# BEYOND BLUETOOTH™

**Long-term value from short-range connectivity; wire-free and hands-free possibilities for critical communications.**

In this age of smartphones, touch-screen tablets and imminently wearable computing, the ubiquitous radio communications device seems to be just as resilient to change as it is to the rigours of the environments in which it's used.

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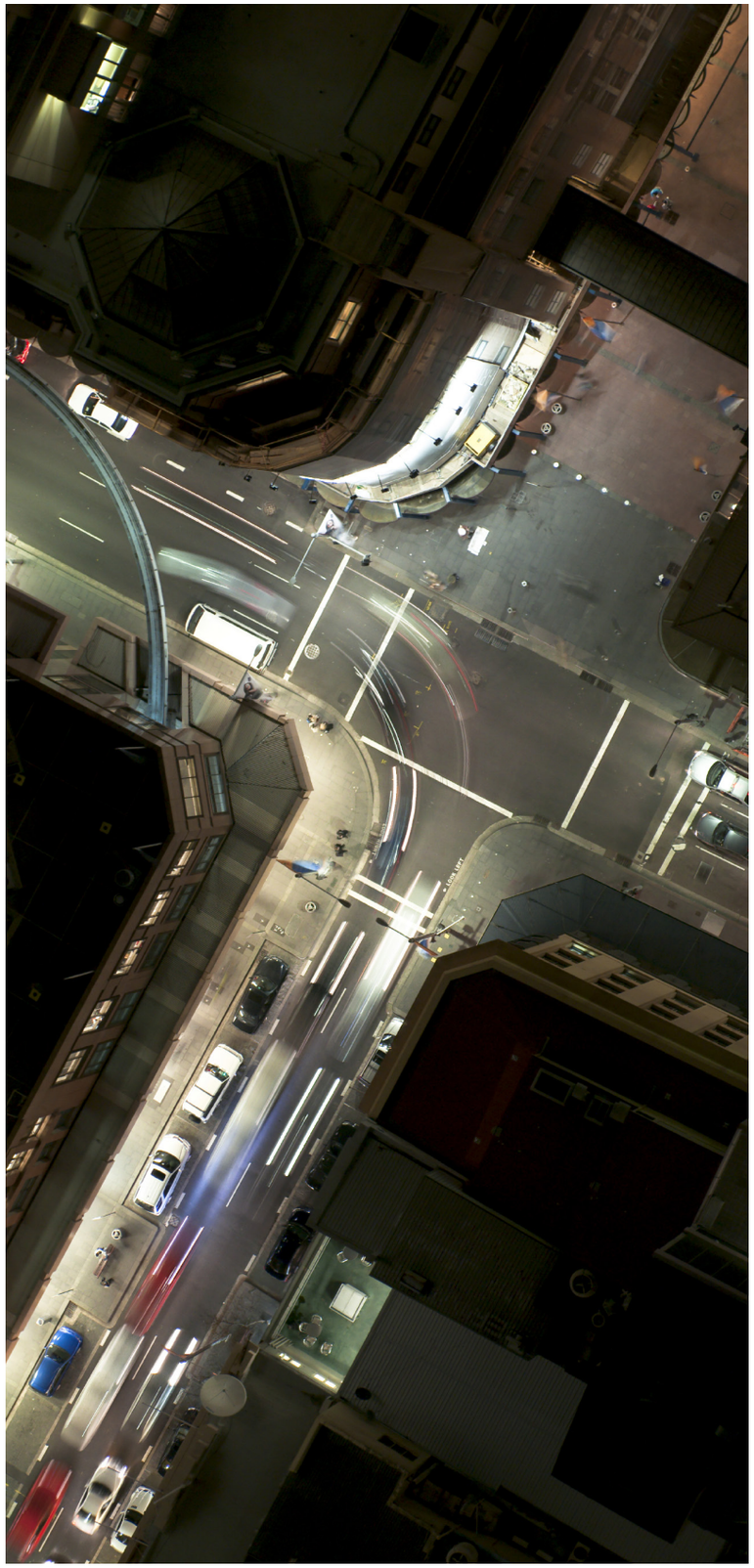

"... radio communications is experiencing a **massive explosion in innovation**, capability and adoption."

Emergency response personnel are literally weighed down by technology these days as they double-up and triple-up on gadgets to get the voice and data information they need. With all available space on utility belts fully occupied, technology is moving into the space around the responder's body, and also between them and their vehicles.

These Personal Area Networks (PANs) and Vehicle Area Networks (VANs) are the domain of short-range wireless proximity technologies, of which Bluetooth is the most well-known. But while Bluetooth is now standard functionality for commercial devices, there hasn't been a professional grade equivalent—until now.

The whole (radio communications) is experiencing a massive explosion in innovation, capability and adoption. Maturing wireless standards and the development of small-scale ultra low-power and low-cost wireless modules, and complementary miniature sensors, are replacing the old hard-wired design paradigms.

The health sector, in particular, is expected to see a surge in the use of proximity technology, spawning the term "telehealth". As hospitals and health trusts strive to drive down operating costs, home monitoring technology—incorporating radio networks that capture real-time biometric data—could mean fewer expensive patient re-admissions. The same technology is already undergoing field trials in public safety where situation commanders have a critical requirement to monitor the health of their personnel.

