

## Are You Ready for the All-Wireless Enterprise?

### The Emergence of the All-Wireless Enterprise

*Enterprises of all types, including universities, K-12, hospitals, utilities, manufacturers, and government agencies are finding the need to deploy an All-Wireless Enterprise — a network with wireless as a primary infrastructure.*

*As enterprises continue to experience the clear cost and productivity benefits of an increasingly mobile workforce, they are deploying wireless for business-critical applications, rather than simply for convenience.*

The advent of broadband wireless communications began what can only be called a genuine revolution. In just a few short years, the vast majority of enterprise organizations have already begun deploying wireless LANs (WLANs), and over 100,000 public Wi-Fi HotSpots have been installed worldwide, according to JiWire. The many advantages of untethered communications have even made home wireless networks increasingly popular.

The future looks even brighter for wireless networking. Synergy Research Group expects that unit shipments of “thin” access points will grow by a remarkable 500% in just a single year from 2006 to 2007. Even with prices dropping, sales of WLAN equipment are expected to sustain a compound annual growth rate of nearly 60% through 2009, also according to Synergy.

Why is wireless in such high demand? The adoption of WLAN and mobile applications in the enterprise is being driven by three major trends:

- Business pressures to enhance competitiveness while reducing overall IT costs
- A growing dependence on mobile devices that substantially increase productivity—both professionally and personally
- Technological advances that are dramatically improving the price/performance of broadband wireless communications

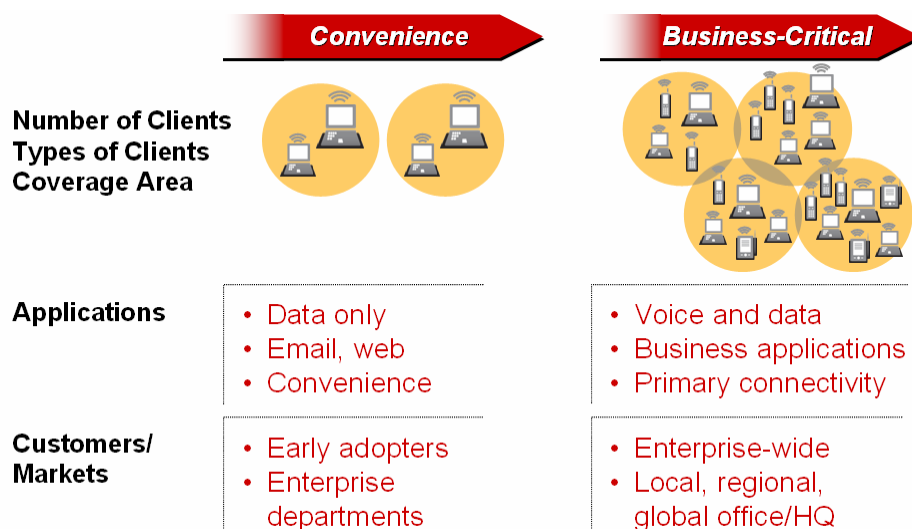
Certain industries benefit more from the mobility afforded by wireless communications, and these “forward-leaning” deployments are forging a path that others can follow with little or no risk. Indeed, the benefits of wireless are so significant that some organizations are now abandoning wire entirely. Could such an “all-wireless enterprise” be in your organization’s future?

### What Is the All-Wireless Enterprise?

Initially, most WLANs in the enterprise are implemented as a limited extension to the wired LAN in select locations for employee convenience. Coverage is provided in meeting rooms, cafeterias, lobbies, and other gathering places to give employees untethered access to email, intranets, and the Internet. The wireless network also provides a great guest communications solution for visiting employees, customers, business partners, and consultants.

What begins as a convenience can quickly turn into a dependency. Such is the case with WLANs that are routinely now implemented as widespread overlays across the enterprise. And while some may poke fun at the “Crackberry” addicts who cannot seem to get away from their emails and instant messages, there is a legitimate reason for staying in constant touch. After all, the worst problems occur only when people are uninformed or fail to communicate.

The inevitable next step in this progression is the pervasive, all-wireless enterprise where all employees can enjoy the advantage of anywhere, anytime access—from any device—to any and all business-critical applications. That’s not to say people must stay connected constantly, but with the all-wireless enterprise, they just never need to be out of touch again.



