IN THE 802.11a WORLD, FASTER ISN'T NECESSARILY BETTER.

Static symbol

By Maury Wright, Editor at Large

Borne like a badge of honor by proponents of new IEEE 802.11a WLAN (wireless-LAN) products, the claim of a 54-Mbps data rate has set high expectations. Indeed, many expect the technology to carry multiple HDTV video streams as effortlessly as it does the trickle of data bits that creep from the Internet. Will it deliver on the promise? Or will errors in transmitting data symbols over RF waves resemble static from a distant radio station? The answer lies in the future, but read on to find out how my first tests of 802.11a products turned out.

Actiontec Electronics (www.actiontec.com) recently sent me a set of its brand-new 802.11a products, which are driven by chips from Atheros Communications (www.atheros.com). As with all 802.11a devices, the products operate in the 5-GHz frequency band. The IEEE 802.11a standard specifies a maximum data rate of 54 Mbps, but Atheros also supports a proprietary turbo mode that can deliver higher speeds. The company claims its latest offerings can top 100 Mbps, and the implementation that Actiontec uses presumably tops out at 72 Mbps.

Actiontec sent me both a wireless access point and a PC Card for a notebook computer. The access point is much like the first WLAN access point I tested almost five years ago; it's basically a simple bridge between wired and wireless LANs. As the technology matures, expect to see access points that include router, firewall, Ethernet-switch, and other functions of 2.4-GHz, 11-Mbps 802.11b products.

The products arrived with sparse documentation. I found a brief set of instructions on how to configure the access point, and the manual indicated that the products should work out of the box for most installations. So I connected the 802.11a access point via Ethernet to one of the ports on the Ethernet switch that's integrated in my Linksys (www.linksys.com) 802.11b router.

Next, I turned to my Compaq (http://thenew.hp.com) Evo notebook, which houses an 802.11b module in the MultiPort slot in its lid (**Reference 1**). I disabled the 802.11b module, powered down the notebook, and removed the module from the MultiPort slot. Then, I inserted the Actiontec 802.11a PC Card into the notebook's PC Card slot and rebooted the system. As the brief PC Card instructions promised, Windows detected new hardware and asked for the CD. Less than a minute later, installation was complete, and the notebook was restarting.

I fired up Internet Explorer and immediately found myself at my home page. My cable modem feeds the Linksys router, and the Actiontec bridge connected the notebook to the router.

DOWN TO BUSINESS

With a connection up and running, I planned to run a series of performance tests similar to those I

Actiontec's wireless access point bridges wired and wireless LANs.

ran when comparing Ethernet, powerline networking, and 802.11b (**Reference 2**). Using Windows Explorer and my stopwatch, I'd time a copy operation for a 20-Mbyte block of data.

Working at the notebook, I copied the files from my main work system, which connects to the Linksys switch via 100-Mbps, full-duplex Ethernet. The 802.11a link to the notebook would be the slowest link in the chain because the connection between the Linksys switch and the Actiontec access point was also operating at 100 Mbps full duplex.

When I use the Compaq 802.11b module, I realize a maximum data-transfer rate of 2.1 Mbps. Networks never deliver their stated maximum rates, but the 802.11b rate on the Evo is even lower than what other 802.11b products deliver because the MultiPort Module uses USB 1.1 internally to link the wireless-network adapter. Still, the convenience of having 802.11b integrated in the lid—rather than having an antenna protruding from a PC Card—is extremely compelling. Using Linksys and Agere (www.agere.com) Orinoco 802.11b PC Cards, I've clocked rates as high as 4.3 Mbps on this test.

With the Evo notebook and its 802.11a card sitting about 15 feet from the access point, my first test yielded a rate of 9.2 Mbps on the transfer. I was surprised, however, that the status utility for the Actiontec card wasn't reporting full-speed operation. Indeed, the utility sometimes reported a transmit rate of 54 Mbps, but the receive rate was generally 32 to 48 Mbps. I ran the test with the notebook sitting directly next to the access point and achieved the same results. Still, the performance was far better than any 802.11b product I've tested.

Since the conception of the 802.11a standard, however, I've worried about the range of such products. The laws of physics make range more problematic at higher frequencies. I've been outspoken about 802.11b products' failing to deliver anywhere near their advertised range, and I've feared that the "a" products would be even worse.

LACK OF REACH

Proponents of 802.11a, however, claim that the superiority of the standard's OFDM (orthogonal-frequency-division-multiplexing) modulation scheme will overcome range issues. Early reviews of 802.11a seem to indicate that my fears were unwarranted. Several testers have reported lower speeds as the distance between access point and client grows but have generally claimed few range problems. I can't say the same.

My first stop with the 802.11a-equipped Evo was my chair in the living room, about 55 feet from the access point, where I spend many nights and weekends with the notebook in my lap. The status utility reported a transmit rate of 24 Mbps and a receive rate of 12 Mbps, presumably still faster than 802.11b. I accessed a few Web pages with no problem. The file-transfer test, however, didn't go so well. On several occasions, Windows aborted the test before completion due to a dropped connection. At best, I measured a rate just over 1 Mbps on a complete transfer.

