The Wireless Internet is Alive and Well

Not only is the wireless Internet alive and well, it looks like we will be surfing it on our laptops and not with our cell phones. At first it seemed like a great idea to be able to view Web pages with your cell phone. However, reality has shown it to be cumbersome and a frustrating experience. Let's face it, you can put some knobs and a screen on your toaster, but it is never going to make a good television set. Likewise, your television is not going to make a good toaster. Turning a cell phone into a good Web surfing tool makes it a bad phone. Add to this the difficulty of having to navigate through a myriad of submenus, it is no wonder many cell phone users try out the wireless Web when they get their first Web-enabled phone, and never browse it again. The handset form factor plus the painfully slow evolution of wide area networks to achieve their promise of 2.5G (GPRS) and eventually 3G (UMTS) has left North Americans looking for a viable alternative to wirelessly reach the Web.

That alternative seems to be wireless local area networks (WLAN) which have experienced strong growth and acceptance in many areas of industry and government over the past twelve months. The majority of that growth has been

wireless-based LAN systems conforming to the 802.11b standard. Also known as Wi-Fi, 802.11b describes two basic pieces of equipment that, in concert, enable a portable computer to access a conventional network. The first is the transceiver module within the laptop computer which complements or replaces the conventional Ethernet adapter and cable that would otherwise connect the computer to the network access point. The second is a wireless access point or base station. This takes the form of another one or more 802.11b-equipped devices.
The market demand looks very bright for wireless networks. One indication is the Yankee Group 2002 Corporate Wireless Survey which states 25 percent of all enterprise workers are considered mobile, spending more than 20 percent of their time away from their workspace. This equates to 40 million professionals in the U.S. who still want and need access to the Internet or their corporate intranet and e-mail servers. This market demand can be seen in the success of some wireless internet service providers (WISP) such as T-Mobile of Bellevue, WA. Through agreements with companies such as Starbucks Coffee, American Airlines, United Airlines, and Borders bookstores, T-Mobile is on track to meet its target of being available in over 2000 locations by the end of the year.

