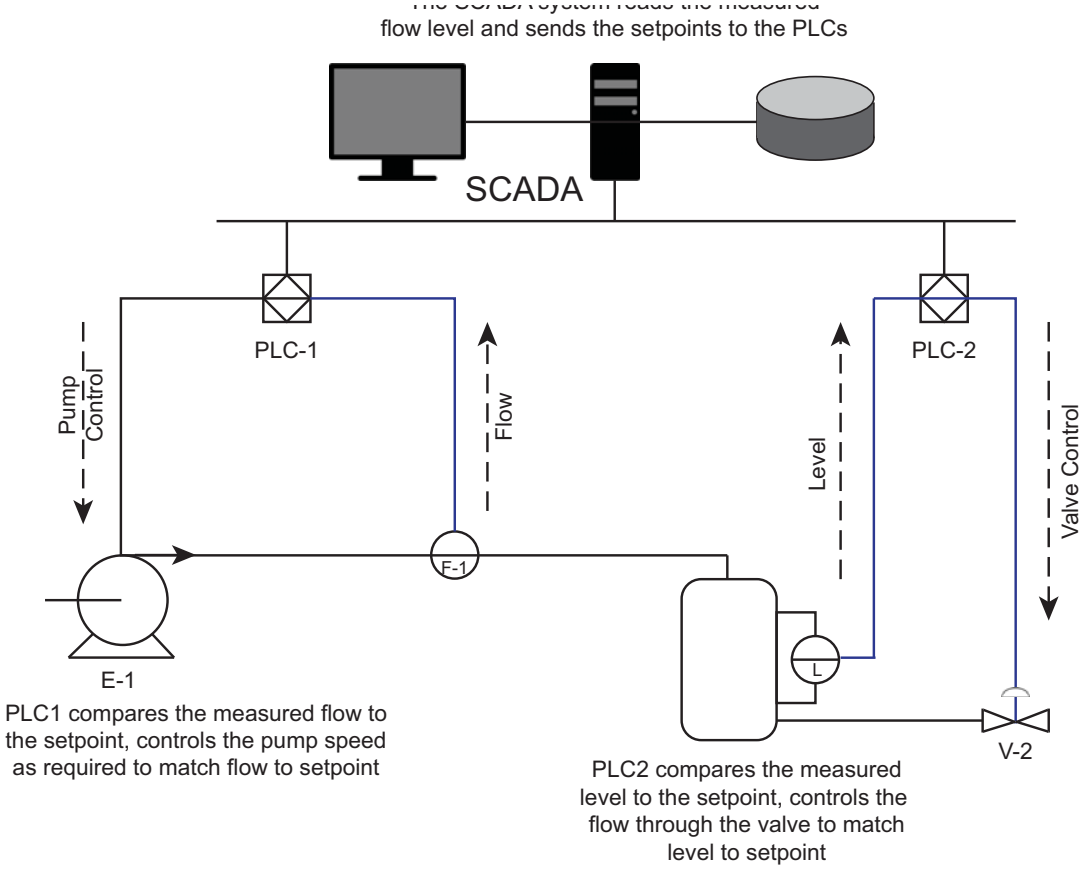
The need for real time data has become a critical component of monitoring systems in applications such as oil and gas production, electric power and water treatment. Radio technology is one of the most convenient and reliable means of transferring data over short and long distances. Most radios in the market have the ability to transfer large amounts of data in minutes. However, this often comes with challenges such as line of sight, range, speed and security of the data being transferred. For industrial companies transmitting sensitive information or operating machines in high risk applications, these factors are extremely important.

Shopping for the right radio can be a tedious experience. There are many options in the marketplace and every supplier claims that their solution is the best. Perhaps what is most important is the reputation of the manufacturer and quality of their products and support. Choosing the right radio system can help your organization cut costs, reduce truck rolls and improve productivity as well as keep your data secure.

A LOOK AT RADIO APPLICATIONS

Many companies employ Supervisory Control and Data Acquisition (SCADA) networks for remote monitoring and control of sensors. These sensors are connected to either Programmable Logic Controllers (PLCs) or Remote Terminal Units (RTUs), which convert signals from the sensors to digital data.

