



Independent, original, in-depth coverage of the trends and technology shaping the BWIA industry

Recipient of **Part-15.Org's 2002 Wireless Advocate Of The Year Award**

Steve Stroh, Editor

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FOCUS On Broadband Wireless Internet Access is founded upon the following tenets:

1. Internet technology is becoming the foundation for nearly all communications, commerce, and entertainment services;
2. For Internet access to be truly usable, always-on Broadband Internet access is required;
3. By the end of the first decade of the 21st century, Internet access will be ubiquitous;
4. In the "last mile", wireline-based technologies and systems will generally prove to be insufficient or not cost-effective to provide ubiquitous, always-on, Broadband Internet to most homes and businesses;
5. In the near term, Broadband Wireless Internet Access in all its forms – Sub 11 GHz, Above 11 GHz, Free Space Optics, Ultra Wideband, Licensed, License-exempt has emerged as *the most likely technology* to provide cost-effective, ubiquitous, always-on Broadband Internet Access.

FOCUS On Broadband Wireless Internet Access is written in an informal, easy-to-read style, with an emphasis on clear explanations of why a particular company, product, or development in the Broadband Wireless Internet Access industry is significant. Each issue contains a number of *original*, in-depth articles and news stories. *FOCUS* is a just-in-time, short-lead-time publication, using Adobe Acrobat (.pdf) format, and email distribution. *FOCUS On Broadband Wireless Internet Access* is published by:

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FCC Authorizes Operations In 70, 80, 90 GHz Bands

On October 16, 2003 the United States Federal Communications Commission (US FCC) announced that it will allow commercial communications use of "millimeter wave" spectrum previously reserved exclusively for US government use. The newly commercialized spectrum is in three bands - 71-76 GHz, 81-86 GHz, and 92-94/94.1-95 GHz, a total of 12.9 GHz. The new bands are known, collectively, as the "millimeter wave bands."

The millimeter wave bands are intended to facilitate very high speed point to point communication links at ranges of up to ten miles. Speeds of 1.25 Gbps have been demonstrated and speeds of up to 12.5 Gbps are projected to be achievable within the next few years.

While high density metropolitan areas were a primary target market for high speed communications services possible with millimeter wave communications systems, other types of markets are equally applicable where there is a requirement for such speeds. One primary application is "fiber bridging", allowing access to vast bandwidth available in fiber systems, without the delays and construction expenses required to install such fiber "lateral connections."

The most unusual operational characteristic of the millimeter wave bands is that the radiated

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beamwidths are described as “pencil-thin”; in practice, the beamwidth of this spectrum is as narrow as one degree, allowing considerable frequency reuse because many transmitters using the same frequencies can be operated in close proximity, with the signals easily isolated from each other.

Equally unusual from an operational standpoint is the “first come, first served” automated licensing model for the millimeter wave bands. License applications for use of this spectrum will be conducted via automated access to a “links in use” database. Applicants will submit an application for use of a portion, or all, of the millimeter wave bands over a path between two selected points. If there is no conflict with a previous filing for use of that spectrum on that path, the application is granted. If interference mitigation is required, the earliest filing for a particular path will be given preference.

The FCC has not yet released detailed information about the application process and overall administrative issues, but several troubling possibilities of how such a system may be “gamed” come readily to mind:

- Will the system determine whether an applicant does in fact have authority to construct a link from a given location? A “gamer” may well file thousands of applications for links between all major buildings in a metropolitan area, without the burden of any cost to file the application, actually constructing a link, or having the authority to construct a link from that point (not be the “rooftop communications coordinator.) If this happened, when a real, working link is applied for, the earlier “paper” link application would take precedence.
- Will the system include a mechanism to “age out” applications that are no longer operating? If not, links that were applied for and never built, or links that were built, but later removed (such as when a company vacates a particular building and no longer

requires a link from the abandoned building to another building?)

- Will the system be updated to address issues such as buildings being torn down, new buildings constructed, etc.?

