M2M FEATURE

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DecaWave Sees Ultra-Wideband (UWB) and Micro-Location in 2015's Internet of Things

By TMCnet Special Guest

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Anyone who's watched technology in the past ten years has seen it get increasingly personal. Desktop PCs have moved to laptops; the Internet has moved to smartphones and tablets; and email and messaging (not to mention phone calls) are in our pockets and instantly available.

But, as we enter 2015, the Internet of Things, along with wearable computing and smart homes, are poised to make technology even more personal.

The Internet of Things is bringing connectivity to a lot of real-world things in our pockets and our environments. Some companies are enabling our smartphones to interact with coffee machines, home entertainment systems and other devices around the house, so that we can control them from our phones, or even better, so that they can react automatically when we walk into a room. Other companies are adding wireless connectivity to key chains, wallets and other things in our pockets, so that we can find them when they're lost. Other companies are adding sensors to our environment, so that our smartphones can know when our kids get home, when the liquor cabinet is opened, or when the last egg is taken out of the refrigerator.

At the same time, wearable computing is adding connectivity and intelligence to our wristwatches, shirts, eyeglasses and other things we wear. These are in wireless connection to our phones, enabling our phones to display information more subtly and understand where we're going and what we're doing.

Lastly, smart home systems are adding Internet connectivity to laundry machines, dishwashers, and other home appliances, enabling them to communicate with each other and with us. When our laundry finishes being washed and needs to be moved into the dryer, we can receive a

message on our TV screens or on our connected bathroom mirrors, or on our smartphones, depending on where we are.

The biggest common denominator of all of these new developments is wireless connectivity. How will our smartphones, our appliances, our wearable devices, the things in our pockets and sensors around the house communicate with each other?

For many, the first thought is to use Bluetooth or Wi-Fi, which are available in almost all smartphones and other mobile devices. But Wi-Fi and Bluetooth are both one-to-one pairing protocols. If one device is connected to another device, it's not communicating with all the others. One approach is to connect through a router or hub, but this loses the simplicity and straightforwardness of "things" connecting directly to each other. A standard is needed for communication over mesh networks, in which all the devices in the house can communicate with all the others.

Another challenge in using Wi-Fi or Bluetooth for the Internet of Things is the importance of location tracking. How will our smartphones know which room we are in, to display the movie we're watching on the nearby screen? How will the washing machine know which screen is best to send us a message that the laundry is ready? How will our home entertainment systems and smart picture frames know who is in the room, to play the appropriate music and show the appropriate pictures and artwork?

Wi-Fi and Bluetooth are both inherently limited in how accurately they can track distance and location. Because of the properties of narrowband radio, they can only measure distance and location to within 3-5 meters of accuracy. This means that any location measurement based on Wi-Fi or Bluetooth is likely to be off by 3-5 meters. They also suffer from reflected radio waves and multi-path artifacts, which can distort both radio signals and location measurements.

Ultra-Wideband (UWB) radio provides a new and advanced wireless technology that can connect all of these devices in a mesh network. At the same time, UWB can support much more accurate and reliable location tracking than Bluetooth or Wi-Fi. DecaWave has brought UWB to market in a chip that can be embedded in a wide variety of devices.

The key point is that UWB was designed with these challenges in mind. Its short pulses are such that multi-path interference will not cancel out the primary signal. These short pulses can also be measured much more precisely than narrowband signals, making distance and location measurement much more accurate. In practice, UWB can measure location to within 5-10cm, an order of magnitude better than Wi-Fi and Bluetooth based systems. And UWB devices can communicate in a mesh network configuration, in which each device can talk with many other devices.

As we move into 2015, as technology is becoming more and more personal, UWB radio will enable all of our connected "things" to talk to each other and track their locations. With UWB technology, the connected things in our pockets and around our homes and offices can communicate with each other without interference, and can track location and distance precisely

enough to offer accurate location awareness. So your smartphone can lead you directly to your lost keys, your home entertainment system will know who is in the room and who is in the room next door, your washing machine will know precisely which screen or display device you're near, and your lights will know when you're in the room and won't mistakenly turn off.

Time will tell which Internet of Things and smart-home applications really take off, but whichever of them the market likes, they'll need to communicate and track locations. Look for UWB to be a big part of technology getting personal in 2015.

Edited by Maurice Nagle