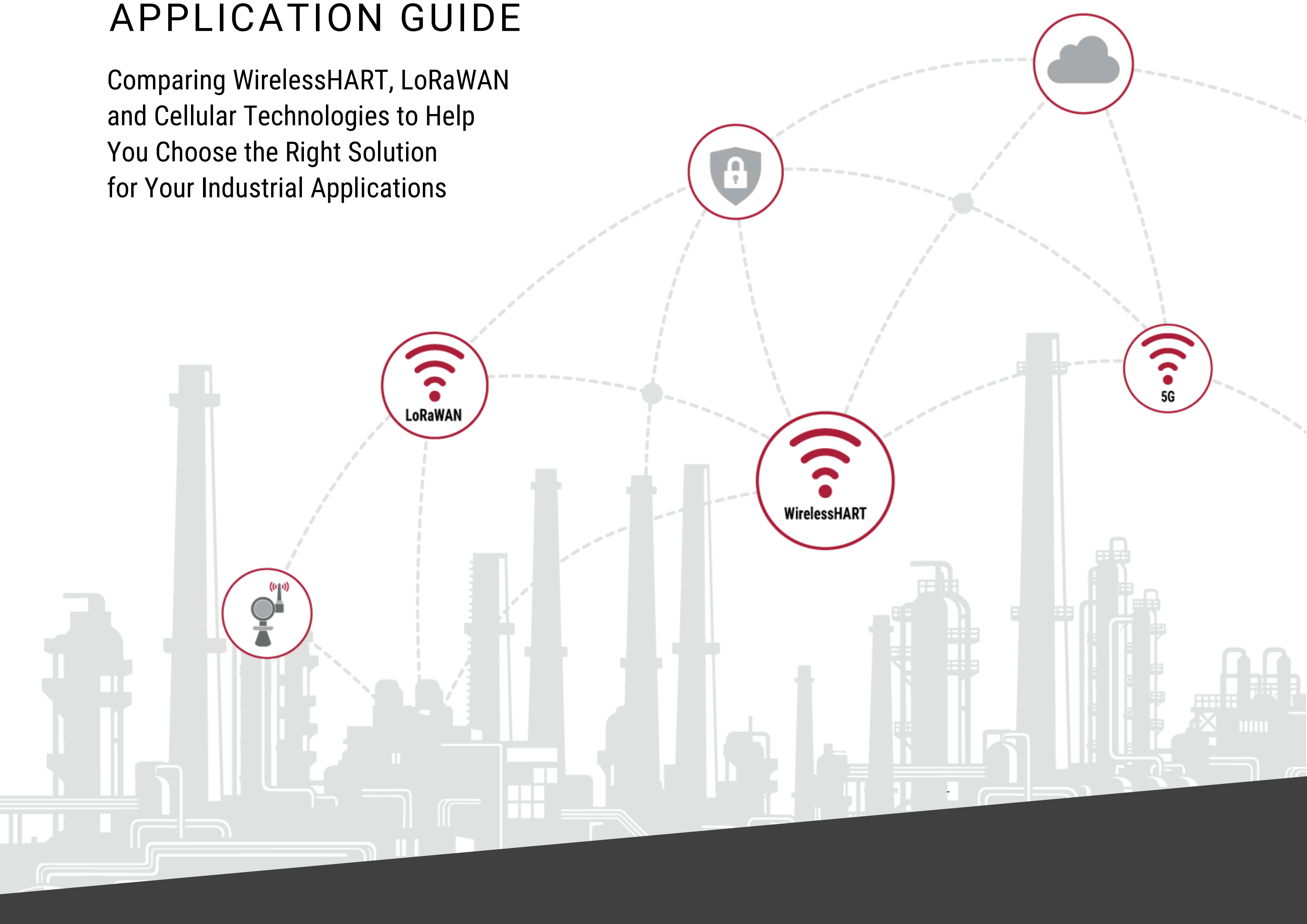
INDUSTRIAL WIRELESS TECHNOLOGY

APPLICATION GUIDE

Comparing WirelessHART, LoRaWAN and Cellular Technologies to Help You Choose the Right Solution for Your Industrial Applications



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THE EVOLUTION AND VALUE OF INDUSTRIAL WIRELESS

Today's widespread prevalence of wired Ethernet, Wi-Fi, and various wireless technologies makes it difficult to recall that just a few decades ago early iterations of these connectivity methods were considered too immature for effective industrial use. However, much has changed to make wireless technologies suitable for demanding commercial- and industrial-grade applications.

As the name suggests, one key advantage of industrial wireless is the lack of wires. Wiring—along with conduit and associated infrastructure—installed within complex facilities with obstructions, hard to reach tanks and hazardous environments, represents a huge expense and commitment. Industrial wireless technologies simplify and optimize connectivity by addressing these issues and others, leading to significant deployment benefits and flexibility. However, going totally wireless, for power as well as signals, means these devices must operate on battery power.