**The all-wireless enterprise enables organizations to support business-critical voice and data communications with seamless mobility throughout the enterprise.**

In the all-wireless enterprise, the network is easily and economically freed from the bonds of wiring with a secure, pervasive, high-performance wireless infrastructure. In effect, the all-wireless enterprise provides for the same robust communications of a wired enterprise, but with the added cost-saving benefits and convenience of mobility. For example, with RFID tags, virtually anything—from assets to inventory—can be tracked virtually anywhere throughout the enterprise, including within manufacturing and warehouse facilities.

### Benefits of the All-Wireless Enterprise

By providing support for business-critical voice and data applications throughout the enterprise, organizations are able to maximize the many benefits afforded by mobility. With pervasive coverage, employees enjoy exactly the same communications capabilities whether they are at their desks or roaming elsewhere throughout the enterprise buildings or campus, however geographically dispersed.

### Benefits of the All-Wireless Enterprise

- *Access to data and communications throughout the enterprise*
- *Increased productivity*
- *Eliminates need to wire access points and for costly site surveys*

Previously hard-to-reach areas can be networked without the cost, complexity, delays and limitations often imposed by wiring.

Peak productivity is therefore possible for all employees—all the time. Imagine being able to continue a phone conversation over wireless VoIP with dial-tone quality while walking to the copier or someone else's office, or just going to get a cup of coffee—all without incurring per-minute access fees. Or imagine being able to handle your "action items" while still in a meeting, rather than returning to your desk to get the details needed to make a fully-informed decision—at yet another meeting.

While the improvements in productivity are impressive, the low total cost of ownership (TCO) of an all-wireless enterprise is what makes its value-proposition compelling. There are no new wires to pull, or switch ports to consume, which affords significant savings owing to the fact that the cost to wire wireless access points (APs) can account for up to 20% of installation expenditures. Next-generation wireless solutions from Meru can even eliminate the need for extensive site surveys that often account for another 10-15% of up-front costs. Then there are the relentless moves, adds, and changes found in any organization. This cost regularly reaches hundreds of thousands of dollars over the years—an amount that can be exceeded in a single year by a large organization. But, with the all-wireless enterprise, all these add, moves, and changes all occur automatically without adding any network infrastructure costs or causing any service disruptions.

### Who Needs an All-Wireless Enterprise?

Meru Networks believes that, sooner or later, all organizations will want—and need—a fully untethered work environment. Meru innovations in WLAN technology not only make the all-wireless enterprise possible today, but also, these advances have already made it a practical reality for a growing number of major corporations and institutions.

Here are just a few examples of how some organizations are already deploying pervasive wireless with Meru WLAN products and solutions. A major gas utility company wanted enterprise-wide mobility for its campus headquarters and nationwide offices. The all-wireless enterprise network from Meru now provides business-critical communications for 6,000 dual-mode Wi-Fi/cellular phones and thousands of laptop computers. The company estimates its total IT savings to be about 30% per year based on an "address-free" office environment with ubiquitous wireless voice and data communications.

