The Industrial Internet of Things (IIoT) creates unique challenges for communication networks. On one hand, IIoT platforms such as cloud services universally connect to IP networks, as the word Internet in IIoT implies. On the other hand, the world of industrial things is very diverse. Industrial things come from a variety of manufacturers, employ a variety of wired and wireless interfaces and protocols (many of which are proprietary), range from new to very old, and have widely varying degrees of intelligence. For the IIoT to deliver maximum value, the homogenous, IP-based world of IIoT cloud platforms must communicate with the heterogeneous, divergent world of industrial things.

To enable communications between IIoT cloud platforms and industrial things, wireless networks and devices must provide diverse interoperability. These wireless networks must seamlessly connect to the array of diverse interfaces and protocols supported by industrial things, translating their data into IP traffic on standard physical and logical network interfaces. Standard interfaces can connect to, and IP traffic can be routed over, the Internet to the desired IIoT cloud platforms.

The Universe of Industrial Things
The universe of industrial things is large and varied. The variety of industrial things encompasses a number of dimensions. These include:

- Manufacturer
- Interfaces both wired (e.g., Ethernet at various speeds using both copper and fiber, RS-232 serial, RS-485 serial) and wireless (802.11 in a number of variants, 802.15.4)
- Protocols (e.g., IP, Modbus, DNP3, IEC 61850, Fieldbus, Wi-SUN, Wireless HART, numerous proprietary)
- Age (very old to new to future)
- Functionality/degree of intelligence

For example, in distribution utilities, the universe of industrial things includes smart meters and other
AMI devices, feeder automation components including capacitor bank controllers, recloser controllers and voltage sensors, substation automation devices such as load tap changers and remote terminal units (RTUs), and streetlight control systems.

Interoperability is the fundamental challenge of IIoT communications – the homogenous, IP-based world of IIoT cloud platforms must seamlessly communicate with a divergent alphanumerical soup of industrial things, and must do so reliably and securely. An interoperability gateway that can mediate between the homogenous and divergent sides of the IIoT is a baseline requirement for the IIoT to deliver maximum value.

Network Side Wireless Communication Options

The requirement for supported protocol on the network side, i.e., the interfaces that point toward the IIoT cloud platforms, of the interoperability gateway is clear -- it must be IP. There are, however, a variety of network side wireless interfaces that must be supported, albeit fewer than on the industrial thing side. These wireless interfaces include numerous variants of 802.11, 802.15.4 as well as public and private LTE. Ideally, the network side can connect to the core IP network using any standard wireless or wired interface.

Interoperable Wireless Communications Fills the Need

A new generation of wireless interoperability gateways is emerging. These interoperability gateways support standard IP communications and an array of wireless interfaces on the network side. They must also support a variety of wired and wireless interfaces, as well as a diverse set of protocols, on the industrial thing or device side. In many ways, these wireless interoperability gateways are analogous to cell phones with the capabilities required for the IIoT.

Modern cell phones provide an IP over LTE, 3G, 2.5G or Wi-Fi connection on the network side. They also support Wi-Fi and Bluetooth wireless, as well as wired USB and an audio jack, on the device side. Wireless interoperability gateways are similar but must support a much wider array of client side interfaces and protocols. Wireless interoperability gateways provide an IP connection running over standard interfaces such as 802.11, 802.15.4 as well as public and private LTE on the network side. This is analogous to the LTE, 3G, 2.5G or Wi-Fi connection on a cell phone.

On the device or industrial thing side, the job of a wireless interoperability gateways is very different than that of a cell phone. Interoperability gateways must support a much wider range of protocols such as Modbus, DNP3, IEC 61850, Fieldbus, Wi-SUN, Wireless HART and more running over a larger variety of wired and wireless interfaces such as 10/100/1000 BASE-T Ethernet, RS-232 and RS-485 serial, 802.11a/b/g/n, 802.15.4, and others. They must also have the intelligence to convert traffic using these protocols to IP traffic.

To complete the cell phone analogy, wireless interoperability gateways provide edge computing capability similar to the way cell phones can run apps. Edge computing is especially important when the industrial things connected to the interoperability gateway lack intelligence. In this case, edge computing can, for example, enhance security by adding firewall and virtual private network (VPN) capability at the edge of the network, the ports where the industrial things attach.

Benefits of Wireless Interoperability Gateways

IIoT cloud platforms use deep domain expertise with network connectivity plus the latest digital technologies and innovations to solve real business problems and produce tangible business results for customers. Connecting industrial things to IIoT cloud platforms closes the loop, enabling customers to augment processes, gain insight, and optimize control of operations to enhance safety, reduce outages and increase efficiency.

Further, by supporting legacy, as well as current and emerging, interfaces and protocols, wireless interoperability gateways enable new IIoT capabilities by extending interoperability to field installed industrial things, extending the life of past investment and avoiding stranded assets.

Simply put, wireless interoperability gateways enable organizations to realize the full potential of the IIoT.