I had a long conversation about these and other issues with Lou Slaughter of Loea Communications and Doug Lockie of Endwave Communications. I told them that such an automated system seemed ripe for manipulation and “gaming”, and that the technologies involved seemed particularly well suited to use a license-exempt model, as is done with the 57-64 GHz band. The two replied, pretty much with one voice, that potential customers of such high-bandwidth services were not willing to tolerate even a possibility of service interruption; that the possibility of “someone else setting up a system and causing interference” was intolerable, and a mere “faint possibility” of such interference was sufficient for the potential customer to lose interest in using wireless. Slaughter and Lockie told me that obtaining an “automatic license” was sufficient comfort for potential customers, but both readily acknowledged that such a “license” is no guarantee that interference wouldn’t occur, only that interference could be tracked down and a “cease and desist” order delivered and enforced. When I pointed out that their original point was that potential customers for such services couldn’t tolerate downtime on their links, and yet they readily conceded that interference was entirely possible despite the fact that a license is granted, neither had much to say.

For now, there will be a wait for the formal, detailed rules to be published. Initial “link licensing” and coordination with existing US Government links for the millimeter wave bands will be done using the FCC’s existing Universal License System (ULS). At some point the licensing for the millimeter wave bands will be transitioned to an independent system administered by one or more third-party database management organizations.

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Going forward, a more daunting task will be obtaining equipment for the new bands. Loea Communications has demonstrated equipment for the millimeter wave bands, but no other vendor has yet indicated that they plan to build millimeter wave systems. Cisco and Harris have both been mentioned as potential vendors in popular press reports but neither give much indication that the creation of the millimeter wave bands was very significant; Cisco offered a very bland statement and there was no mention at all from Harris. In my research of this story over the past two years, all indications are that Cisco's interest is primarily that such millimeter wave systems will make it possible for enterprises to build privately-owned Gigabit links, which will presumably mean more sales of Gigabit-enabled Cisco routers. Other than its Wireless LAN business, Cisco has not indicated much interest in Broadband Wireless Internet Access since shutdown several years ago of its Broadband Wireless business unit, and the resulting extensive write-offs that the shutdown entailed.

Even more daunting will be finding sufficient business that requires gigabit links and has a willingness to pay for such speeds. While there is some demonstrated demand for gigabit transport... is there enough of that business for a sustainable business?

Then there is the issue of competition for such business, primarily from 60 GHz links, Free Space Optical (FSO) links, and most potently, run-in-parallel 60 GHz/FSO links. 60 GHz and FSO are both license-exempt which could potentially be a potent advantage should the worst-case "gaming" scenario envisioned above come to pass.

With 7 GHz of available spectrum, the 60 GHz offers the ability to easily achieve 1 Gbps links and likely 10 Gbps links. 60 GHz offers nearly the same narrow beamwidths, but reliable range is limited to approximately 1 mile. The situation is much the same for Free Space Optical links – demonstrated speeds of 1 Gbps+ with reliable range of approximately 1 mile. The practice of

running the two systems in parallel was first attempted by the innovative service Provider expedient in Miami, FL and has now been adopted by several service providers. Operating 60 GHz and FSO links in parallel provides 5-9's reliability, compensating for FSO's unreliable operation in fog (no problem for 60 GHz) and 60 GHz's unreliable operation in heavy rain (no problem for FSO.)

One puzzling development in this story is that the company most identified with the development of these new bands, Loea Communications of Lihu, Hawaii seems to have "gone quiet"; their web pages formerly at www.loeacorp.com and www.loeacommunications.com are unavailable, nor is there any mention whatsoever of Loea or millimeter wave communications systems (only scattered mention of millimeter wave components for defense systems) on the sparse web page of Loea's parent company, Trex Enterprises of San Diego, California.

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FCC Releases Report and Order Allowing "Leasing" Of Licensed Spectrum

WT Docket No. 00-230 - Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets

The broad dimensions of this FCC action have been widely known for some time; the Report and Order was formally issued on October 6, 2003. The FCC will allow entities that hold spectrum licenses to "lease" their spectrum with a minimum of technical and administrative oversight. Such a change is a radical, disruptive departure for the FCC, which until now has required numbingly detailed applications for any changes to spectrum usage, with approvals or denials that could take years to be rendered.

The ability to "lease" licensed spectrum is, on the surface, a vast improvement to the current

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spectrum allocation paradigm . Over the years, spectrum licenses have been acquired by entities that can simply not make effective use of it. Only recently (but not retroactively) has the FCC included provisos that once acquired, licensed spectrum must actually be used. In reality, the “proof” requirements of spectrum usage are so minimal that all that is required to retain a spectrum license in some cases is construction of a very minimal system, a single customer, and revenue of \$1/year. Small wonder that licensed spectrum is seldom, if ever, “reclaimed.”

