Wireless Communications in Industrial IoT Applications

Why all the interest in wireless?

The rapid evolution of wireless communications over recent years is of special interest in the Industrial IoT sector. By their very nature, IoT architectures have an insatiable hunger for more data. The more data we have, the better our models will be. The better our models are, the more effectively we can run our businesses. The more factors we can consider (and therefore points we need to measure), the more we can account for subtle variations which may impact quality, efficiency or safety.

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However, providing this data incurs cost. The cost of sensors and edge devices to gather and sanitise the measurement, the cost of transferring the recovered data into the wider system, and often most significantly, the cost of installing and maintaining the equipment needed to achieve this.

Correct selection and use of modern wireless technologies can dramatically reduce both the costs of transferring data and, more significantly, the costs and time involved in installing equipment and bringing the measurements online. Measurements which were previously uneconomic to include in our systems become possible, enriching the factors we account for and model in our information systems.

In addition, over the same time period, there have been significant shifts in how we expect to be able to consume the output from our systems. There remains a place for the dedicated control room filled with operator consoles, but we also want to get summary and exception data delivered to us in real time wherever we are via our mobile devices. We also want to be able to interact with the wider system immediately as a result of this information.

What options exist?

Broadly, wireless technologies can be split into two main groups. The first of these contains technologies focussed on local area transmission. This includes applications such as bringing raw sensor data into a local edge device, or networking edge devices within a single site. The second group focusses on wide area transmission – connecting geographically distributed sites together. As is always the case, there are situations where technologies from one group are applied to the other and vice-versa, but it remains easier to think of things in terms of their original intent and then deal with the special cases, rather than treat all wireless technologies as a whole.

Local Area Communications

- Unlicensed proprietary systems
- Bluetooth Smart
- WiFi
- Wireless Mesh (eg DUST)
- LoRa & Private LoRaWAN
- Private LTE

Wide Area Communications

- LTE
- NB-IoT
- Public LoRaWAN
- Sig-Fox
- line of sight private radio eg MPT 1329
- Microwave
- Satellite

What about 5G?

The current roll-out of 5G technologies will offer many interesting options in the future for M2M and IoT applications, including the promise of near real time communications and low device power requirements. Advantech is committed to the technology and already offers a number of compatible router and gateway solutions. Currently, however, the most interesting features from an M2M perspective are still part of a second phase deployment. At the same time, the operators' need to recover their roll out investment is leading them to focus initially on high data high bandwidth applications which have higher revenues. This means that, for the next few years at least, whilst future compatibility with 5G should be a consideration, in most cases it is better to implement today using existing technologies, rather than wait for all that 5G promises.
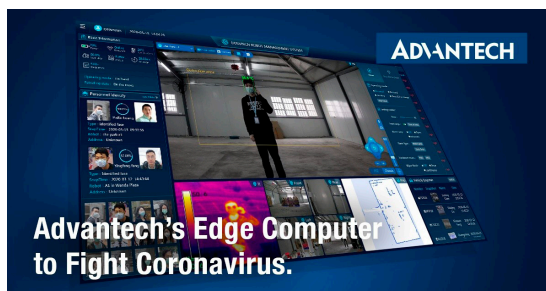
How to choose the right technology

Choosing the right technology for an individual application means balancing many factors.

- How quickly a change in the field needs to propagate through the system
- Whether data transfers are only in one direction, or whether bi-directional data transfer is needed
- The value of the data – can occasional data losses be tolerated
- Security of the transmitted data streams
- The geographic area that data needs to be recovered from
- The rate at which data points need to be sampled
- The volume of data resulting from each sample
- The capital expenditure associated with communications equipment purchase
- The operational expenditure associated with communications equipment installation operation and maintenance
- The nature of the installation: temporary/permanent; fixed/mobile
- The environmental and physical conditions at the installation sites
- Radio interference from electrical machinery
- Radio reflection from metal objects
- Radio penetration and absorption by buildings, landscape, people
- Airwave congestion from other systems and users

Balancing these factors often results in an optimal solution that does not rely exclusively on one technology, but is instead multi-modal. Advantech engineers are used to evaluating these conditions alongside other factors that influence overall system performance, such as the appropriate use of edge intelligence to efficiently aggregate, filter and transfer data over the selected communications media, in order to advise our partners and clients on the optimal technology to enable their vision and goals.

If you're considering the use of wireless technologies in your industrial IoT project, reach out to us to see how we can help you.

———— **Dario Nacawa** *IIoT Sales Manager Italy & Iberia presso Advantec*

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