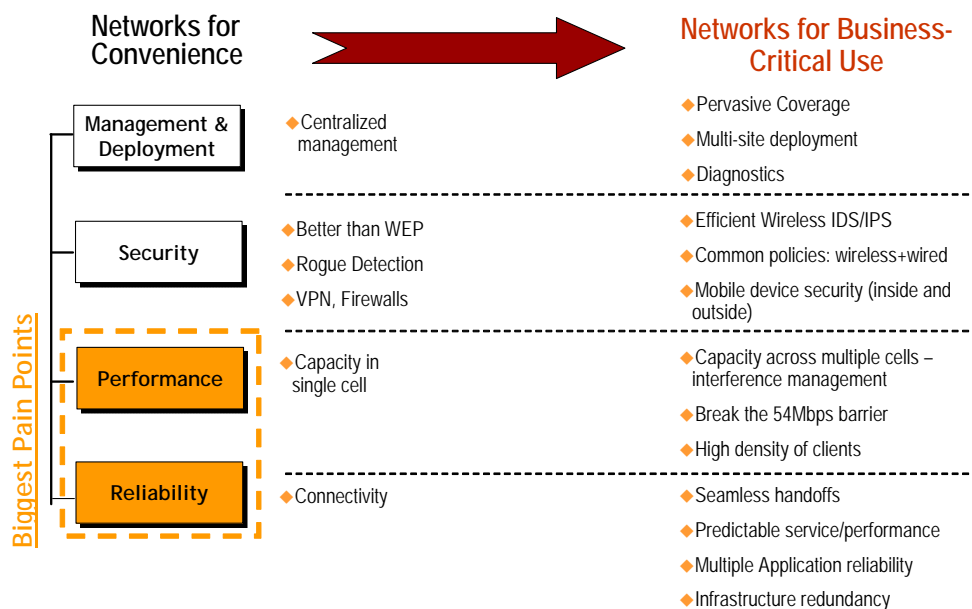
A large private hospital, with several hundred beds throughout a campus setting, wanted to upgrade its older-generation WLAN to enhance mobility, security, performance, and quality of service (QoS). The all-wireless enterprise network, which provides pervasive coverage for the entire campus, was implemented without an extensive site survey. Over 500 doctors, nurses, and administrators now enjoy untethered networking for broadband data access, and Vocera voice communication badges even in the most crowded of settings, such as the cafeteria at lunchtime.

A major university has equipped every student with a Wi-Fi-enabled notebook computer for Web-based collaborative learning. Access is available in all dormitories, lecture halls and classrooms, creating periods when as many as 100 students are simultaneously connected to a single AP. High density areas, such as lecture halls, are covered with multi-channel cells, enabling all students to download files simultaneously or take tests online during class. Significantly, all previous attempts to support these high densities of bandwidth-hungry users met with failure.

These and other organizations share a common need to make business-critical voice and data communications fully mobile. And not just here and there, but everywhere—including those hard-to-reach locations. And not just for the privileged few, but for the entire staff or student body. This is what the all-wireless enterprise is able to deliver.

### Are There Any Challenges to an All-Wireless Enterprise Network?

Challenges confront any network implementation, and the all-wireless network is no exception. Although security has historically been the primary concern with wireless communications, enterprise-wide implementations raise additional issues involving performance and reliability, as well as management and deployment. Fortunately, all four areas are addressed fully with the wireless networking innovations from Meru.



**The many requirements for a business-critical, all-wireless enterprise can all be satisfied with Meru wireless networking technology.**

### Management & Deployment

With pervasive coverage throughout the multiple buildings and locations of an enterprise, there is a clear need to simplify both the initial deployment and all ongoing management of the wireless infrastructure. The Meru Wireless LAN System takes ease-of-deployment to a new level by eliminating the need for an extensive site survey and elaborate channel planning prior to the installation, and doing away with the cumbersome “tuning” normally required afterwards. With the Meru WLAN System, physical APs are placed for coverage without concern for radio frequency (RF) considerations, including co-channel contention. In addition, a Meru E(z)RF coverage planning tool is available for precise coverage modeling as needed. After the installation, the patented Meru Air Traffic Control™ technology then automatically takes over to form Virtual Cells—a single virtual abstraction of all the Meru APs—that provide pervasive coverage, complete with support for seamless roaming.

After making the deployment a relatively trouble-free, plug-and-play process, Meru E(z)RF management tools continue to handle many of the ongoing network management tasks. With productivity being the goal, Meru scalable management tools enable fast access to network information, via dashboards and RF visualization, while also enabling multiple device configuration and performance optimization. Meru tools substantially simplify ongoing management responsibilities, enabling authorized IT personnel to continue to have full centralized control with the ability to monitor the network, configure security policies, upgrade system software, and perform other periodic tasks.

### Security

In a fully untethered, all-wireless enterprise network, security is of paramount importance. This is why the Meru WLAN System provides a complete suite of enterprise-class, multi-layer security provisions. Authentication can be based on the IEEE 802.1x standard and the Extensible Authentication Protocol (EAP), or existing AAA servers that utilize RADIUS, LDAP, or Active Directory. Over-the-air traffic encryption is provided by Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA) or WPA2 (IEEE 802.11i) that supports the Advanced Encryption Standard at a strong 128 bits. Access control is provided at the MAC address layer for any systems not equipped with WEP, WPA, or WPA2.