Licensed spectrum is desirable. Licensing of spectrum offers exclusive usage of a given segment of spectrum in a given geographic area – fairly effective protection from interference. Use of high(er) transmitted power levels than equivalent license-exempt systems are possible, potentially resulting in greater usable range and potentially lower network construction costs. A spectrum license is considered to be a durable asset and a barrier to competition; for those reasons capital is often easier to obtain for a company that makes use of licensed spectrum. Licensed spectrum is also (incorrectly) perceived to be a scarce and valuable resource whose value can only appreciate over time (the “beachfront property” model).

Many, many spectrum licenses are accidents of history, commerce, or opportunity. Some examples are educational institutions holding spectrum licenses for Instructional Television Fixed Service (ITFS) spectrum at 2.5-2.69 GHz that have never transmitted anything, nor do they ever intend to. Others have acquired spectrum licenses opportunistically, such as Nextel’s purchase of Worldcom / MCI’s spectrum licenses in the Multichannel Multipoint Distribution Service (MMDS) band at 2.5-2.69 GHz. Such licenses are acquired, or retained not because of their actual utility to the license owner..., but rather because the licenses offer the potential for “the big payoff” at some point in the future, with very minimal “carrying costs” during the wait.

Yet, there is a very large cost in having licensed spectrum “warehoused” and not used productively. Systems that could be built, making use of unused spectrum don’t get built. Or, such systems do get built, but use systems and techniques that don’t work as well and aren’t as cost-effective, resulting in wasted opportunity for an otherwise better level of service to be offered, greater revenue to be earned, and society’s benefit as a whole.

So, WT Docket 00-230, on the whole, would appear to be step forward, allowing spectrum license owners an opportunity to realize some revenue from their spectrum licenses, and other entities a chance to make use of licensed spectrum that is otherwise unavailable to them. At least... that would be the conventional perspective...

My perspective of spectrum leasing is a bit more radical. That is... if a spectrum license owner leases their licensed spectrum... isn’t that in effect a legal, public, irrevocable admission that they do not need the spectrum that is licensed to them?

Admittedly, this is a very idealistic perspective of the fundamental basis for the FCC to grant spectrum licenses- to enable a licensee to “put the spectrum to use” and offer a spectrum-based service to the public. If the owner of a spectrum license won’t... can’t... doesn’t... offer a spectrum-based service to the public, then there seems little point in that entity retaining the spectrum license.

I said “admittedly idealistic” because the reality of spectrum licenses, the FCC as a whole, and nearly a century of spectrum regulation based on legalisms derived from laws intended for “real” property has created a legal, financial, and administrative monstrosity that simply cannot be rationalized with the viewpoint expressed above. There are enormous investments made in the perceived value of spectrum. There are multi-billion dollar businesses that would not survive if my “idealistic” perspective was applied to the allocation and reclamation of licensed spectrum.

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So, there is considerable, unalterable “momentum” to the idea of “scarce” licensed spectrum that is “already spoken for.” From the perspective of the FCC, the idea of allowing a spectrum license owner to “lease” their licensed spectrum is about as much as can realistically be accomplished to get otherwise unused licensed spectrum into productive use.

In limited circumstances... spectrum leasing may work, but for it to work, the spectrum license owners will have to be reasonable with their terms for leasing the spectrum- long lease periods (stability), and low costs.

But in the main, and in the long run, I don't think spectrum leasing will work very well, for two reasons. The first is that instead of earning a reasonable, patient return on an investment of licensed spectrum, I think it likely that most spectrum license owners will be driven to “make a killing because we're sitting on a scarce resource”. This is applying the “law of supply and demand”. You have a scarce resource, so you can demand more of it. If you price the scarce resource too low, it's quickly snapped up by someone else and you have nothing left to sell.

The second reason I don't think that spectrum leasing will work in the long run is that instead of paying for the use of licensed spectrum, would-be spectrum lessors will find it more cost-effective and a better business practice overall to make use of license-exempt spectrum. Yes, there are (perceived) disadvantages to using license-exempt spectrum instead of licensed spectrum. But, there aren't nearly as many disadvantages as conventional wisdom dictates, and those disadvantages are becoming less severe by the month as increasingly sophisticated technology, production volumes, and pricing pressure is brought to bear on license-exempt systems, bringing license-exempt systems much more on a par than licensed spectrum systems.

