

# An Interview with Bob O'Hara

Airespace™ Co-Founder  
and 802.11 Pioneer



*Bob brings over twenty years of engineering experience developing networking, telecommunications and computing products. He has been instrumental in the development of 802.11 standards and protocols over the past 10 years.*

## Tell us about your involvement with 802.11 standards.

My interest in wireless LANs (WLANs) was actually spurred by my passion for Science Fiction. One of the standard features of Sci Fi is its ubiquitous communication – it's always there and there's never a wire trailing behind the character. In real life, I saw 802.11 as the first opportunity to really make that happen.

I have been involved in the development of IEEE's 802.11 standard since 1992. Through the years I've held several positions with IEEE focused on designing and delivering the current and future 802.11 standards. My work with the organization ranges from serving as the technical editor of the original standard to chairing both the Revision Group that published the current standard and the 802.11d Wireless LAN Operation in Additional Regulatory Domains team. I'm currently the technical editor of IEEE's Recommended Practice for an Inter Access Point Protocol committee, and have co-authored a book focusing on 802.11 standards.

## What took so long getting 802.11 started?

Unlike the evolution of the Ethernet standard, which was developed from a technology that was already in use, the 802.11 standard took a lot longer to evolve because it was being written as the technology was being developed. Everyone had an opinion as to what the standard should be and what it should do, so it took a very long time to reach a consensus. However, this process was important as the current standard is far better than the standard available in 1992.

## How has the technology evolved over the past decade?

The true "birth of 802.11" was actually driven by the automobile manufacturing industry which was having problems with its 802.4 token bus wired network.

The activities of arc welders on the manufacturing floor created a hostile electrical environment and interfered with the cabling required for the token bus. So the IEEE 802.4 working group developed what we now know as 802.11 in order to get network connectivity without disrupting the manufacturing process.

In the last ten years, there have been significant speed increases in the 802.11 standard. This evolved due to two critical developments – changes in radio spectrum regulations that made a large amount of new, clean spectrum available for WLANs; and technological advances in semiconductor technology that resulted in complex radios being available in inexpensive CMOS processes.

Today, the largest number of WLAN users are accessing their networks using the 802.11b technology. And, while 802.11b runs at speeds up to 11 Mbps, many WLAN users are seeing even faster speeds – up to 54 Mbps – by using 802.11a. The standard will continue to develop and allow for higher speeds, in fact, an IEEE group is currently chartered to develop standards for access at speeds beyond 100 Mbps.

## Why do you think this new technology is so important?

One of the reasons the 802.11 technology is so important is that it is the enterprise's answer to Ethernet for mobile access to information. This is critical because it will

contribute to great changes in the way enterprises do business – just the ability to have a workforce with anytime/anywhere access to information has a significant impact on employee productivity. Early studies have found that a mobile workforce employing real-time mobile converged wireless and data applications had a 15-20% increase in employee productivity. It's estimated that by 2004 more than 40% of the global workforce will operate remotely, so very shortly WLANs will become a necessity. A company that does not make its workforce mobile will be left behind by its competitors.

## What are some of the current shortcomings of this generation of technology that vendors need to address?

The current generation of 802.11 technology/equipment for enterprise-sized networks has shortcomings in two areas – one deals with standards – the fact that certain aspects of 802.11 are not standardized yet. The other area deals with how the products of every 802.11 manufacturer are built today.

From a standards aspect, there are two significant issues – security and quality of service. Security has easily been the most glaring shortcoming of 802.11. The Wired Equipment Privacy (WEP) that was in the original 802.11 standard, was known to be very weak. In fact, after WEP was adopted, researchers found very significant holes in the protocol. There's currently a standards effort called 802.11i that is

specifically working towards providing improved security for current devices and ironclad security for future devices.

Another shortcoming in the 802.11 standards is quality of service (QOS) support. As networking applications have evolved from simple file sharing and email, to voice and multimedia distribution over a network, the base protocol for 802.11 is not adequate to handle the demands of these new applications. This is particularly true with multimedia distribution (high-definition video, high-bandwidth audio,) the demands are significant and they have QOS demands that were not even considered in the original design of 802.11.

