

Choosing the Right Connectivity

Wireless Options That Can Save Money and Improve Productivity

Honeywell Scanning & Mobility

Executive Summary

“Always connected” was a phrase without meaning 20 years ago; today, maintaining constant connectivity is a necessity. Enterprises of every type know they need employees with more mobility – and more connectedness – than ever to grow their businesses and remain competitive. But which type of wireless technology to use is difficult to determine. This paper examines the wireless options for mobile computer connectivity and takes a close look at some nontraditional choices that can save enterprises money while still delivering improved productivity.

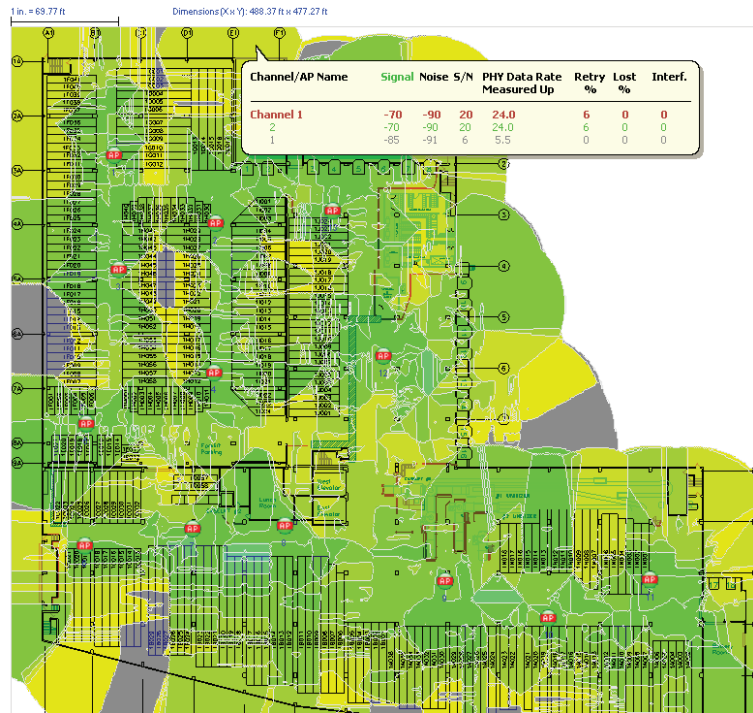
Communication within the four walls usually leverages 802.11a/b/g/n technology (also called Wi-Fi® or wireless local area networks, WLAN). Going outside the four walls requires other technology, typically wireless wide area networks (WWAN) or satellite. Each has strengths and weaknesses.

802.11

802.11 uses the 2.4 and 5 GHz frequency bands. The most widely deployed 802.11 protocols are 802.11b and 802.11g, with the former operating at an 11 Mbps transmission rate, and the latter at 54 Mbps. A recent iteration of the technology, 802.11n, operates at up to 600 Mbps, though implementing 802.11n can be tricky because it involves multiple-input and multiple-output antennas.

802.11 technology has the advantage of being commonplace (most computers come with this technology already built in), affordable and scalable. However, its coverage area is typically fixed and small (a few hundred feet), and because it uses radio frequency (RF), its signal strength may not be sufficiently strong for some situations. In addition, security is not as robust as with other technologies.

A challenge of 802.11 is the tendency of access points (APs) to overlap, interrupt each other and cause devices to lose their connections. A Cisco customer survey regarding wireless RF interference found that 54% of those surveyed experienced RF interference that caused wireless network performance problems and another 18% did not know if RF interference affected their 802.11 network. For this reason, enterprises should have professionals analyze their space and map the best possible 802.11 coverage. Industrial-grade AP planning, not consumer-grade, will be needed.



Mobile computer manufacturer Honeywell dispatches field service engineers armed with Fluke Networks AirMagnet devices. They determine the number and placement of APs to optimize RF coverage, while detecting the sources of interference capable of degrading WLAN performance.