In the long run, the FCC, and society as a whole will be driven, inexorably, by market pressures, by legislative pressures, and technological rationality to move to a license-

exempt regulatory model for all spectrum. Spectrum leasing is a concept designed for the technological limitations of the previous century. When the FCC was founded in the wake of the Titanic sinking, radio technology was primitive and “legal” mandates were required to organize the radio spectrum so that the primitive radio technology of the day could be used efficiently. In this century, we have radios with the capability to decide whether a channel is in use for the next ten milliseconds and if not, transmit a data packet... (and if so, find another channel) all in the time it takes for an FCC staffer to blink an eye. Radios can make spectrum usage decisions to make use of otherwise unused spectrum in milliseconds; the equivalent decision by the FCC or a spectrum license owner takes weeks, months, even years. Much like an empty airline seat is an unrecoverable revenue opportunity after the plane door closes, every millisecond that a swath of spectrum is idle is a lost opportunity to transmit data to where it is needed.

In truth, we don't have a shortage of spectrum. We never have, nor will we ever. Usable spectrum is entirely a function of the technology that is applied to using it. In the 1930's we didn't have very good technology, so we didn't have much usable spectrum. In 2003, we have very good technology, and can make effective, cost-effective use of spectrum from “DC to Daylight”.

The tragedy of current spectrum allocation policies is that we simply have a lack of willingness to make efficient use of the spectrum. Fortunately... technology will prevail... it always does.



Wireless Communications Association (WCA) Creates Personal Broadband Alliance

On October 16, 2003 the WCA launched the Personal Broadband Alliance, whose announced mission is “to advance mobile and portable consumer services through the U.S. and around the world.” BWIA technology has been

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advancing rapidly, including being able to offer “mobility” and “portability” BWIA access for the last several years... though the overwhelming perception is that WCA represents “fixed” wireless service... to *premises*, not to individuals. For that reason, it makes sense for the WCA to carve out a semi-independent entity whose identity and perception can be directed entirely towards the perception of portable, mobile, and *personal* Broadband Wireless Internet Access. Because the WCA is now representing mobility and portability, its role will begin to overlap to some extent with the Wireless Local Area Network (WLAN) industry and the wireless telephony industry; Both are represented capably and assertively by their respective trade associations – The Wi-Fi Alliance in the case of the former, and the Cellular Telephone & Internet Association (CTIA) in the case of the latter. The presence of Intel on the WCA board was undoubtedly a factor, considering that Intel, far more than any other company represented by the WCA is very directly involved in the consumer market. The PBA web page is www.wcai.com/pba.



New Products!

News Items Of Note is a new feature of ***FOCUS On Broadband Wireless Internet Access***. In the last several issues of ***FOCUS***, it should be clear that 2003 will be the pivotal year for the Broadband Wireless Internet Access industry. News Items Of Note is intended to offer a more comprehensive view of selected, significant developments in the BWIA industry.

- fSONA March 19, 2003 – **News From Annual Wireless Telephony Trade Show Reflects Profound Shift In Interest to Potential of 802.11b / Wi-Fi**. The general perception of the news filtering out of Cellular Telephone & Internet Association’s (CTIA) annual Wireless

(2003) show is that license-exempt wireless systems will likely achieve parity in the number of customers for high-speed Internet access services... bad news an industry plunging headlong into a costly implementation of “3G” technology... especially when licensed and license-exempt “4G” (faster-than-“3G”) systems are already appearing in trial and production deployments. (Derived from numerous news reports and press releases from CTIA Wireless 2003 - <http://news.google.com/news?hl=en&q=%22ctia+wireless+2003%22>)

- http://www.parksassociates.com/inthePress/press_releases/2003/ubw1.html
-
- March 17, 2003 – **New Leaders Elected to Wireless Communication Association’s (WCA) License-exempt Alliance (LEA) Subgroup**. Elected were Alvarion Chief Evangelist Patrick Leary; AMA*TechTel Vice President Douglas Campbell; Intel Corp. Director of Business Development for Broadband Wireless Access Stuart Goldstein; Motorola Canopy Director for Sales and Marketing Thomas Hulsebosch; Prairie iNet CEO Neil Mulholland; and UniiGo Communications President & CEO Dudley C. Freeman. These six join LEA Chairman Douglas Keeney, Chairman of US Wireless Online, a large Broadband Wireless Internet Access Service Provider. This new streamlined board is expected to be more effective in its advocacy mission to advance the cause of providing Broadband Internet Service primarily through the use of license-exempt spectrum. Of particular note is Intel’s participation in both the LEA and the WCA as a whole. Previously Intel’s involvement in wireless was limited to Wireless LAN