Many companies are looking to adopt industrial wireless so they can continuously monitor asset performance and improve their process monitoring. Sometimes these applications are for the internet of things (IoT) or industrial IoT (IIoT) data gathering needs, but wireless is also becoming a common element for many monitoring uses.

There are several standards and protocols available, so end users and designers should understand the advantages and disadvantages as they seek to select best-fit technologies for their facility needs. This application guide is a survey of WirelessHART, LoRaWAN, and two protocols that rely on cellular technologies (LTE-m and NB-IoT) which overlap to a certain extent, with each communication variant offering a unique set of benefits, but also restrictions.

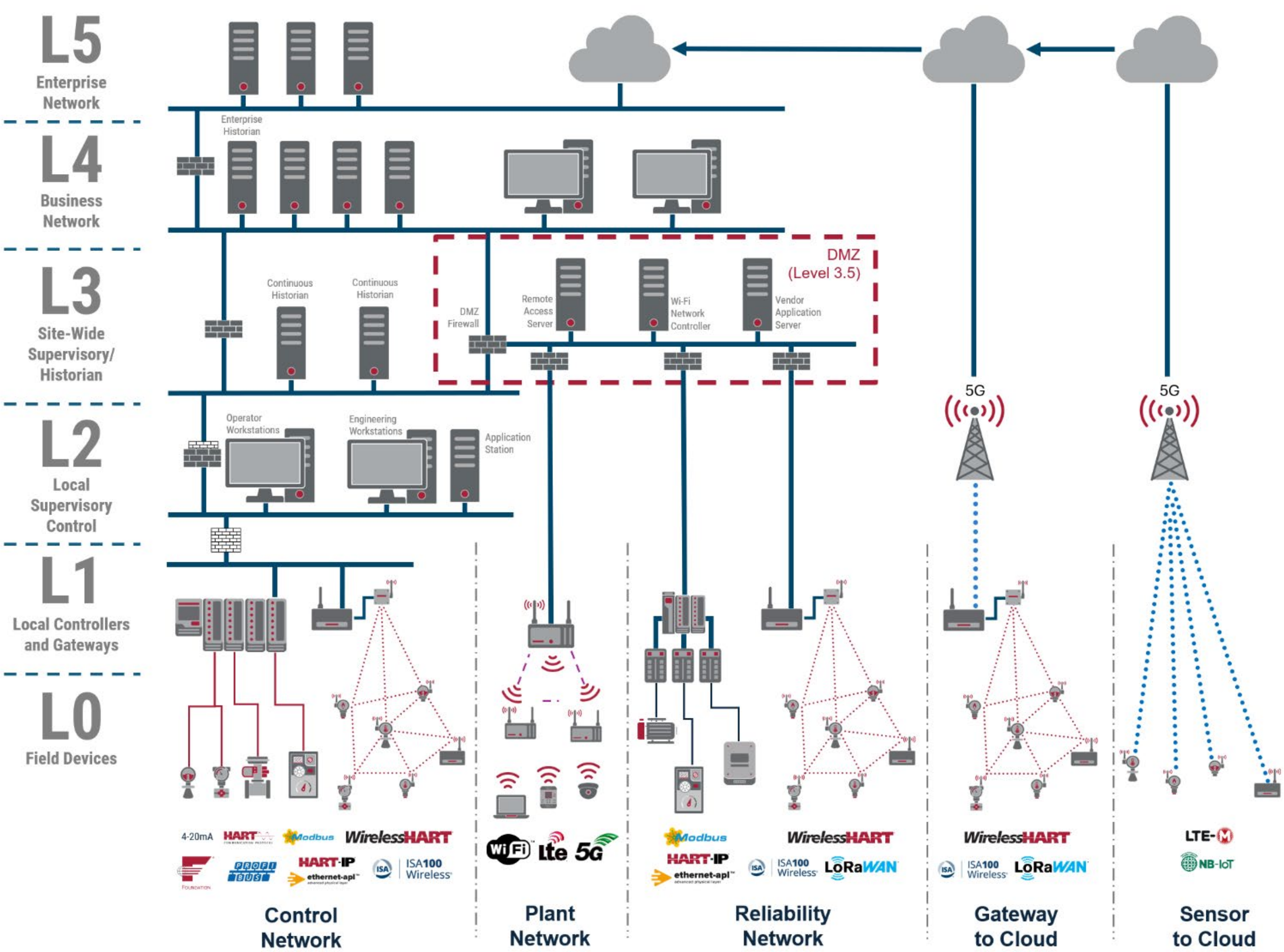

Figure 1: This system architecture diagram depicts many possible approaches for applying industrial wireless connectivity for communicating field device information to the control network, the plant network, a reliability network, or directly to the cloud.

