

Missing the Next (Radio) Wave

The FCC leaves tomorrow's promising wireless technologies on the beach

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By Thomas Hazlett

WHEN COMETA NETWORKS announced, in December 2002, that it would construct 20,000 Wi-Fi hotspots across the United States in two years, the buzz was deafening. The New York Times heralded a "Wi-Fi boom." Intel Capital announced \$150 million in equity funding for Wi-Fi start-ups and a \$300 million marketing budget to tout the wonders of its wireless Centrino chip. Out came the hockey-stick growth charts, last sighted on PowerPoint slides about March 10, 2000. Happy days were (nearly) here again.

Yet, in May 2004, Cometa -- a joint venture of AT&T, IBM, Apax, 3i and Intel -- slipped gently into the cyber-night. It had created just 200 new hotspots, had run through about \$6 million, and could not find investors willing to risk more -- not even at Intel Capital. The 17-month collapse of the "next big thing" was rapid even by dot-com-bubble standards.

Such blunt market feedback saves equity markets from going too far down the wrong road. But when hotspot hype infuses regulators with irrational exuberance, airwaves sought for other advanced wireless networks are denied entrepreneurs who see alternative technologies as more efficient.

Wi-Fi systems are extremely useful as short-range network extensions -- as cordless PCs. Using wireless to share your upstairs cable-modem connection with a downstairs PC may avoid an expensive indoor-wiring job; allowing Internet users to roam around a campus, factory, or office complex without entanglement increases productivity. Other innovative uses arrive daily. But self-limiting factors may box in such applications relative to other systems.

This is because Wi-Fi is provided in a very delicate resource space: unlicensed spectrum. Unlicensed, but hardly unregulated. The Federal Communications Commission sharply restricts emissions and transmission on these bands.

While some claim that the explosive growth of users in unlicensed bands renders exclusively assigned spectrum rights obsolete, the truth is that Wi-Fi works best where users do not share spectrum. With strict power limits, users stay out of each others' way.

Territorial Imperative

Mike Chartier, an Intel wireless-technology expert, notes that "Wi-Fi works because of de facto land-owner rights." For example, his wife's notebook Wi-Fi modem interfered with their cordless phone.

"We replaced the expensive 2.4 gigahertz phones with [cheaper] 900 megahertz ones, problem solved. Later, wanting the caller ID feature on the 2.4 GHz phone, she reconnected it in a different location, trading off a smaller amount of interference for the added feature."

The key to success was her control of the relevant space -- the radio spectrum in her home. Wi-Fi works best where one entity has this sort of jurisdiction. Campuses and enterprises successfully deploy hotspots, with IT departments configuring networks to optimize local airwaves. They password-protect access and prohibit unauthorized access points. For a more commercial example, note the nation's airports, where airlines tracking baggage via short-range transmissions are forced to

use, and pay for, airport-owned Wi-Fi systems.

But what allows Wi-Fi to work as a localized unlicensed application severely limits its utility when efficiencies are best provided by wide-area networks. A "tragedy of the commons" can develop when unlicensed transmissions go beyond the walls of home or office. When unlicensed bands are used by Wireless Internet Service Providers, for instance, conflicts often arise. Then the WISPs plead with regulators for protection.

Some WISPs are even asking the FCC to give them exclusive rights to use Wi-Fi's unlicensed spectrum -- a license by another name. But property rights are just what unlicensed frequency allocations rule out.

Exclusivity, protecting investment in new networks, is delivered via licensed frequencies. The \$150 billion spent to build six national wireless-telephone networks depends on airwaves managed by licensees who act as de facto spectrum owners. This proves extremely valuable in national deployments providing service beyond pinpoint hotspot locations.

Popular Success

Consumers acknowledge this: There are 164 million mobile-phone subscribers who will buy about one trillion minutes of use this year, generating more than \$80 billion in consumer surplus (in addition to more than \$90 billion in revenues for operators). This constitutes intense sharing of radio spectrum by disparate spectrum-users who must cooperate if chaos is to be avoided. Well-defined frequency rights and market competition regulate these bands.

Exactly the same success would extend to data services, were additional licensed spectrum made available. Yet, the FCC addresses WISP pleas with additional unlicensed allocations-300 MHz in 1997, 255 MHz in 2003-while effectively doing nothing for licensed spectrum since 120 MHz was allocated for personal communications services (PCS) in 1990-1994.

Take the TV band, encompassing more than twice the total bandwidth now allocated to wireless phone service, yet absurdly underutilized. Rather than auction liberal use rights for unoccupied TV channels, allowing rival technologies to compete, the commission staff is drafting rules that would permit only low-power devices -- like Wi-Fi.

The regulatory rationale: "The Commission's rules for unlicensed transmitters have been a tremendous success. [The experience] shows that there could be significant benefits to the economy, businesses and the general public in making additional spectrum available for unlicensed transmitters."

Wrong. More unlicensed spectrum may have value, even though unlicensed bands made available in the past decade have largely proven a bust, but the FCC central-planning mandate is not the way to gauge this complex economic evaluation.

Numerous providers of advanced technologies, from Qualcomm to ArrayComm to IP Wireless to Navini Networks, ache to provide wireless broadband to homes and businesses via licensed frequencies. Such valuable wide-area options, excluded by unlicensed rules, could be neatly deployed on exclusively assigned spectrum. Surfing today's Wi-Fi bubble, the Commission leaves tomorrow's promising wireless technologies on the beach.

Craig McCaw hopes to exploit this regulatory blindness. Having made his initial \$7 billion or so by accumulating the nation's first cellular network (sold to AT&T in 1994), McCaw's Clearwire has been quietly accumulating licenses in the 2.5 GHz band. Here the FCC technically allows broadband

wireless using exclusively assigned rights -- but under such a contorted regulatory model that licenses sell at about a 98% discount to liberally regulated PCS licenses. McCaw aims to gain rule changes to allow him to offer nationwide competition to cable modem and DSL service.

Markets or Rules

Clearwire may simply be following Cometa to a financial funeral. But McCaw's risk capital, bidding against rivals for exclusive spectrum rights, seeks to create superior service by better controlling frequency access. The regulators' enthusiasm for unlicensed spectrum requires that wireless innovations be squeezed into spaces afforded by their rules.

Rival technologies should be free to compete. But government planning of spectrum markets does not allow this, when regulators decide which bandwidth is permitted. With allocations of flexible, exclusive spectrum rights, network operators or equipment vendors set their own rules. Market competition, not central planning, reveals the most useful technologies.

Each of today's mobile-phone carriers could save billions on licenses by transmitting in unlicensed bands. While operators are happy to use unlicensed bands in very local applications, they are unwilling to sink billions to create ubiquitous coverage, because the cost of "free" bandwidth -- complying with government power limits, putting up with competing users -- is too high. In Cometa's experience, the right to access "free" spectrum can be worth nothing at all.

The FCC should take heed. There are other "tremendous successes" besides those using unlicensed spectrum, and many unlicensed business models have proven a wasteful use of spectrum. Markets are dying to discover just where particular technologies make the most sense for any given slice of bandwidth. All they require is freedom, property rights and bandwidth.

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