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systems such as the ill-fated HomeRF system, and now 802.11b / Wi-Fi. Intel's "nomination" statement was particularly enlightening for the future of the BWIA industry, considering that Intel has the ability through its technology, partnerships, and financial strength to "make things happen", such as the (now) near ubiquity of the Universal Serial Bus standard. Statement begins: *Intel accepted a position on the WCA Board as part of its effort to increase the availability and adoption of broadband Internet access worldwide. Intel is also an active member and supporter of the IEEE 802.16a standards group for Wireless Metropolitan Area Networks in the 2-11GHz licensed and unlicensed spectrum. To ensure the success of the 802.16a standard, Intel will remain active in WiMAX to ensure interoperability between 802.16a compliant systems. Availability and adoption of broadband Internet access is critical to driving demand for more powerful personal computers, and is therefore core to Intel corporate strategy. Intel has and will continue to make investments throughout the broadband wireless value chain in order to create an ecosystem to accelerate broadband deployment and the sale of Intel silicon.* http://www.wcai.com/lea/le_news2003.htm#mar11

- March 17, 2003 – **Companies Collaborate To Offer Wi-Fi HotZones At Truck Stops.** Columbia Advanced Wireless, IBM, and RockSteady Networks have announced plans to provide HotZone services at 1000 truck stops nationwide. An estimated 25% of truckers carry laptops and the HotZones would allow truckers to check for loads, answer email, check

weather conditions, and other Internet tasks. Columbia Advanced Networks will install and operate the HotZones using IBM servers and RockSteady access and authentication software. Unlike coffee shop Wireless HotSpots, the value proposition for a truck stop Wireless HotZone is unambiguous – time is money for truckers, and being able to conduct business from their cab instead of waiting in line at an Internet kiosk is money well-spent.

<http://tinyurl.com/7xwv>

- March 17, 2003 – **SkyWeb Alliance Melds Three Large California WISPs.** In one of the first announcements of its kind, NextWeb, SkyPipeline, and SkyRiver Communications have formed the SkyWeb alliance to offer a branded Broadband Wireless Internet Access across the service territories of all three companies. This announcement is one of the first of what is expected to be a number of such branding and interoperability agreements. <http://www.skyweballiance.com/>
- March 17, 2003 – **LightPointe Introduces FlightStrata Product Line.** FlightStrata appears to be a refinement of LightPointe's successful Flight product line of FSO systems, incorporating beam steering, beam shaping, and automatic power control. Versions of FlightStrata be available at 52 Mbps and 155 Mbps. <http://www.lightpointe.com/index.cfm?useaction=news.NewsDetails&NewsID=52>
- March 13, 2003 – **FCC Opens Proceeding That Suggests The Possibility of License-exempt Operations in 2.5 – 2.7 GHz ITFS/MMDS Band.** This is really thinking outside the box... for the FCC. Sprint will undoubtedly mount a

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vigorous defense, as will Nucentrix and Clearwire Technologies, all holders of significant portions of ITFS/MMDS spectrum. Worldcom has already announced its desire to sell its ITFS/MMDS spectrum and small broadband wireless business. The FCC is absolutely right (and surprisingly courageous) in suggesting this possibility. There is ample available equipment, much of it adapted from equipment available in the 2.4 GHz band “right next door” and therefore quite cost effective and robust. There is 190 MHz of spectrum available in the ITFS/MMDS band – more than twice what is available in 2.4 GHz. This topic will be explored in depth in a future issue of ***FOCUS***, including my formal comments to the FCC on this issue. http://hraunfoss.fcc.gov/edocs_public/atchmatch/DOC-232107A1.pdf

- March 12, 2003 – **Intel Announces 802.11b / Wi-Fi Enabled Centrino Chipset**. Once upon a time, the mouse (port), video card, serial ports, parallel ports, disk controllers, Ethernet, USB, and modems were all optional in a PC... until Intel decided to include each of those features into successively new generations of chipsets, adding little or nothing to the cost of the computer, while insuring that every PC user would have access to those increasingly desirable functions at no additional cost. The latest wrinkle of Intel’s aggressive application of Moore’s Law is no different – adding the core functions of 802.11b Wireless Local Area Network into its latest generation of chipset. Intel’s announcement all but insures that 802.11b / Wi-Fi will be a yet another standard feature of every laptop shipping within a few months.