INDUSTRIAL WIRELESS DESIGN CONSIDERATIONS

For industrial wireless, as is the case with most technologies, there is no one-size-fits-all solution suitable for all uses. Deciding on the best connectivity approach for any application begins with considering several key characteristics. For this section, we will use the term "nodes" for any wireless-enabled target field device, sensor, or associated gateway/base station, although this will be architecture-dependent.

EXISTING INFRASTRUCTURE

As part of the decision-making process, designers must also survey the existing infrastructure to identify what communication protocols already exist on-site and if the target systems for the information from the wireless network support these protocols or will require a gateway/base station layer.

COMMUNICATION RANGE AND ENVIRONMENT

The transmission distances between nodes and the number and concentration of nodes should be some of the first conditions to be defined because the distance that a wireless signal can travel impacts the infrastructure costs to provide coverage.

Communication range is also significantly impacted by environmental obstacles such as structural steel, reinforced concrete, piping, and vessels. Top questions to consider are:

- Does the environment provide a clear line-of-sight between nodes, or is there a lot of built-up metal hardware and/or other obstructions that will impede signals?
- Is significant electromagnetic interference from sources such as power conductors or electric motors expected?
- Will any nodes be in hazardous areas?
- What is the mean and longest distance signals will need to reliably travel?

DATA VOLUME AND BANDWIDTH

These two terms are associated but different. Data volume is how much data must be transferred, while bandwidth is the fastest possible data transfer rate. A tank level signal may just be a single value, while a vibration monitor may need to transfer complex waveforms as a large amount of data. Even the simplest field devices are trending toward supplying increasing amounts of data, consisting of multiple process points, plus diagnostics.

UPDATE FREQUENCY VERSUS POWER CONSUMPTION

How often data must be transmitted is a critical consideration for selecting wireless technology. The update rate should be as slow as possible to conserve power (to extend battery life) and network bandwidth (how many sensors you can have in the network), but fast enough to capture changes that need to be acted upon. A long update period will be experienced as a lag or delay, for instance, by the console operators who may be impatient as they prefer to see instant responses to actions initiated from the operator console or manually in the field, such as opening or closing valves.

Some field nodes may be line-powered, but the focus of this application guide is on devices that are battery-powered, as these provide the ultimate in installation flexibility. For battery-powered devices, reducing the amount of time the radio is powered (reducing the update frequency) significantly improves battery life.

SECURITY

Because wireless communications operate over the air, industrial wireless networks are generally more exposed to cybersecurity threats than wired systems. To protect operational data and network integrity, wireless technologies should support strong encryption, authentication, secure key management with key rotation, access control, and secure device provisioning. Just as important, security must be practical to deploy and maintain. Users should evaluate the commissioning process, required cybersecurity tools, and technician training needed to securely manage the wireless network throughout its lifecycle.

COMMUNICATION PROTOCOLS

Some wireless industrial networking variants are full-stack implementations as they include both the physical transmission layer (the radio) and how the data is presented on the network (protocol). The radio can either be an IEEE standard or proprietary. Similarly, the protocols can either be an IEC standard or proprietary. For proprietary protocols, data integration into automation systems and software becomes more difficult. Many wireless technologies are physical layers only and rely on proprietary vendor-specific applications to decode the data and make it available via operational technology (OT) industrial communication protocols, or other information technology (IT) protocols. Full-stack implementations generally improve the ease of use and data availability compared with other options.

WirelessHART is an example of a full-stack standardized implementation supporting multi-vendor interoperability and interchangeability by standardizing both the physical transmission layer and how the data is presented and interpreted by host applications.

BACKHAUL NETWORKS

Backhaul refers to the network from the wireless sensor network gateway/base station to the host systems. This may be Ethernet or RS485 cable or cellular to the cloud.

Common industrial OT protocols include HART-IP, OPC UA, Modbus TCP (or serial Modbus RTU), EtherNet/IP, PROFINET, and others.

Common IT-friendly protocols include OPC UA, MQTT, or the use of proprietary APIs. Proprietary APIs make data integration time-consuming and costly.

NETWORK TOPOLOGY

Two common wireless network topologies are star and mesh configurations, each with varying capabilities regarding range, how metal obstructions are handled, and bandwidth. In star networks, all nodes communicate individually and directly to a central gateway, while for mesh networks, the nodes can communicate amongst themselves to establish a pathway to the central gateway.