SCADA operates with coded signals over communication channels. Most SCADA networks are a combination of wired and wireless communication channels. Typically there is a host computer located at the main office or control room running a SCADA software program, which controls functions related to basic overriding or supervisory level intervention. For example, a PLC may control the flow of cooling water at a power plant as illustrated below.



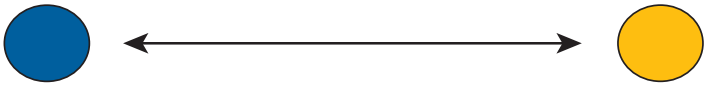
Industrial processes can be much more complex with additional sensors, monitors to optimize production and alarms to indicate problems with processes. This makes connectivity and real time data an important part of all industrial processes.

TYPES OF RADIO NETWORKS

Before selecting the type of network to deploy, it is important to consider what you need to connect. We explore several options below.

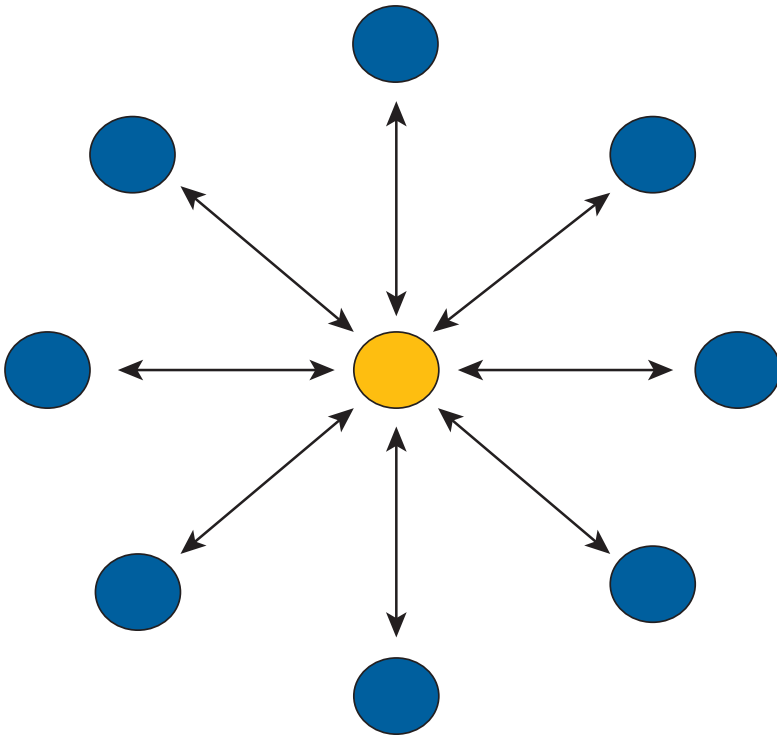
POINT TO POINT

A point to point communication topology consist of an access point and a client with the possibility of adding repeaters if needed. Typical applications for Point to Point are backhauling data, or when there is only one remote sensor sending data back to the central location. Point to Point is often abbreviated as P2P, PP or PTP.



POINT TO MULTIPOINT

A point to multipoint communication topology is a one-to-many connection, providing multiple paths from a single location to multiple locations. Point-to-multipoint networks are used whenever there are multiple site locations in a given coverage area. Point to multipoint is often abbreviated as P2MP, PTMP, or PMP.



REPEATER MODES

Generally there are two types of repeater modes - store and forward mode or back to back mode. Both are very different, with back to back mode effectively cutting the throughput in half. Back to back repeating allows you to maintain full throughput through the IP network while extending the range between the radios nodes. Thus, you can create complex networks extending for many miles.

CONSIDERATIONS

WHY INVEST IN RADIOS?

Distance and Scalability

A wired Ethernet network can only transmit data for about 100 meters. A good radio can transmit data several miles and the network can be extended further with repeaters.

Cost efficiency

Wireless radio networks eliminate the need to dig trenches to bury cables. Wires are much more costly to install, maintain and can easily be severed when repairs and expansions take place. Wireless systems are cheaper to install, easier to maintain and can be dismantled easily making them efficient for temporary projects.