<http://www.intel.com/pressroom/archives/releases/20030312comp.htm>

- March 12, 2003 – **Ceragon Networks Introduces FibeAir 3128, Doubles Capacity Of A Single 28 MHz Microwave Channel To 311 Mbps**. The new product makes use of a cross-polarity interference canceller allowing double the usual capacity of a typical 28 MHz microwave channel in the licensed 6 – 38 GHz bands. http://www.ceragon.com/news_01_65.htm
- March 11, 2003 – **McDonalds Announces Trial Of Wireless HotSpots In Manhattan Restaurants**. In a move that’s been variously predicted since the beginning of the Wireless HotSpot trend, McDonalds has begun to equip its restaurants with 802.11b / Wi-Fi HotSpots. The trial phase consists of ten restaurants in Manhattan and is expected to expand to “several hundred restaurants in three major US markets by year’s end”. I think that the announcement of Wireless HotSpots is the proverbial “Camel’s Nose Under The Tent” gambit. Imagine the effect of adding a roof-mounted triple-sectored 802.11b on the roof of each standalone McDonalds to provide Internet service to nearby stationary, permanent customers. The primary expense in deploying a Wireless HotSpot is the ongoing cost of bandwidth, and in this scenario, the “permanent” customers could easily pay enough for the service to offset much if not all of the bandwidth cost, allowing McDonalds to provide HotSpot service to itinerant customers at little or no cost, providing even more of a draw. <http://tinyurl.com/7xyv>
- March 11, 2003 – **Motorola Offers New Canopy 20 Mbps P-P System**. This newest version of the well-

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received Canopy system has achieved ranges of 35 miles and 13 Mbps throughput in real-world deployments. The 20 Mbps version has the same form factor as the previous version. http://biz.yahoo.com/prnews/030311/cg_tu064_1.html

- March 11, 2003 – **Alvarion Unveils BreezeAccess Go – New Line of Wireless HotSpot Products.** In one of the most modestly named product offerings ever – “Go”, Alvarion begins its attack on a segment of the BWIA market from which it had previously been conspicuously absent. Go offers a very well-thought-out product for the Wireless HotSpot segment industry, including authentication by SIM card used in GSM phones and built-in support for aggregation services such as GRIC, Boingo Wireless, and iPass. Most compelling is that Go isn’t a standalone HotSpot product, but rather part of a system that includes “last few miles” backhaul via wireless. The cost-effectiveness of wireless backhaul is one of the key factors that will make Wireless HotSpots tenable in the long run. Now if Alvarion will just get a companion HotZone product out the door (purely conjecture on my part) for coverage of areas such as truckstops, campgrounds, concert venues, etc. http://www.alvarion.com/RunTime/Products_2020.asp?tNodeParam=33
- March 10, 2003 – **Intel Announces Year-to-date Investments In Four Companies Involved In Wi-Fi.** In short, Intel is voting with its considerable “wallet” on the success of 802.11b/a/g / Wi-Fi. The four investments are rovingIP.net, Vivato, Broadreach Networks Limited, and Pronto Networks. The funds invested are part of a \$150M portfolio that Intel intends to invest wholly in early-stage

companies involved in wireless. <http://www.intel.com/capital/portfolio/funds/icf.htm>

- March 4, 2003 – **Wi-LAN Launches Next Generation of Robust, Mature OFDM BWIA System.** Wi-LAN, one of the longest-established and most-experienced providers of BWIA equipment, announced the AWE-120-58 Ultima3 for the license-exempt 5.8 GHz band. Vendors that are shipping 5.8 GHz systems currently and in the near future are on their first generation of equipment; the AWE-120-58 is Wi-LAN’s second generation of OFDM-based systems. Arguably, Wi-LAN has the most experience with OFDM of any company in the BWIA industry. The AWE-120-58 is available in three distinct versions reflecting different applications – Point-To-Multipoint (MP), Rapid Deployment (RD), and Extended Range (ER). <http://www.wi-lan.com/solutions/main15.html>
- March 1-2, 2003 – **Groundbreaking Conference – Spectrum Policy: Property Or Commons Is Held At Stanford Law School.** This is one conference that, from all accounts, did it right to discuss the increasing disconnect in policy between the realities of wireless technologies evolving at the pace of Moore’s Law, and the advocates of “Spectrum As Property” who feel that rights to use portions of electromagnetic spectrum are a tangible asset. It was one of the most intensively “blogged” conferences to date, resulting in excellent coverage of the event from many different viewpoints. <http://cyberlaw.stanford.edu/spectrum>