WIRELESS TECHNOLOGY CANDIDATES

Once the design considerations have been identified, it is possible to evaluate various wireless technologies suitable for industrial applications to identify which ones fit the best. Three major candidates are:

WI-FI AND 4G/5G COMMERCIAL CELLULAR

Wi-Fi is familiar to most users; it can be used for industrial applications to provide high bandwidth. Similarly, most people are familiar with telecom companies touting the high-speed benefits of 4G/5G for mobile phones. However, both Wi-Fi and 4G/5G radios are basically always on and consume a lot of power, making it impractical to use these radios for battery-powered applications, so they are not considered part of this application guide. Additionally, they are radio-only. Therefore, a standard protocol must also be chosen to achieve interoperability.

WIRELESSHART

Introduced in 2007, WirelessHART operates in the 2.4 GHz frequency band based on IEEE 802.15.4 (radio) and IEC 62591 (protocol) standards. While the technology is different than common Wi-Fi, they both compete on the same 2.4 GHz frequency band. This technology uses a time-synchronized, self-organizing, and self-healing mesh network topology purpose-built for industrial environments. Supporting configurable update rates from one second to minutes or hours, WirelessHART is widely used for process monitoring, predictive maintenance, asset health, and remote instrumentation applications. Supported by leading suppliers including ABB, Emerson, Endress+Hauser, Honeywell, VEGA, Pepperl+Fuchs, Microcyber, SUPCON, and others, WirelessHART has been deployed across hundreds of thousands of industrial networks worldwide. Wireless adapters simplify integration with existing HART devices, while WirelessHART gateways help support NAMUR Open Architecture (NOA) monitoring and optimization initiatives.

WirelessHART has a strong established user base, facilitated by backward compatibility with the traditional HART protocol, software, and tools used in many process plants. A key feature is that the protocol has a tightly defined message format and data types, ensuring easy interoperability and automatic data conversion.

LORAWAN

Long range wide area network (LoRaWAN) was introduced around 2011, and it is a networking protocol built on LoRa radio modulation, with the ability to transmit long distances but at very low data rates. The topology is a star-of-stars, where field devices connect to base stations, which in turn connect to a network server, and it is optimized to preserve battery life. Common applications include sensors used for pressure, temperature, vibration, and valve position; as well as electronic meter reading, intelligent agriculture, smart buildings/cities, logistics, public utilities, and more. The protocol is low-level, without defined message formats and data types. Data integration is therefore time-consuming and must be redone if devices are changed.

INDUSTRIAL CELLULAR

Although commercial cellular networks are usually thought of in the context of supplying mobile phone voice and data, there are two technologies developed in recent years that are specially designed to work over those networks, while providing cost reductions, energy savings, and range/penetration benefits. These are extensions of 4G/5G and thus also require a standard protocol to provide interoperability.

- Long-Term Evolution for Machines (LTE-M) is economical, low power, provides great coverage (although it is less suitable for roaming), and is useful where lower data rates are needed.
- Narrowband Internet of Things (NB-IoT) is optimized for mobility, lower latency, and higher data rates.

The following chart represents how these technologies compare in terms of update rate and bandwidth.