WHAT IT MEANS FOR YOUR BUSINESS

Operator Benefits

- Allows you to monitor different systems from one central location via the SCADA host
- Instant awareness of negative conditions and quick response, preventing catastrophic events such as spills
- Enables the command and control of remote sensors and RTUs without a physical presence onsite, significantly reducing costs

Supervisor Benefits

- Eliminates costs associated with trenching. You no longer have to pay for the design of trench layouts.
- Quicker installation means less man hours installing and a reduction of installation costs
- Faster response time due to near real-time awareness of faults occurring in the field

CONCLUSION

While it can be difficult to select a good radio for your organization, we hope this guide has helped make the selection easier. Pre-engineered radio networks are less costly to install and maintain, allow faster uptimes, and improve command and control of mission critical systems while offering secure, robust, real time data on the health and status of mission critical systems.

CHECKLIST (CHOOSING THE RIGHT RADIO FOR YOUR ORGANIZATION)

RADIO

Frequency

400MHz, 700MHz and 900MHz are licensed frequencies the ISM band in 900MHz, 2.4GHz and 5GHz are unlicensed. It is important to know the noise floor at your location to determine which of these frequencies would work best for you. You may use a spectrum analyzer to determine the level of interference within different frequencies. Some technologies such as frequency hopping spread spectrum (FHSS) have a built resistance to interference because the radio remains on a given frequency for only a short amount of time. This makes frequency hopping a more secure method of sending data.

Proprietary versus Standards Based

Does your application require a proprietary frequency hopping spread spectrum (FHSS) network for security reasons or can a standards based protocol such as 802.11 be used?

Many companies are moving away from proprietary protocols and towards standards based protocols such as Wi-Fi (802.11 a/b/g/n). Devices need to talk to each other and a standards based protocol allows a customer to utilize a Wi-Fi endpoint that can communicate with any access point with the same classification. However if security is an issue, you may want to consider a proprietary network such as FHSS or licensed radios because the data can be encrypted and the signal is harder to demodulate. Distance between locations

Distance between locations

This will determine the range and the antenna gain required. Some wireless systems have a range of only a few feet while others can transmit for several miles. The FCC regulates radio transmission. Please consult FCC guidelines before installation and before selecting an antenna.

Line of sight

Is there a good line of sight between locations? If not, repeaters may be required. Some technologies do not require line of sight.

How much data needs to be transferred?

Data is packetized and as a general rule, as the packet size increases, the required SNR (signal to noise ratio) must also increase for comparable performance. For very noisy environments, small packets will be more successful than large packets.

Polling frequency

This is how often the SCADA host requests data from the remote sensors, determined by your monitoring requirements.

Link Rate

The link rate is how fast the RF data is moving over the RF link. This is the raw payload of data moving over the link.

Throughput

Throughput is a combination of the raw data payload and the Ethernet overhead. Knowing the throughput required is useful in deciding what modulation to use. SCADA packets are typically very small while video requires at least a couple of megabits per second (MBPS). Some radios have adaptive modulation capabilities meaning the radio will start operating at the lowest speed and, if successful, will increase to the next selected speed. Thus the radio dynamically changes the data rate based upon signal quality measures. As a general rule, as the data rate increases, the signal strength required by the receiving radio also increases. Therefore, for long distance, low-signal installations, a lower data rate will better utilize bandwidth as opposed to a high data rate. If the signal is strong with little interference, then a higher data rate may be used.

What is the protocol of the sensor device?

RS-232, Ethernet, Modbus, Profibus and HART are common protocols in SCADA networks.

What are the security requirements?

If the data is mission critical, then encryption is typically required. Some radio manufacturers offer AES encryption with either 128 bits or 256 bits. Are there any network firewalls? Good communication with the Network Administrator is key to the projects' success.

MANUFACTURER

Reputation

Is the manufacturer a recognized company that stands by their products?

Support

Does the company have a good support structure? How fast do they resolve support issues?

Compliant

Are the products compliant with current FCC and UL regulations?

Distribution

Does the company have a good distribution network? How long does it take to fulfill orders?

Warranty

Does the company offer a good warranty period?

Training

Is there a good training structure?

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