BWIA Deadpool (New Feature)

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The BWIA Industry is one of continuous, and of late, very rapid evolution. The strong, fast, clueful, and sometimes just lucky survive. The weak, slow, clueless, and unlucky usually don't survive. There's so MUCH "evolution" going on - new companies coming into the market, and dead or acquired companies leaving the market, and this (hopefully not too regular) feature will try to keep tabs, especially on the going. In this installment, I'm featuring some smaller... and not-so-small companies that have apparently expired in the previous two years since I last updated my page on BWIA vendors.

- Adicom Wireless – died 2001, assets acquired by Carlson Wireless Technologies
- AirFiber, San Diego, CA – died February, 2003. Web page still online at www.airfiber.com
- BroadTel Wireless – web page doesn't answer, presumed dead
- Caly Networks, died April, 2002, assets acquired by Radiant Networks.
- Centerpoint Broadband Technologies – web page doesn't answer, presumed dead
- Galleon Wireless Broadband – web page doesn't answer, presumed dead
- Hybrid Networks – died 2002, assets acquired by ioWave. CEO Michael Greenbaum did a commendable job of winding down the company to protect the investments of customers.
- IDigi Wireless – web page doesn't answer, presumed dead
- IoSpan Wireless – redirect page indicates assets purchased by L-3 Primewave Communications.
- Optical Access – apparently reabsorbed into parent company MRV
- Raze Technologies – web page doesn't answer, known dead, but no details.
- Spectrum Wireless – web page doesn't answer, known dead
- Spike Broadband – died 2002, assets acquired by Remec

- Tantivity Communications – assets acquired by InterDigital Communications
- Triton Network Systems – died 2001, assets acquired by MDS CarrierCom
- Ultradevices – placed into stasis 2002
- Winnet MCS – web page doesn't answer, presumed dead
- Wireless Mountain Labs – web page doesn't answer, presumed dead

Events Of Interest To The Broadband Wireless Internet Access Industry

Please let me know of events that will be of interest to those in the Broadband Wireless Internet Access industry, and they will be featured as space permits. If I plan to attend a particular Event, it is noted.

- September, 2003 – Hong Kong – Broadband Wireless Asia 2003
www.scievents.com/bwasia
- September, 2003 – Washington, DC – WISP.X Wireless ISP Conference & Expo
www.scievents.com/wispx
- September 8-11 *or* September 15-18, 2003 – *Site To Be Determined* – IEEE Working Group on Broadband Wireless Access Standards Session 27 (held in conjunction with IEEE 802 Plenary Session)
grouper.ieee.org/groups/802/16/calendar.html
- September 16-18, 2003 – Finland – Software Defined Radio (SDR) Forum General Meeting
www.sdrforum.org/MTGS/next_meeting
- September 18-19, 2003 – Sydney, Australia – 802.11 Planet Conference & Expo Australia 2003
www.jupiterevents.com/80211/sydney03

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- September 24-25, 2003 – Hamburg, Germany - 8th International OFDM Workshop
ofdm.tu-harburg.de
- September 29-30, 2003 – Munich, Germany – 802.11 Planet Conference & Expo Europe 2003
www.jupiterevents.com/80211/munich03
- November 9-14, 2003 – Albuquerque, NM – IEEE Working Group on Broadband Wireless Access Standards Session 28 (held in conjunction with IEEE 802 Plenary Session)
ieee802.org/meeting/future_meetings.html
- November 25-26, 2003 – Cambridge, UK – Wireless Broadband Forum
www.broadband-wireless.org
- December 9-11, 2003 – Santa Clara, CA – 802.11 Planet Conference & Expo Fall 2003
www.jupiterevents.com/80211/fall03
- January 12-15, 2004 – Vancouver, BC – IEEE 802.16 Working Group on Broadband Wireless Access Standards Session 29 (held in conjunction with the other IEEE 802 Wireless Working Groups meetings)
grouper.ieee.org/groups/802/16/calendar.html

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