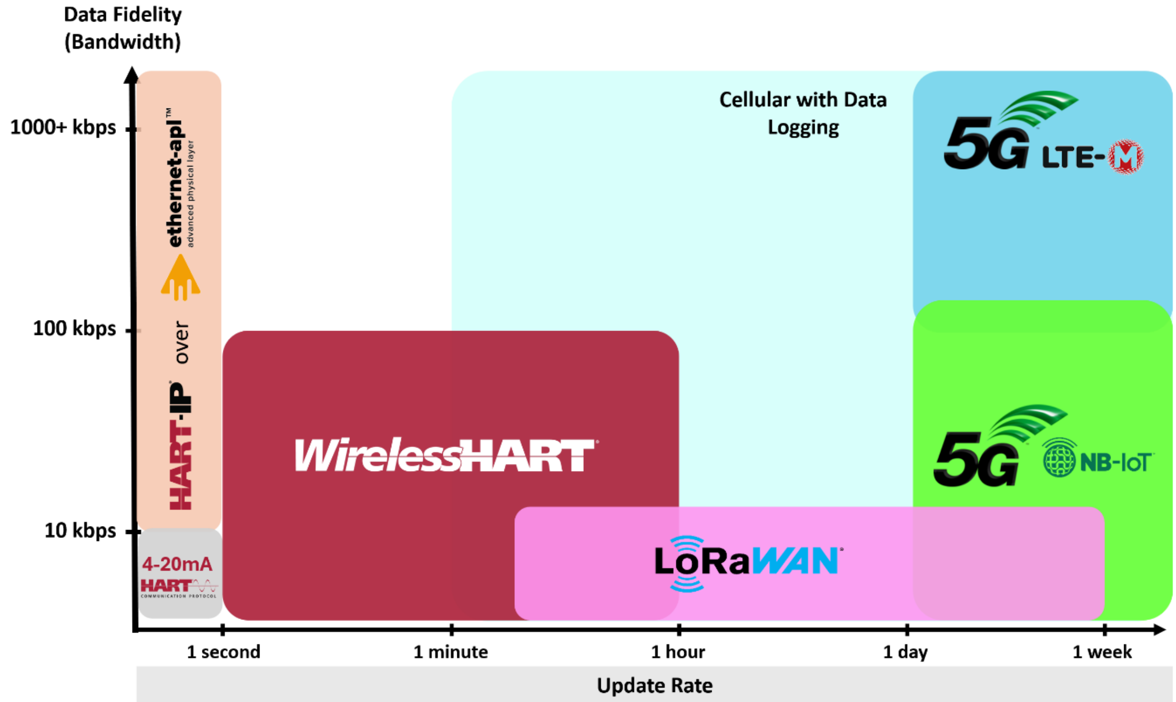

Figure 2: Two of the most prominent industrial communication characteristics of interest are update rate and bandwidth; this graph compares the relative performance of WirelessHART, LoRaWAN, LTE-M/NB-IoT, HART-IP over Ethernet-APL, and wired 4-20mA HART.

CHOOSING THE RIGHT WIRELESS TECHNOLOGIES

Having identified the design considerations and some leading industrial wireless technologies, it is possible to compare and contrast the capabilities of each.

COMMUNICATION RANGE AND ENVIRONMENT

WirelessHART has a relatively short communication range from one device to another, but is supported by mesh networking, where each device can act as a repeater in the network, thus carrying data for long distances in multiple "hops" and ultimately providing 99.99% packet delivery reliability. This feature significantly increases network coverage, especially when many devices are installed in areas of significant obstruction, as in a typical industrial plant. Additionally, many WirelessHART devices are specifically designed for process automation in hazardous environments.

LoRaWAN, LTE-M, and NB-IoT have the longest communication range at over a kilometer line-of-sight, which enables entire industrial sites to be covered with just two to four base stations, assuming no obstructions. These technologies can be used in hazardous areas with extra device certifications.

DATA VOLUME AND BANDWIDTH

WirelessHART has a medium amount of bandwidth that allows for rich data sets to be sent occasionally. LoRaWAN has the lowest bandwidth and smallest data payload of the common protocols, which limits functionality and the precision with which data is transmitted.

LTE-M and NB-IoT both have relatively high bandwidth and are optimized for use with long-life battery-powered sensors.

UPDATE FREQUENCY AND POWER CONSUMPTION

A WirelessHART device can be configured to communicate periodically at intervals ranging from 1 second to 60 minutes, with a corresponding battery life of between 2 years (at 1 second) to over 10 years (at 32 seconds or faster updates).

LoRaWAN update intervals can be selected ranging from every 10 minutes to once a day or longer, with the battery lasting between 2–10 years, depending on update rate, network environment, and type of battery used.

LTE-M and NB-IoT are used for applications where once-a-shift (8 hours) to once-a-week updates are appropriate, but they also allow for effective "report-by-exception" communication where an update can be sent as soon as an alarm condition is triggered. Battery life is expected to be between 2–10 years, but is dependent on update rate, network environment, and type of battery used.

SECURITY

WirelessHART is unique in that it incorporates many security features into the standard, including encryption, authentication, and key rotation, so any device that is registered by the managing standards body (FieldComm Group) will incorporate all of these same security features for seamless interoperability.

For the other "physical layer only" communication protocols, the security features are dependent on the vendor implementation and can be different for devices from different vendors on the same network, making interoperability a challenge, thus requiring additional attention from the designer.

BACKHAUL NETWORK COMMUNICATION PROTOCOLS

As a full-stack implementation with a well-defined application protocol, WirelessHART gateways are able to automatically convert sensor data to other protocols to communicate directly using common industrial OT and IT protocols, so they can easily be connected to the control system and/or the business network such as Modbus TCP, EtherNet/IP, and OPC UA for integration with control systems and HART-IP for integration with intelligent device management (IDM) systems, while also enabling IT and enterprise connectivity through OPC UA with PA-DIM support for standardized, contextualized access to field device data. In contrast, many alternative wireless solutions rely on proprietary integration approaches for both OT and IT environments.

LoRaWAN base stations can be connected to the business network with vendor "decoder" applications running in a network DMZ for an on-premise installation, but they are often used with cellular modems to enable the decoder applications to run in a vendor cloud application. Alternatively, data decoding can be done on a server in the plant. Depending on the implementation, decoding does not always require a proprietary vendor application and may be handled generically when the appropriate decoder information is available.

LTE-M and NB-IoT use cellular network infrastructure and will always connect to cloud applications. An important note on cost is that cellular connectivity solutions will include data plan subscription operating costs that should be considered in any total cost of ownership calculations.