The Meru WLAN System also supports virtual LANs (VLANs) and virtual private networks (VPNs) that allow traffic to be segmented and/or tunneled as an additional layer of security; such virtual forms of networking are often an ideal way to overlay guest access onto the private enterprise network. Network guests can even be directed to a captive portal that might limit their access, for example, to an extranet and the Internet only.

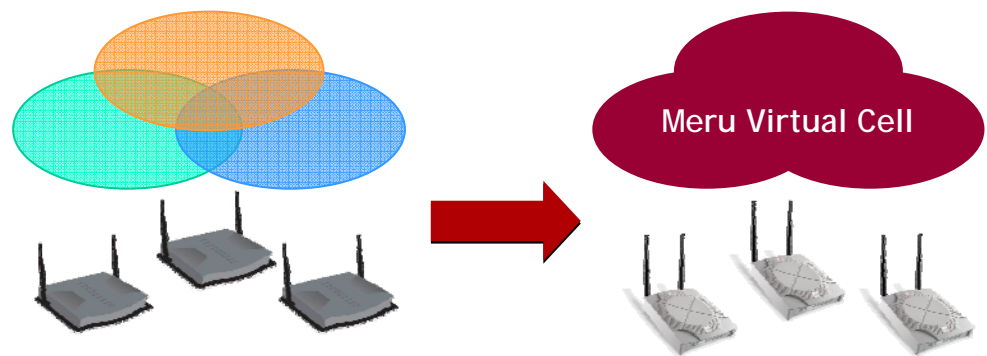
Finally, the Meru patent-pending AirShield™ system with AirFirewall technology uses advanced micro-scanning, radio scrambling, and transmission jamming techniques to ensure military-grade RF layer security for the all-wireless enterprise. Unlike other wireless security offerings, the Meru AirShield system protects the entire wireless infrastructure at the RF signal level by establishing an “air firewall” capable of thwarting any attempted intrusion or snooping, including those made via rogue access points.

### Performance

Performance can be a concern in the all-wireless enterprise, but here too the Meru WLAN System leads the industry in performance. Meru understands that performance has multiple dimensions. The first involves raw throughput, and unlike other solutions that throttle back to lowest client data rate, the virtual AP cells sustain the maximum data rate for both IEEE 802.11g/a (54 Mbps) and 802.11b (11 Mbps) access on a per-user basis. In other words, Meru has solved the notorious 802.11b/g problem, allowing both of these 2.4 GHz technologies to operate at their full data rates concurrently on the same virtual AP. The Meru APs can also read standard RFID tags, of course, with the Meru controller providing an interface to the location engine application. Pervasive coverage is essential for RFID applications, which are particularly popular in the healthcare, manufacturing, and retail industries.

The second dimension of performance involves the type of throughput needed for real-time applications, such as voice over IP (VoIP). Meru Air Traffic Control technology provides both minimal latency and jitter, along with the seamless roaming needed to deliver deterministic, toll-quality service levels for VoIP traffic.

The third dimension involves scale, which has historically been a serious limitation with wireless solutions. Based on the intelligent load-balancing and real-time RF coordination of Air Traffic Control, multi-channel virtual cells of coverage are automatically created in the same physical space to support user densities up to 10 times higher than other wireless solutions—without sacrificing any of the other dimensions of performance. Think of it as “Every MHz Everywhere.”



**Traditional deployment of overlapping (and contentious) access points on the left compared to the Meru Virtual Cell architecture with pervasive coverage and seamless roaming.**

The fourth dimension of performance is uptime, for without high reliability, no claims about throughput, QoS, or user density have any real meaning. As such, reliability warrants coverage as a separate requirement for the all-wireless enterprise.