The question is, can this proximity technology bring about a hands-free nirvana for all radio users, and bring to an end the inconvenience of physical connectedness?

To date, only Radio Frequency Identification (RFID) has been extensively deployed to industrial grade applications most commonly in automatic toll road charging, contactless payment, machine-readable travel documentation, electronic asset tracking and airport baggage logistics. But RFID's usefulness is limited by its low data transfer rate, making it unsuitable for voice communication or access to cloud data.

While RFID alone may not meet all application needs, integration of various short-range wireless technologies can enable broadband data over radio.

Critical communications networks are formed from an eclectic mix of technologies including radio, cellular, Wi-Fi and broadband. Short-wave wireless can be used as the "intelligent glue" to bridge these gaps and allow each element to seamlessly connect and communicate. The radio communications device—suitably equipped with short-range wireless—becomes the "smart hub" of an entire voice and data PAN or VAN.

What could this freedom mean to utility linesmen working on ladders, poles and pylons? How could this unattached connectivity help First Responders caring for patients or protecting citizens? With hands-free and multiple devices all in sync, how much safer would these workers be in extreme weather conditions, dangerous environments and emergency situations?

This same technology can also be used for data collection, using automated electronic data reading. Similarly, sensors built into clothing or helmets can be coupled with short-range wireless bearers so incident controllers can monitor their workers' health status in real-time—measuring heart rate, blood pressure, temperature or low glucose levels and triggering alerts when certain parameters are met. Still, other sensors can monitor the environment for hazardous gases.

## Popular Short-Range Wireless Technologies

| TECHNOLOGY OR STANDARD | FREQUENCY | RANGE | FEATURES | COMMON APPLICATIONS |
|---|---|---|---|---|
| ANT+ | 2.4 GHz | < 10 meters | Low power | Health sports monitoring |
| Bluetooth | 2.4 GHz | > 10 meters, up to 100 meters with higher power | Low-power version available | Wireless headsets audio apps |
| Cellular | Common cellular bands | Several kilometers | Larger range | M2M |
| IEEE 802.15.4 | 2.4 GHz | < 10 meters | Multiple protocols available | Wireless networks |
| IEEE 802.22 | 470 to 768 MHz | Many kilometers | Designed for white spaces, cognitive radio | Broadband. Backhaul not yet used |
| ISA100a | 2.4 GHz | < 10 meters | Extra security and reliability | Industrial monitoring and control |
| Infrared (IrDA) | 800 to 1000pm | < 1 meter | Security, high speed | Remote control, data transfer |
| ISA band | Part 15 frequencies | < 10 meters | Low cost, simplicity | Monitoring and control |
| NFC | 13.56 MHz | < 0.3 meters | Security | Payment, access |
| RFID | 125 KHz<br>13.56 MHz<br>902 to 926 MHz | < 1 meter | Low cost | Tracking inventory, access |
| 6LoWPAN | 2.4 GHz | < 10 meters | Internet access | Monitor and control via Internet |
| UWB | 3.1 to 10.6 GHz | < 10 meters | Low power, high-speed data | Video transfer |
| Wi-Fi | 2.4 and 5 GHz | < 100 meters | High speed, ubiquity | Local networks, Internet access, broadband |
| Wireless HART | 2.4 GHz | < 10 meters | HART protocol | Industrial monitoring and control |
| Wireless HD | 60 GHz | < 10 meters | Very high speed | Video transfer |
| Wireless USB | 2.4 GHz | < 10 meters | Proprietary protocol | HD |
| ZigBee | 2.4 GHz | < 10 meters | Mesh networks | Home, industry monitoring and control |
| Z-wave | 908.42 MHz | < 30 meters | Simple protocol | Home monitoring and control |

## Technology choices

There are many wireless technologies, and most of them are standards-based (see the table on previous page). Some have been developed for specific applications while others are more flexible and generic. Selecting the best technology for each application is, of course, the real challenge.

The choice of which short-range wireless technology is best must match the different applications, such as Bluetooth Classic for voice, Wi-Fi for data access, and BLE or ANT+ for sensors. The specific combination of data rate, power usage and range characteristics all have a bearing, as does power efficiency, performance, robustness, throughput, latency, coexistence and colocation, impact to battery shift life, security concerns, authentication, interoperability/compatibility, usable temperature range and the user interface.

Over and above the standard technologies, the real value and power of short-range connectivity comes when organizations create their own purpose-built applications. They can do this through access to the Application Programming Interface (API). Just like the legion of developers who produce programs for smartphones all over the world, it's easily possible to customize applications for radio communications to leverage short-range connectivity. There's already an extensive portfolio of applications available for wireless bearers, many of which can enable added-value web applications too.

Fundamentally, short-range wireless is a viable, immediate solution for data on traditional radio communication networks. These intelligent connections mean users can get to the critical information they need more quickly and, at the same time, network call traffic is reduced. As a result, business effectiveness and workforce safety increases.

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