NETWORK TOPOLOGY

WirelessHART mesh networks are beneficial at sites with many obstructions and a lot of signal-impeding metal and other barriers because there are more path options for signal routing.

LoRaWAN is generally line-of-sight but is designed to pick out even weak signals in noisy environments.

LTE-M and NB-IoT are also line-of-sight but offer good penetration through certain types of structures.

EXISTING INFRASTRUCTURE AND TOOLS

WirelessHART has been installed in many plants for over 15 years, and when a new wireless IIoT project is initiated at these sites, the people involved may not even know there is already an installed infrastructure with extensive coverage and existing data pathways to the control system, historian, and/or business networks. WirelessHART device commissioning/provisioning is done using familiar HART tools such as a HART field communicator or a laptop with a HART modem—the same familiar tools used for 4–20 mA devices.

Adding another IIoT protocol like LoRaWAN will require additional base station infrastructure—along with configuring security and network interfaces to make the data available—which will increase costs, deployment time, and effort.

Because NB-IoT/LTE-M operate over the commercial cellular network, many end-users are already inside coverage areas for these protocols, but they will still need to add software to establish connectivity.

COMPARING TECHNOLOGIES

Characteristic	WirelessHART	LoRaWAN	LTE-M/NB-IoT
Communication range	Short	Long	Long
Architecture	Mesh; good for complex environments	Star-of-stars; mostly line-of-sight	Star; mostly line-of-sight
Data volume and bandwidth	Medium	Low	High
Update frequency	1 second to 60 minutes	10 minutes to once-a-day, or longer	8 hours to once-a-week, with report by exception possible
Power consumption	Battery life of two to ten years, depending on poll rate	Battery life of two to ten years, depending on poll rate	Battery life of two to ten years, depending on poll rate
Cybersecurity	Incorporated into the protocol standard and implemented when the device is registered by FieldComm Group	Depends on vendor implementation	Depends on vendor implementation
Existing infrastructure	Already installed extensively in many plants	More likely to require new infrastructure and configuration	Most likely to require new infrastructure and configuration

Table 1: This table compares the key design considerations important for evaluating WirelessHART, LoRaWAN, and LTE-M/NB-IoT industrial wireless technologies for use in various applications.

APPLICATION REQUIREMENTS

To better understand how designers would evaluate applications for industrial wireless implementation, the following are a few use cases.

TANK FARM MONITORING

CHALLENGES SOLVED

Manual gauging of the level of products, chemical additives, lubricants, and other utility fluids is a common operator function that is often neglected until it's too late. Detecting floating roof tilt due to pontoon failure, breather valve failure, and hatches left open are related challenges.

SENSORS USED

IIoT- style wireless level sensors can be used to remove the burden of manual rounds from operators, while avoiding running low on consumables level issues, optimizing fluid replenishment, and detecting changes in usage rate. Immersion level sensors and vibrating fork level switches are other options.

DATA UPDATE REQUIREMENTS

The data is very simple (0 to 100% level), the environment is relatively open, and the data changes relatively slowly, so daily or even weekly updates can suffice. Sometimes the data needs to be integrated with the control system, but in other cases, simple email notifications are adequate.

Suitable wireless variant considerations for this application can support very low bandwidth, have line-of-sight communications to a common gateway radio, and be connected to either the local business network or to a cloud connection for access by third parties, with the latter option beneficial when suppliers need to monitor and replenish tank contents.

WIRELESS CONSIDERATIONS

Both WirelessHART and LoRaWAN are suitable for this application with their bandwidth and update time capabilities for on-premises applications, or via a gateway to cloud applications. The cloud connectivity capabilities of NB-IoT/LTE-M allow for very wide geographical coverage, making it a good choice for this application when a supplier manages inventory for many end-users as a service.

MANUAL VALVE POSITION MONITORING

CHALLENGES SOLVED

All plants have manual valves distributed over a wide area. Incorrectly lined-up manual transfer valves, isolation valves, and bypass valves can result in production and safety incidents such as overfills, spills, fires, and explosions as well as product cross-contamination, causing off-spec products.

SENSORS USED

Using low-cost IIoT devices to monitor manual valve position is an effective way to significantly reduce this risk.

DATA UPDATE REQUIREMENTS

The bandwidth requirements are minuscule (open/moving/closed status), and the update rate can be quite slow, with reports on changes of state and routine position confirmation transmissions (using intervals between hours and days, depending on the individual application). The information from the sensors will be used by the operators or interlocks, which require the signals to either connect to the control system directly or have a secure path to the control room.

WIRELESS CONSIDERATIONS
All the common wireless sensor protocols are suitable for the bandwidth and update time requirements. However, if the update period is long, operators in the control room will have to wait a long time before they can see that a manual valve has been opened or closed. So for valves that are turned often, an update period of a minute or less will be better for the operators; WirelessHART is a better option here. Only WirelessHART can be used with the control system because its Ethernet-based gateway output is natively used by all the common industrial OT communication protocols.