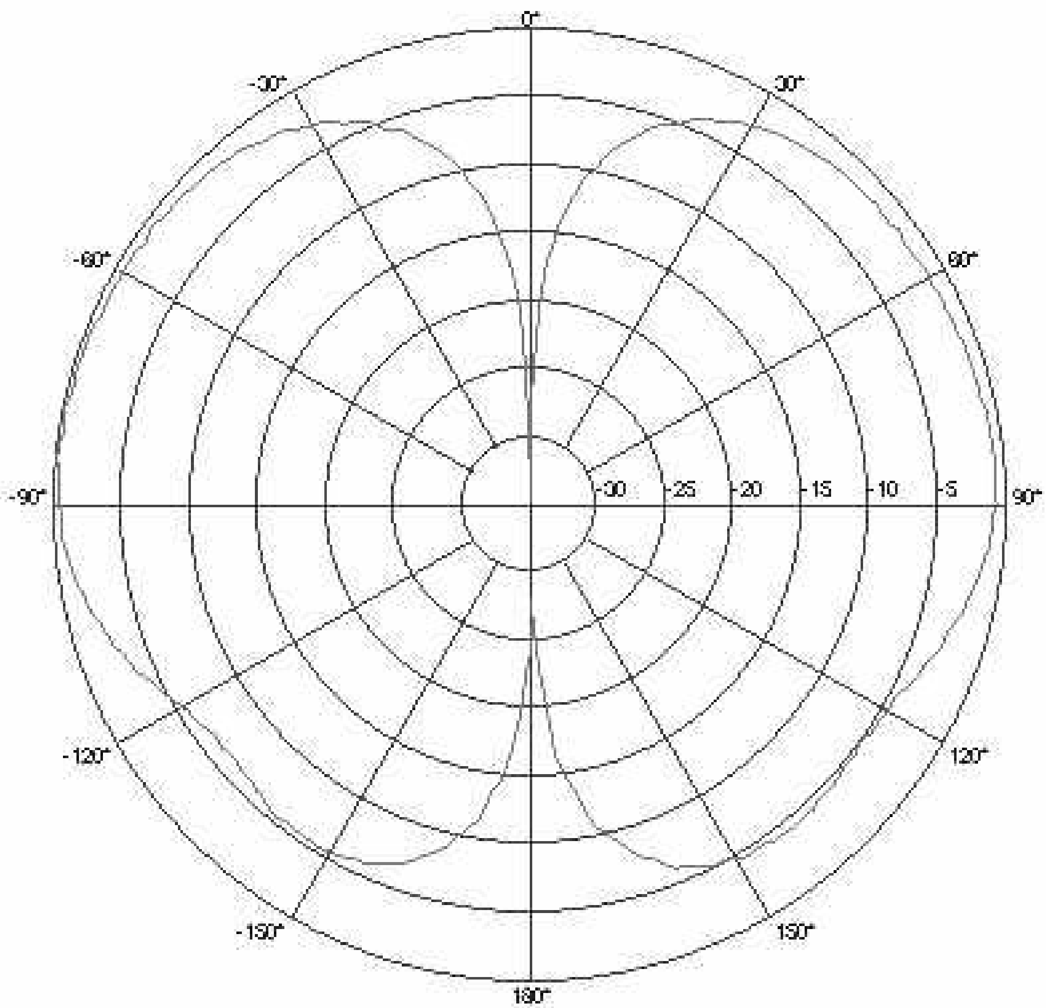

Figure 1
Local municipalities are also showing strong demand for wireless connectivity. Homeland security has heightened public safety concerns. Many cities are choosing to use IP-based technology in potentially vulnerable areas. For example, cities are installing digital cameras with wireless feeds to monitor traffic lights, public

buildings, sports venues, and other large public gathering areas where effective visibility is needed if police must be called into action. With broadband wireless access, a patrol vehicle's mobile data computer (MDC) can be updated with current department files as well as live video feeds. Municipalities also use SCADA (supervisory control and data acquisition) systems for such things as sewage treatment plants and flood control systems. Historically, these systems got by with 900 MHz radio systems. However, today's systems have feature-rich monitoring capabilities requiring higher bandwidths. Wireless-LANs provide a quickly deployable, cost effective solution.