In a new trend, some “outside-the-four-walls” enterprises with field force automation projects are developing innovative processes using 802.11 technology that provide a sufficient level of connectivity at a lower cost than an ongoing data plan, including the following:

Store-and-forward

Workers in a store-and-forward process must connect to one of several 802.11 hotspot options to transmit stored data back to the home office including:

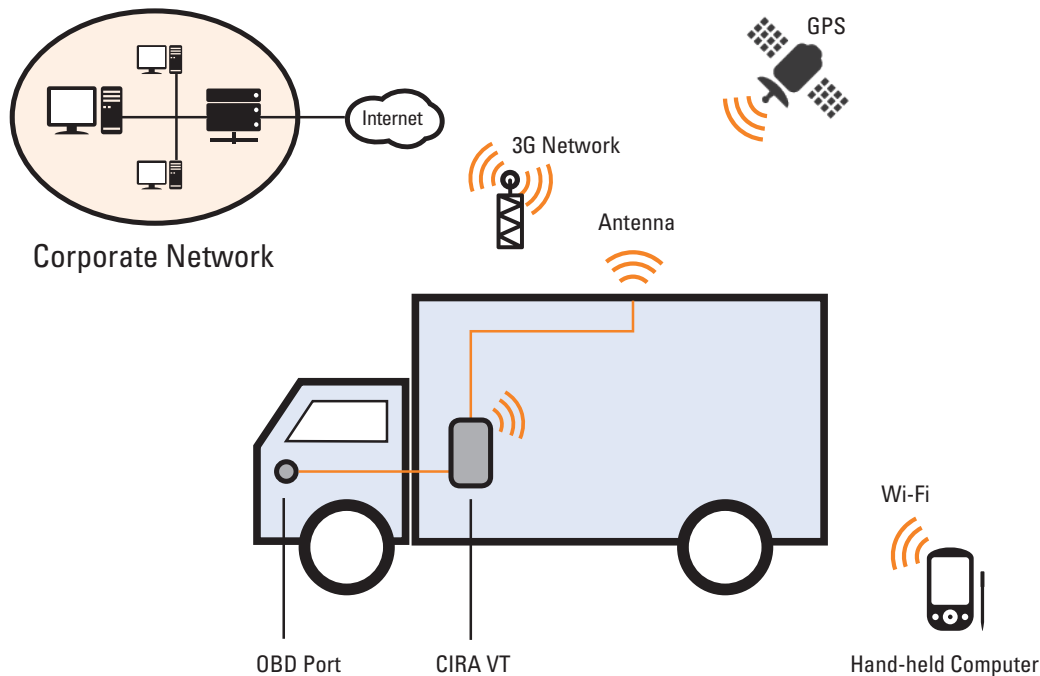
- Any public hotspot; for instance, a coffee shop or bookstore
- Their own home or office wireless, or Ethernet network, if the batch can wait until the day’s calls are complete
- An in-vehicle hotspot

Industrial field service

Another optimum use of 802.11 technology involves field workers who service telephone lines or large machines but do not require access from a homeowner or business. Often, they service the same pieces of equipment every day, allowing manuals and other critical information to reside on a mobile device’s hard drive rather than requiring continuous access via a web browser.

In-vehicle hotspots

Matt Belange, Honeywell’s transportation & logistics vertical marketing manager, says: “In-vehicle hotspots are an emerging hybrid connectivity model combining WWAN and 802.11. Until recently, many enterprises with mobile workforces carried not one but two cellular data plans per worker: the cellular plan associated with the WWAN radio inside their computer or hand-held, as well as the recurring cost of an on-vehicle ‘black box’ that communicates GPS positions and telematics. An in-vehicle hotspot serves the function of the ‘black box,’ with the added benefit of sharing its signal with the worker’s mobile computer, consolidating two data plans into one and saving significant costs.”



These solutions combine several functions and are growing in popularity.

Security is, of course, a significant issue, and an 802.11 network does not guarantee absolute security. But the protocol is so well established that a well-planned, encrypted network should be secure. The exception is when a remote worker uses a public hotspot to batch data back to the home office.

Doug Brown, Honeywell's supply chain vertical marketing manager, gives an example of how to keep an 802.11 system secure: "I recently met with a company that chose batch solely for security concerns with WLAN. Their workers download the day's instructions in the morning via Wi-Fi, and batch their results at day's end. During the day, they remain completely offline."

WWAN

The word "wide" in wireless wide area network is apropos. Such networks provide coverage over a campus, a region, a country or even globally. Cellular telephones use WWAN technology, which includes: CDMA (Code Division Multiple Access); GSM (Global System for Mobile Communications) and WiMAX (Worldwide Interoperability for Microwave Access).