LoRaWAN can be installed on the network, but it requires vendor software to decode the data before it is used, necessitating IT infrastructure to then make it available to the control room for the operators to use the data.

NB-IoT/LTE-M is a cloud-based architecture requiring additional transmission from the cloud to the control room, which adds complexity. However, the wide coverage range does make it ideal for beyond-the-fence-line monitoring or for the more remote areas of the site, where dedicated gateway infrastructure is not viable.

PRESSURE RELIEF VALVE MONITORING

CHALLENGES SOLVED
Detecting pressure relief valve events can decrease flaring emissions, enable accurate regulatory reporting compliance, and significantly reduce operations response time associated with process upsets. Yearly manual surveillance with portable testers is too infrequent.

SENSORS USED
IIoT wireless acoustic sensors are a cost-effective solution for informing operators and maintenance personnel of pressure relief events so they can take immediate action.

DATA UPDATE REQUIREMENTS
The bandwidth requirements are minuscule (lift/seated/passing, pressure, and temperature), but the update rate is critical. Less than 30 seconds to report an event is a reasonable expectation, and it may be a regulatory requirement in some locations and processes. Data must be available to both operators and maintenance personnel.

WIRELESS CONSIDERATIONS
WirelessHART is often used for this application because the gateways can be connected to the control system directly, giving operators responsive access to the data.

LoRaWAN could also be used, with the added complication of installing vendor software on the network.

NB-IoT/LTE-M meets the bandwidth and update requirements with its report-by-exception capabilities, but the data will require a cloud connection to the network, which adds significant network architecture demands, and it requires very commercially sensitive data to go off-premises. PRV monitoring is done using specialized software.

STEAM TRAP MONITORING

CHALLENGES SOLVED
Monitoring steam traps for failure so they can be repaired/replaced in a timely manner is one of the most common “starter applications” for IIoT deployments due to the significant potential for energy savings, along with improvements to process heating, which can translate to improved product quality and throughput. Yearly manual surveillance with portable testers is too infrequent.

SENSORS USED
Wireless sensors monitor acoustic noise patterns, and temperature must be utilized.

DATA UPDATE REQUIREMENTS
This is a relatively low-bandwidth application because sensors either transmit two variables (typically acoustic and temperature) or the resultant trap status (healthy, failed open blow through, or failed closed blocked). The update rate can be quite slow (hourly or daily is common), and the users for this data are the maintenance team, so the network connection can be through the business network (DMZ) or via a cloud connection. There is usually a high quantity of steam traps to be monitored, and they are installed in high-obstruction areas.

WIRELESS CONSIDERATIONS
LoRaWAN and WirelessHART are the most common protocols used for this application. LoRaWAN has benefits because of its long-distance coverage, but it often suffers from communication issues because of the large equipment and obstructions typically found where steam traps are installed close to the ground.

WirelessHART overcomes this limitation with the mesh network, reducing the need for line-of-sight. The ability to add repeaters to strengthen the mesh network can help, but this comes with additional gateway cost, largely overcome by the energy and production cost savings. Steam trap monitoring is done using specialized software.

PUMPS AND OTHER ROTATING MACHINERY CONDITION MONITORING

CHALLENGES SOLVED
Unexpected pump failures can lead to expensive repairs and severely impact production. Monthly, weekly, and even daily inspections with portable testers are too infrequent.

SENSORS USED
Monitoring this equipment with vibration and equipment temperature sensors to detect and mitigate based on early signs of failure is one of the highest return on investment programs from IIoT deployments for many end-users. The bandwidth requirement depends on the degree of monitoring and the computing power of the monitoring sensors. For sensors that can export the high-frequency waveforms for analysis by advanced software and reliability experts, the bandwidth requirement is significant.

DATA UPDATE REQUIREMENTS
An important consideration is the update frequency (hourly to daily), because most detectable faults will take some time to develop into failure. The information is used by reliability and maintenance teams (sometimes remotely), and so connection to the business network or cloud connections is appropriate. Traditionally, simple manual pump monitoring is done on daily maintenance technician rounds, with more advanced monitoring performed by reliability teams on a weekly or monthly basis.

WIRELESS CONSIDERATIONS
The WirelessHART protocol has been used for over a decade to provide effective monitoring in the high-obstruction environment that pumps are typically installed in, with hourly update rates for overall vibration, and on-demand uploads of detailed waveforms. The long distance and high device count capability of the LoRaWAN protocol does provide some benefits to infrastructure costs, but the very low bandwidth limits communication to simple fault status signals that will limit the value of its use for pump monitoring. NB-IoT/LTE-M does provide the bandwidth capabilities required for this application, but the high-power requirements of the radio limit it practically to once a day and report by exception updates. Condition is done from asset performance management (Intelligent Device Management) software and specialized vibration software.