## Why isn't current WLAN equipment suitable for businesses?

Last generation equipment for WLANs was built as stand alone equipment – not as a part of a bigger network system. The last-generation access devices are entirely self-contained and act independently, which works fine for small networks with as many as 10-12 access points that one person can configure. But when the network gets larger, say a size of 50 access points or more, then one person can't keep an accurate picture of a network in mind. Stand alone access points don't help with that because they operate independently and tend to optimize for their own operation by choosing the best radio channel getting the most traffic points. The action that these access points take is

detrimental to the operation of other access points and therefore, the network itself.

## How to Make WLANs Work As Well As Wired Networks.

Care needs to be taken when deploying and running a WLAN to make it as predictable as a wired network. For IT departments, the trickiest part of managing WLANs is the lack of training in radio propagation. WLANs are not like a typical radio station where signals are sent in an umbrella-like model. Effectively managing WLANs requires dealing with the multi-path fading problem that the layman is unaware of. Skilled and experienced IT personnel have to take a considerable amount of time to adequately correct for multi-fading problems.

## What are the major requirements for WLAN data infrastructure equipment?

There are several reasons that enterprises need next-generation WLAN infrastructure equipment, most importantly they'll need to prepare for the increasing number of users needing access to an enormous amount of information.

For the most part, enterprises have treated their WLANs as they would their wired network – using current (or last generation) Wireless LAN products like an extension

cord. They've employed WLANs just as a means to reach the Ethernet connector from wireless devices. This approach worked as long as there weren't a lot of wireless users on their network, just as an extension cord will adequately run a vacuum cleaner, but not your oven.

Today, installing and operating a WLAN is not just a convenience for an enterprise – it is becoming very critical to ROI, productivity, mobility, improved applications, etc. If employers don't put in wireless LANs, their employees will do it for them, one access point at a time resulting in a potential worst-case-scenario where they lose control of their network, begin having security issues, etc.

Next-generation products, such as the Airespace solution, take into account the fact that you're going to have a large number of users needing access to an enormous amount of information. We are building the "intelligence" right into the wireless infrastructure so that even inexperienced IT departments will be able to effectively manage scalability and security.

## How do you think the technology and the industry are moving? What are some of the roadblocks to wide scale penetration?

With next-generation WLAN equipment – such as that of Airespace, enterprises are gaining significant return on investment (ROI) – a recent enterprise case study

noted an 80% decrease in networking equipment costs versus a wired network.

**ROI**—Recognizing all the benefits that are available from a wireless network. A typical IT staff is well-versed with wired networks, but a wireless network is both somewhat like and very unlike a wired network. There are some things a wireless network will do, that you'll never do with a wired network. Mobility is really a big differentiator. But, in the past, it has been difficult to make a case for investing in WLANs because the benefits and ROI have been difficult to measure.

**Security**—There has been a lot of media attention regarding last-generation 802.11 networks and the security problems they've had. The problems stemmed from the fact that the last-generation WLANs generally used no security measures, the infrastructure equipment didn't have the functionality that companies such as Airespace are employing to create better security and IT departments are generally still unfamiliar with WLANs. In general, today's IT departments are rightfully concerned about the security of their information as it crosses a WLAN.

**Cost of Operation**—Using today's last-generation WLAN equipment makes it very costly to run a WLAN. Each access point is an individually addressed and

separately managed device. Providing WLAN coverage in most enterprises typically doubles the number of network devices that need to be managed by adding the access points and, potentially, Ethernet switches supporting the access points, to the network equipment already deployed. Maintaining the configuration of each of these access points, monitoring their health, and maintaining the service quality expected by the users is very time consuming.

## What kinds of customers did Airespace have in mind when devising its solution?

We spoke to customers from a variety of segments – medical, warehousing, general office, manufacturing, financial services, etc. – and found that we were looking for 3 things:

1. Moving the network from one of convenience to one that is business-critical, one they could run their business on reliability.
2. Greater visibility and control into the performance of the network. Who is using it? What kind of performance are they getting? How well is it secured?
3. Making it easier to deploy and manage networks. Large-scale deployment of WLANs today is a dirty and messy job – and it could be frustrating. We wanted to make sure that WLANs are radically easier to deploy and operate.