



# Connecting with a Wireless World

By Greg Quirk

A **mesh network** is a way to ensure that data is properly conveyed to other systems within the network. This is an expansion on point-to-point networking because if a device in the chain is broken or fails, it does not disrupt the data transfer. Each device creates a “node” that can create unique information but also passes data from other devices within the network along. Previously, mesh networks were hardwired, but **wireless networks** are sufficiently low in power and cost and robust enough to ensure a solid connection.

## Revenue and Shipments

The use of mesh networks has grown substantially since they were first introduced. The current estimations expect revenues to exceed \$7 billion by 2014 with a 100 percent growth in municipal infrastructure in 2010 alone. When you take into account that there were over 8 million smart meter shipments in North America in 2009, this is quite a significant growth rate. Nearly 70 percent of the average utility bill could be influenced by [wireless sensor networks](#), according to reports, and could control heating and lighting to reduce energy costs.

## Applications

There are many [applications](#) for mesh networks aside from the military, which is where the technology first was implemented. Industrial systems rely heavily on the assurance that the critical information they use to operate efficiently is always available. For example, smart gas meters use mesh networks to ensure that billing information is sent even if there is an issue with some of the meters between the home and the receiver.

Asset tracking is another application where it is vital not only to know where shipments are within the chain of custody, but also to guarantee that nothing gets lost in the process. This is another huge growth area that is projected to reach \$845 million by 2014, which in turn can save companies millions through its implementation.

## Implementations

Two of the most common kinds of wireless networks are **ZigBee** and Wi-Fi, but there are many others that have earned their right in this space. There was a controversial study performed by GE that demonstrated that ZigBee systems consume just 0.39 watts over 24 hours, compared to 0.87 watts used by Wi-Fi solutions. While the amount may seem

small given the size of the networks, this can equate to over \$315 million when implemented in one billion devices. There has been some debate over the validity of the report, but it is clear that this is a hot topic for many people.

## **ZigBee**

ZigBee was created with a [mesh topology](#) in mind. It leverages extremely low power consumption to ensure that the network operates for a very long time on a single battery, typically years before needing to be changed. It can operate in the ISM band, as well as the 2.4GHz range.

The [Laird Z100S1](#), with an external antenna, has an outdoor range of 4.8km.

There have been some changes to the ZigBee stack. To make setting up the network easier, companies such as Digi International have created a [programmable module](#) that makes creating ZigBee applications easier by including a processor separate from the RF code.

## **SNAP**

SNAP is an abbreviation for Synapse Network Application Protocol. **SNAP** has a very small memory footprint of only 40 KB, so more memory is available for other applications.

The [Panasonic PAN4561](#), an application compatible solution with Panasonic PAN4455, offers extended range by using low noise and power amplifiers. CEL produces a [single-chip RF transceiver](#) with RF transceiver with baseband modem, a hardwired MAC and an embedded 8051 microcontroller with internal Flash memory for a complete solution.

## **WirelessHART**

While there are 30 million HART devices in place, until the inclusion of WirelessHART, they were not used to their full potential or set up to provide device diagnostics. The wireless aspect enables the devices to be placed in more locations than before, while obtaining the full benefits that HART offers.

A transceiver module for WirelessHART is offered from RFM. The [XDM3620HP](#), which requires no embedded programming, is designed for industrial applications where long battery life is required.

## **Alternatives**

Other solutions in the mesh networking arena include BlueTooth, Ultra Wide Band, wireless USB, and IR. So far, there is no single solution that meets all of the market's needs, although new developments are being made in all products to provide better coverage at a lower price while consuming less power. And while it will be years yet

before there is a “winner” in this space, the industry is still moving forward to take advantage of the many benefits that mesh networking offers.

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