AUTOMATING FIELD OPERATOR ROUNDS

CHALLENGES SOLVED

Manual field operator rounds reading mechanical gauges for pressure, temperature, level, interface level, and flow are time-consuming and error-prone. Monthly, weekly, daily, or even shift rounds are too infrequent. Operations need better situational awareness.

SENSORS USED

Wireless sensors for pressure, process temperature, level, interface level, and flow automate this data collection, thus solving the problem.

DATA UPDATE REQUIREMENTS

The ideal update period varies from seconds to minutes for each measurement point. NB-IoT/LTE-M are too slow for most applications.

WIRELESS CONSIDERATIONS

LoRaWAN may be an option for several points. However, WirelessHART will give console operators the shortest lag, the fastest response time to see how changes from the operator's console or in the field affect the process. WirelessHART is also ideal because this data gets integrated into the DCS or historian using standard OT protocols.

CORROSION/EROSION MANAGEMENT

CHALLENGES SOLVED

Corroded pipes and vessels lead to loss of containment, releasing toxic or flammable material, or loss of valuable product or feedstock. Yearly inspection is too infrequent.

SENSORS USED

Wireless ultrasonic thickness (UT) sensors measure wall thickness, permitting corrosion rate and remaining useful life to be computed by software. This drives pipe section replacement, corrosion inhibitor injection, and other mitigation.

DATA UPDATE REQUIREMENTS

Corrosion is a slow process, so a daily or twice-daily update period is sufficient.

WIRELESS CONSIDERATIONS

Most wireless technologies support this. Corrosion/erosion management is done using specialized software.

EQUIPMENT PERFORMANCE MONITORING

CHALLENGES SOLVED

Fouling of heat transfer surfaces in heat exchangers, cooling towers, and air-cooled heat exchangers, etc. causes inefficiency and increased energy consumption with associated increase in carbon footprint and emissions.

Wireless quad temperature transmitter (for synchronized inlet and out ΔT) and differential pressure (DP) flow meters enable automatic monitoring for optimization of the time of cleaning; not too late, not too early. Non-intrusive clamp-on ultrasonic and other flow meters are an alternative, but those are not wireless, so a wireless adapter is required.

DATA UPDATE REQUIREMENTS

Fouling is a slow process, so a daily or twice-daily update period is sufficient.

WIRELESS CONSIDERATIONS

Most wireless technologies support this. Performance management is done by asset performance management (APM) software. Make sure to the wireless technology chosen supports DP flow and quad ΔT transmitters. WirelessHART is a good choice for these applications.

OCCUPATIONAL SAFETY

CHALLENGES SOLVED

Wireless is not used for functional process safety, but is used to improve occupational safety. Manual valve monitoring has already been explained above. While a person is using a safety shower or eyewash station, they may not be able to call for help. Many countries have first responder response time requirements for this, such as OSHA. A wearable gas sensor only alarms when the person is already walking into the gas cloud.

SENSORS USED

Wireless discrete sensors monitor safety showers and eyewash stations. Wireless gas detectors monitor for toxic H2S or CO levels, O2 depletion, as well as %LEL for flammable gases.

DATA UPDATE REQUIREMENTS

In these applications, fast response is of the essence.

WIRELESS CONSIDERATIONS

WirelessHART is the best option. It also integrates well with the DCS and the historian.

ENERGY MANAGEMENT

CHALLENGES SOLVED

Historically, plants only monitor utilities of consumption at the source where city water and fuel gas cross the plant's battery limits, or steam coming out of the boiler and compressed air coming out of the compressor. There is no visibility where these utilities go, and thus, increased consumption cannot be pinpointed.

SENSORS USED

Wireless DP flow meters or other flow meters fitted with wireless adaptors monitor consumption with finer granularity (submetering) for each plant area, process unit, and even individual equipment, thus enabling overconsumption to be pinpointed. Additional pressure and temperature sensors are required for computing steam enthalpy.

DATA UPDATE REQUIREMENTS

A by the minute update period is required.

WIRELESS CONSIDERATIONS

Since utility consumption can be quite dynamic and because the monitoring is typically done from the process historian, WirelessHART is the best technology for this application.

CONCLUSION

While there are countless valuable applications for IIoT wireless protocols, this application guide covers a wide range of requirements. This guide also explains how to assess those requirements and compare them to the attributes of the various protocols to help designers select the most appropriate wireless technologies for their application needs.

Properly selected industrial wireless technology implemented for monitoring, control, and IIoT can free operators from low-value monitoring tasks, improve asset monitoring to enable predictive maintenance, provide valuable insights into the process and asset health, and enable improved operating and business models.

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