### **Reliability**

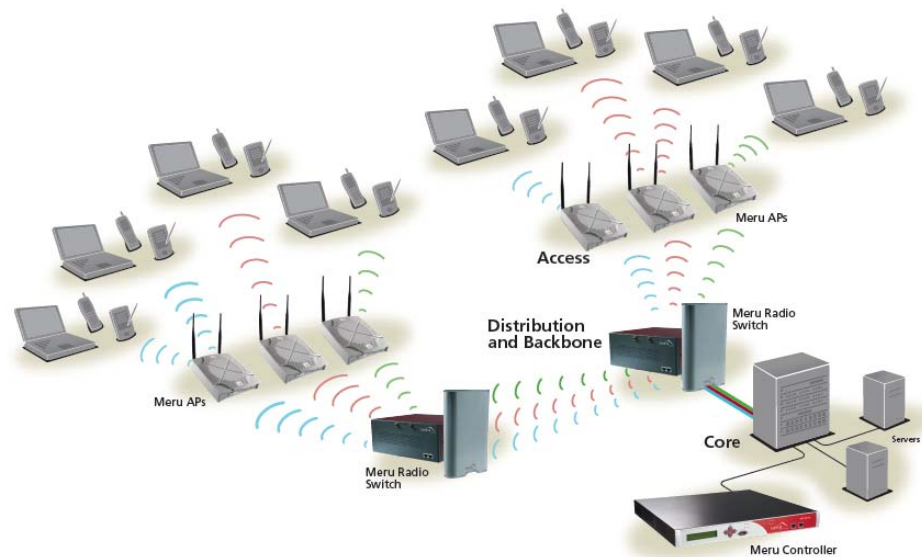
The intelligent nature and predictable performance of the Meru WLAN System and its Air Traffic Control technology makes any deployment remarkably reliable. Because the traffic flow is synchronized and deterministic, service levels are as predictable as they are dependable. Of course, a fully functional network may not appear as such to a user. A good example of this is VoIP roaming. When a call is dropped, any user would be correct in complaining that something is wrong with the network. But because Meru employs virtual AP cells, VoIP handoffs occur seamlessly. The result is a consistent and impressive Mean Opinion Score (MOS) measurement in excess of four points. For those unfamiliar with MOS, any rating higher than four is considered landline quality; that is, just as good as the public switched telephone network (PSTN).

Meru recognizes the fundamental importance of business-critical reliability for any organization considering an all-wireless enterprise. This is why the powerful Meru Air Traffic Control technology was designed specifically to maximize uptime and minimize all other network behavior that might be perceived by users as a problem. And this means that by using the Meru WLAN System in the all-wireless enterprise, users will perceive they are still on a wired network—but sincerely appreciate the fact they no longer are.

### **Revolutionary Step for WLANs: The Meru Wireless Backbone System**

To further enable the all-wireless enterprise, Meru Networks extends Air Traffic Control technology innovations to wireless backbone links that scale bandwidth into the network core, similar to traditional wired Ethernet networks. The Meru Wireless Backbone System is comprised of Meru Access Points and Radio Switches that create and dynamically allocate RF bandwidth via “AirChannels.” Each channel provides full duplex, multi-hop communication extending QoS, virtual cells, and real-time RF coordination over the backbone. Hierarchical bandwidth is created from wireless access to the wireless core, with dynamic allocation of the RF channel spectrum as required to meet deployment requirements. The system is fully compatible with 802.11a/b/g and the emerging 802.11n standards.

The robust Meru Wireless Backbone System enables customers to deploy business-critical voice and data applications over a completely WLAN—pervasively and reliably—while achieving a dramatically lower total cost of ownership compared to both wired and other WLAN solutions.



**The Meru Wireless Backbone System delivers similar levels of QoS, throughput, and service availability as a wired network.**

## Conclusion

Will wiring be required in the future of enterprise networking? Sure—at least for a while longer. But with the many advances in wireless technology, it is difficult to imagine any successful business remaining dependent on RJ-45 jacks a decade from now. People are mobile creatures who need to communicate. Witness the trend in the telephony industry where a growing number of people are abandoning their landlines for cellular phones.

Just as individuals worldwide are going all wireless, so too will the enterprise. The evolution from WLANs for convenience to WLAN overlays and ultimately to a pervasive, all-wireless enterprise is as inevitable as it is desirable. It's simply a matter of time, and for a growing number of organizations, the time is now.

Meru has advanced the state-of-the-art on several key fronts to make the all-wireless enterprise a practical and affordable reality today. The Meru WLAN System overcomes each and every challenge involving reliability, performance, security, and management and deployment. This allows the enterprise to achieve the many benefits of mobility without delay—or worry.

To learn more about how your organization can benefit today from an all-wireless enterprise, visit Meru Networks at [www.merunetworks.com](http://www.merunetworks.com).