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At the next stop, my patio, about 65 feet from the access point, things got even worse; I couldn't even surf the Internet. When I use the Compaq 802.11b module in that same spot, I get a 2.1-Mbps rate. I even get a 1.7-Mbps rate in the corner of my back yard, 90 to 100 feet from the access point.

CONFIGURATION CHAOS

Because I hadn't configured the access point in any way, I thought I might possibly boost performance by doing so. In fact, I hadn't even named my WLAN. The configuration utility on the Evo had no network name, but it was automatically finding the default Actiontec_11A network. Still, it worried me that that the network-name field was blank, and I wanted to test-drive other features, such as security settings, anyway.

As with most routers and access points, you interface with the Actiontec access point by entering its IP (Internet Protocol) address in a browser, which summons a configuration page. Near the access point, I entered the prescribed address: 192.168.0.250. After a minute or so, I got a message indicating that the page wasn't available.

Immediately, I expected that the problem was subnet-related. The "192.168..." IP address range is reserved for private networks behind routers, so anyone can use that range of addresses. But every other home-LAN product I've seen uses a "192.168.1.xxx" address. The "0" in the third octet placed the Actiontec product on a different subnet from the Linksys router, which comes configured with an address of 192.168.1.1.

I expected that I'd be able to change the IP address if I could get to the Actiontec configuration page. So I disconnected the access point from my Ethernet LAN and cycled power to both the access point and the notebook. I assumed that, even though only the two Actiontec products would be connected, I'd be able to access the configuration page. It didn't work.

I phoned Actiontec tech support and was connected after a wait of only a couple of minutes. The tech immediately stated that I had a subnet problem, and suggested the fix I had just attempted. When I told him that it hadn't worked, he suggested that I change the IP address in my Linksys router to "192.168.0.200." The tech also admitted that the 802.11a-access-point software was a bit immature.

NET RISKS

I was tempted to end my experiment right there, rather than placing my 802.11b and Ethernet networks at risk. But I figured I could always perform a hard reset on the Linksys product if necessary to get back to the factory configuration.

Changing the IP address on the Linksys router proved a bit trying. It took several power cycles to the router, my desktop PC, and the Ethernet switch in my office. I first changed the IP address but then had no net access because the DHCP (Dynamic Host Control Protocol) IP address server in the router was now on the wrong subnet. After three power cycles, I had my network back up, and I was finally able to access the Actiontec configuration page.

Unfortunately, there's little you can change in the 802.11a access point via the simple menus. You can name a network, you can enable wired-equivalent-privacy security, and you can change the IP address. You can handle more advanced settings only via a clumsy command-line interface that's not well-documented in the supplied manual. I did create a new network name in the access point and in the client system, but I didn't realize any better performance.

TURBO LOCKUP

Still, I wanted to try the turbo mode, and that setting was available on the configuration page. I enabled it and rebooted the access point. The client-configuration utility had no explicit way to enable turbo mode, but the status screen included a turbo/nonturbo indicator. So, I assumed that the client would automatically switch to turbo mode. After the reboot, however, I could get no wireless connection.

According to the manual, you can depress a reset switch for five seconds to make the access point revert to factory defaults. I tried this tactic several times to no avail. I finally went to my desktop and was able to access the Actiontec configuration page via an Ethernet connection. After disabling turbo mode, I got back the wireless connection.

After my tests, I'd say that this 802.11a product needs a lot of polish before Actiontec sells it to consumers. And I don't necessarily blame the company. For the most part, Actiontec is selling a product based on an Atheros reference design and software base. It's apparent that Atheros is new to the game.

I'D JUDGE THE RANGE/BANDWIDTH LIMITATIONS I EXPERIENCED TO BE PHYSICAL-LAYER-RELATED. WE'LL HAVE TO WAIT TO SEE WHETHER FUTURE REVISIONS OF THE 802.11A CHIPS DELIVER ON THE PROMISE OF THE OFDM PHYSICAL LAYER.

I'd expect products based on chips from Intersil (www.intersil.com), Agere, or other 802.11b veterans to be far more polished because the 802.11a and 802.11b MACs (media-access controllers) are the same; few software changes should be required.

Meanwhile, my experience has me wondering whether 802.11a will ever carry video streams. I recently wrote an article about the upcoming battle between 802.11a and ultrawideband technology in home-entertainment networks (**Reference 3**). In that article, I reported that start-up Magis Networks (www.magisnetworks.com) was relying on an 802.11a-compatible physical layer and leveraging a proprietary MAC layer to carry video. Magis believes that the collision-sensing MAC is the weakest link in the 802.11a technology stack. I saw a prototype of Magis' system in operation.

However, I'd judge the range/bandwidth limitations I just experienced to be physical-layer-related. We'll have to wait to see whether future revisions of the 802.11a chips deliver on the promise of the OFDM physical layer. □

References

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