In recent years, a new option in WWAN radio for mobile computers has emerged—Gobi WWAN radios from Qualcomm. They offer considerable flexibility for North American enterprises by being able to connect to either GSM or CDMA networks (AT&T uses GSM and Verizon uses CDMA). Note that elsewhere in the world, such flexibility is not as necessary, because most or all providers in a given area are on the same protocol.

WWAN connectivity is often the choice for route accounting and some field service applications, which typically require always-on connectivity for several real-time tasks.

Examples include:

- Processing a customer credit card payment
- Dynamic scheduling
- Real-time inventory checks

A device can have GPS functionality without WWAN connectivity; workers can access mapping functionality without necessarily incurring the cost of a data plan, for example. See sidebar below for a more detailed discussion of GPS usage.

WWAN recently gained traction in unconventional inside-the-four-walls supply chain applications, driven largely by

GPS: Is it a field worker connectivity tool or just a navigation aid?

A recent seminar by McKinsey & Company at a Worldwide Business Research Field Service conference stated that 90% of enterprise investment in GPS is wasted. The reasons:

- Businesses give GPS units to their drivers for routes and locations the drivers already know from experience
- Business are not tying the GPS into other business functions, such as dynamic scheduling/routing, to gain efficiency

Some may use the GPS from their home office as a “big brother” function. This may lead to short-term productivity gains by eliminating poor performers, but is not necessarily a business growth driver. Functionality like geofencing may also lead to cost savings and productivity improvements, but typically, those gains plateau quickly. Without employing GPS as a tool to save time on routine tasks performed by all workers, achieving long-term sustainable process improvements is difficult.

the dynamic change within the global supply chain. A WWAN could be used in a rapidly expanding port or intermodal facility, for example. Because it is a relatively confined space, such a facility seems well suited to a 802.11 system, yet this environment can be challenging to this technology. Containers interfere with 802.11 signals, forcing ports to invest heavily in access points. As the global supply chain gets busier, ports around the world are undertaking expansion projects, and are finding that implementing a WWAN expansion is often faster and less costly than installing 802.11.

A similar challenge is faced by companies seeking temporary warehouse space or third-party logistics. These enterprises need to rapidly expand their capabilities to meet fast changes in inventory or customer demand. For these

businesses, WWAN provides a more nimble and flexible solution than 802.11.

Satellite

Enterprises using satellite radio leverage the Inmarsat or other satellite constellations to support affordable global alerting, messaging and reporting where other forms of communication are not possible.

The Inmarsat satellite fleet provides:

- Access to a network of five IsatM2M satellites for seamless global coverage
- Secure, reliable service with 99.995% availability around the world
- A versatile and reliable world-wide satellite network

An alternative to Inmarsat is Iridium, whose satellite constellation consists of 66 cross-linked, low-earth-orbit satellites.

Satellite connectivity requires an application to track and receive messages, and a satellite phone or other tracking device. Devices can attach to a vehicle to transmit location, speed and other diagnostics, or carried by a worker. An example of the latter is Honeywell Global Tracking's Osprey Personal Tracker, which provides cost effective and dependable tracking and two-way communication using a web-based application. The tracker features automated GPS reporting intervals, dedicated alert and point-of-interest buttons, vehicle tracking and simple one-handed operation all in a lightweight (350g) device.

Satellite technology has downsides. In areas where cell coverage is prevalent, WWAN provides an effective and efficient solution due to costs lower than those of satellite communications. In addition, most satellite-driven devices or trackers operate at a low-bit rate, confining users to a limited character set or universe of canned messages to transmit.

The strength of satellite connectivity is its ability to work virtually anywhere with signals more reliable and tougher to jam than WWAN. The inventory of a truck loaded with cigarettes can run up to \$15 million USD. With cell jammers able to interrupt WWAN signals, organized crime can successfully

hijack or rob such trucks, often with the driver's involvement. In such situations, satellite radio may be a better choice.

Also suitable for satellite connectivity are situations with assets or workers in very dangerous or remote areas, and where the enterprise has a "duty of care" to take reasonable safety precautions. A logger in a remote area, a lone worker checking a gas pipeline or a delivery driver in Afghanistan are examples where satellite radio is not just the best choice but the only one.