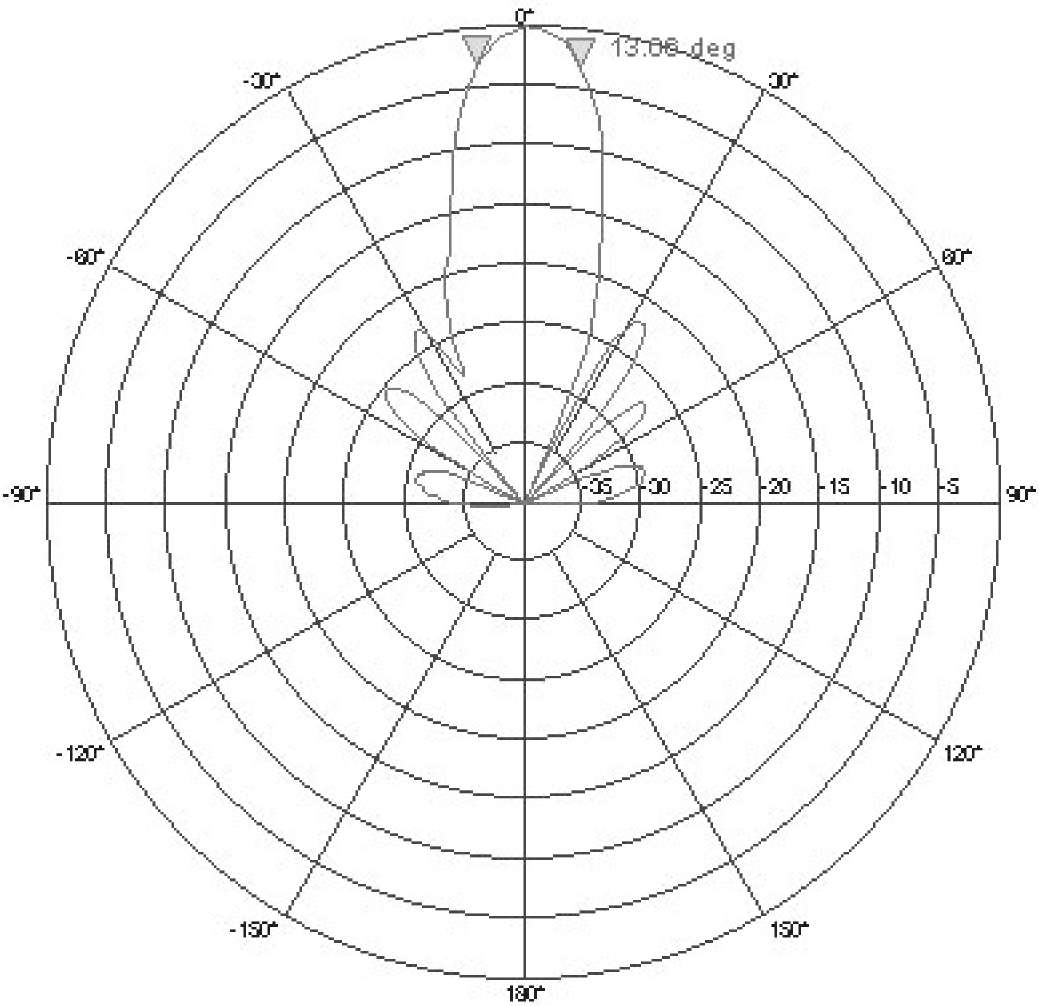

Figure 2

In addition to the two basic pieces of equipment mentioned above (transceiver modules and wireless access points), WLAN infrastructures contain a series of antennas. Antennas play an important role in overall WLAN configuration by directing radio frequency (RF) into an area in a specific coverage pattern. Becoming familiar with basic antenna technology and understanding the factors affecting antenna functionality will help in the selection of the right antennas for specific applications. The correct antenna will provide the coverage pattern best suited to individual site requirements. Two types of antennas are typically used in WLAN applications. Omni-directional antennas provide a 360-degree coverage pattern on the horizontal plane. In other words, the pattern is doughnut shaped which is ideal for square or close to square areas (Figure 1). Directional antennas concentrate the coverage in one direction by creating a conical-shaped pattern (Figure 2). Antenna pattern directionality is specified by the angle of the beam width, which is typically from 15 degrees to 90 degrees. Directional antennas are ideal for elongated areas, corners, and outdoor point-to-point applications.

Proper antenna positioning and installation will ensure the best coverage and service. For indoor applications, antennas should be mounted as high and clear of obstructions as possible. If possible, mount on or close to the ceiling. When mounting antennas on the ceiling, it is important to try to keep at least two feet from sprinkler heads and metal lighting fixtures. For both indoor and outdoor applications, try to keep RF cables as short as possible to minimize RF loss. Try to place the access point as close to the antenna as possible by bringing the Ethernet cable to the access point.

Further understanding of Wireless-LANs can be gained by a review of the protocol specifications. Wireless-LANs operate primarily in unlicensed frequency bands. In June 1997, the IEEE developed the mechanics of the 802.11 protocol which has gone on to become the dominant Wireless LAN protocol. Further revisions yielded the development of 802.11b in 1999 and 802.11a in 2001. The 802.11a radios transmit in the 5 GHz range and send data up to 54 Mbps using OFDM (orthogonal frequency division multiplexing) while the 802.11b radios transmit at 2.4 GHZ and send data up to 11Mbps using DSSS (direct sequence spread spectrum). As explained below, the 802.11a physical layer is further segmented which directly impacts antenna design criteria.

The operating frequencies of 802.11a in the United States fall into the Unlicensed National Information Infrastructure (U-NII) bands: 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.725-5.825 GHz. Within this spectrum, there are twelve, 20 MHz channels, and each band has different output power limits. For reference, Code of Federal Regulations, Title 47, Section 15.407, regulates these frequencies in the United States. The FCC Title 47, Section 15.407 regulation can be summarized as follows. For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed 50 mW (i.e. terminal operations). For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed 250 mW (i.e. mid-base operations). For the band 5.725-8.825 GHz, the peak transmit power over the frequency band of operation shall not exceed 1 W (i.e. base station operations).

Radiall/Larsen Antenna Technologies manufactures a complete family of 802.11a/b WLAN antenna products (Figure 3). To accommodate a variety of WLAN infrastructure applications, the antenna family is available in a range of frequencies including 2.4 GHz, 5.2 GHz, 5.8 GHz, and Dual Band. Leveraging industry-leading technology has led to the development of low profile indoor antennas with innocuous designs that blend into their background. Included in the indoor family are the Omni-Ceiling antenna and the Wall-Mounted Directional Patch antenna. The Omni-Ceiling antenna generates an omni-directional coverage pattern much like a dipole array, but with a small, low profile form factor due to its patented wire-patch technology. The Wall-Mounted Directional Patch antennas generate a 70-degree horizontal coverage pattern and have an articulated mount that enables 120 degrees of horizontal movement.

The Radiall/Larsen offering also includes the Radome Omni antennas and Planar Arrays for indoor/outdoor applications. Radome Omni antennas feature a center-fed co-linear dipole design that assures peak gain stability across the frequency band. The Radome enclosures are made from a rugged resin that retains its stability under long-term exposure to UV, moisture, heat, cold and impact for reliable performance in harsh outdoor environments. Planar Array antennas generate a conical-shaped pattern used mainly in outdoor point-to-point applications. Many of the Radiall/Larsen antennas were developed in close cooperation with major WLAN OEM's.

With a focus on antennas for low-power base stations, terminals, and mobile applications, Radiall/Larsen Antenna Technologies has been a premier manufacturer for over 30 years. The company also has a strong presence in custom OEM development. Radiall/Larsen Antenna Technologies is a subsidiary of Radiall, a global manufacturer.

For more information, see www.radialllarsen.com