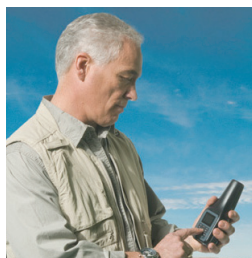
An example is Supreme Foods, which supplies food and other materials to U.S. troops stationed in the Middle East. Its unique business requires end-to-end real-time visibility. To achieve this goal, it combines 802.11 and satellite connectivity. Standard 802.11 is used in warehouses, where hand-held mobile computers capture data on shipments as they are loaded onto a truck. While the truck is en route to the front line, satellite-based trackers transmit real-time locations. A click on a truck's mapped location opens a new window showing the truck's exact contents.

Another satellite-suitable situation involves first responders who must go to areas hard hit by natural disasters, such as fire; other connectivity options are often interrupted in such situations, while satellite remains operable.

Satellite works well for:

Lone & Remote Workers

- Utilities
- Risk Management
- Surveying
- Oil & Gas
- Personnel Recovery
- Duty of Care
- Agriculture



Security & Military

- Non-Governmental Organizations
- Global Media
- Military
- Defense Contractors
- Private Security Operators

- Embassy Staff
- Executives And Vips

Groups, Fleets & Maritime

- Search And Rescue
- Fisheries
- Specialized Logistics
- Vehicle Breakdown Management
- Specialist Travel Operators
- Expeditions
- Extreme Sports

Choosing the right connectivity technology

To choose the right technology, do not focus on one major problem to the exclusion of other issues, because efficiencies in other areas may be missed. That solves one issue, only to leave others unsolved.

Start by breaking down a worker's typical day into discrete tasks, a sort of day-in-the-life analysis. Identify what the worker does routinely, over and over. Then consider how to speed up these steps up by using various connectivity technologies. Rather than focusing on one or two steps, look at them all and determine ways the technologies can help speed up the entire process.

Vital to the analysis is understanding the business process a worker undertakes five, 10, or more times a day, and then mapping the technology to that process rather than have the technology drive the process.

This exercise not only identifies opportunities, but waste, such as when an enterprise buys technology but workers do not effectively use it. A classic example is laptops, which drivers find so clunky they refuse to take them out of the car or truck. Instead they walk back and forth to the car or truck to look up data, wasting considerable time.

For workers at a remote site where conventional wireless coverage is sparse, satellite connectivity may be the best choice. Those who make several stops a day and must be granted entrance to a site by a homeowner or business, likely need the always-on, widely available coverage of WWAN.

Conclusion

We have reviewed the basics of technology for 802.11, WWAN, and satellite-based mobile computing connectivity, and explored cases where an enterprise chooses the less-obvious option for their workers. These leading enterprises were able to make three key distinctions in their selection process:

- They separated productivity from connectivity. The ultimate goal of automating a worker's tasks is the enhanced productivity that comes with mobile technology. Connectivity may be a part of that equation as a communication tool, but always-on connection isn't a requirement for productivity.
- They separated the work being performed from the reporting of that work. Is the mobile technology project designed to make the worker better at his job, or to enable better reporting to the supervisor of the work he is already doing? While enterprises may realize immediate benefits from closer oversight of their workers, especially poor performers, too much connectivity can tempt managers to become micromanagers, which may hinder or frustrate workers and negatively impact productivity.
- They separated short-term and long-term business objectives. In the short term, choosing more costly satellite connectivity for a cigarette truck may look

like a bad decision. But in the long term, it can prove a wise decision by reducing theft. Conversely, the third-party logistics organization that chooses WWAN over 802.11 for a rapid warehouse expansion may not have enough of a crystal ball to see if the uptick in demand is sustainable, and therefore, opts for the more convenient solution to fit short-term business needs, rather than investing in permanent access point infrastructure.

While the importance of balancing short-term and long-term needs seem obvious, the rapid innovation and change taking place in mobile computing makes "quick fixes" of single problems almost too tempting. Best-in-class companies take a step back and view that technology through the prism of their business process and goals.

Please visit www.honeywellaidc.com for more information about our supply chain solutions.

About Honeywell

Honeywell Scanning & Mobility, a leading manufacturer of high-performance image- and laser-based data collection hardware, delivers the latest functionality to meet customer demands.

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Honeywell Scanning & Mobility

9680 Old Bailes Road
Fort Mill, SC 29707
800.582.4263
www.honeywell.com