Focus

On Broadband Wireless Internet Access

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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From The Editor

The "Death" Of Broadband… ?

It's becoming increasingly popular to hail "the death of broadband". Covad Communications' entry into Chapter 11 bankruptcy, the impending death of Rhythms NetConnections, and the sudden disconnection of thousands of customers during the death throes of Northpoint Communications, and many other such stories make this an easy, and attractive story to report. It takes a bit more insight, and courage, to look at the bigger picture.

Many of the dead and dying companies were founded on the promises of the 1996 Telecommunications Reform Act which mandated that incumbent telephone companies cooperate with new companies by making their copper infrastructure and space in their central offices available on a wholesale basis. Investors bought into these business plans in a big way, and the telecom boom of the late 1990's was on.

With the "dot com bust" in 2000, trending towards depression (at least in the telecom industry) in 2001, there was a sudden (?) emphasis on business models that had a roadmap to profits… and surprise!, few of these new telecom companies had any real hope of profits in the near term. A factor in the demise of these new telecom companies was that the incumbent local telephone companies didn't exactly play fair with their competition… but they never really had played fair before, so it's puzzling why any company expected them to do so.

So, a brutally Darwinian process of consolidation began, and is, at this writing, ongoing.

The death and consolidation of so many telecom companies engaged in the Broadband Internet Access industry has apparently led many in the analyst community and popular press to conclude that "Broadband Is Dead". They support this viewpoint by citing factors such as the cutbacks in streaming media services, cutbacks in deployment schedules of DSL, troubles in major broadband companies such as @Home, etc.

It's with considerable courage of my convictions that I declare the "Broadband Glass" half-full, rather than half empty. I do so by observing a simple, seemingly self-evident truth: that demand for Broadband services, both consumer and business, continue to exhibit a steady increase in demand.

That means, to me, that the Broadband business *is* out there. It remains for companies, large *and* small, to figure out how to satisfy that demand, and doing so profitably.

Ahhh… but there's the rub… *profitably*. If there's no path to profits, then there's not much of a business.

It seems obvious in hindsight that many of the upstart telecom companies spawned in the wake of the 1996 TRA didn't take the part about profits too seriously. They didn't really need to – risky as such businesses were, there were plenty of investors.

For example, making a profit on Digital Subscriber Line (DSL) services, when you are paying a substantial portion of your profit to a local telephone company (they provide the copper lines, install them, maintain them, rent in the central office, etc.) was problematic at best.

So… how *does* a new telecom company compete with entrenched, well-funded competitors like local telephone companies? Simply put, they've got to be faster, cheaper, better.

Most of the failed telecom companies fail this test. In too many cases, they simply *weren't* faster, or better, or cheaper. Companies that truly want to survive embrace all three- they strive to be better *and* faster *and* cheaper! In retrospect, much of the management of these new telephone companies were brought in from the existing telecom industry, which largely turned out to be a bad labor pool to draw from given the wrenching changes occurring in the telecom industry that largely nullified these executive's skills.

One facet of executing faster, better, cheaper is to be quicker (than the incumbent competition) to embrace and exploit new technology and use it to offer services that are significantly differentiated from the services offered by the incumbents. I think that not doing so is a primary factor in the deaths of many post 1996 TRA telecom companies.

To summarize, I believe that there is *considerable*, ongoing (if not substantially increased – see below) demand for broadband services, and that by aggressive use of new telecom technologies can enable new broadband service providers to provide such services better, *and* faster, *and* cheaper.

It will come as no surprise that I consider Broadband Wireless technologies to be one of the weapons that smart, innovative telecom companies can use to establish profitable new lines of business. Wireless offers a number of critical advantages – broadband speeds, quick deployment, wide service areas, relatively low costs, and best of all – near total independence from the local telephone company.

That's not to say that making use of wireless-*anything* renders a company competitive. There are plenty of dead telecom companies that employed older wireless technologies and new generation wireless technologies that attest that wireless technology is no panacea. To be successful and profitable in the long term requires that a service provider choose their technology carefully, and change their business model to embrace all possible advantages of wireless.

I fully expect to see more attrition of both service providers and equipment vendors in the Broadband Wireless Internet Access industry. But, I also expect *new* companies to be emerge that can fully embrace and exploit the full potential of Broadband Wireless technology. This is why I remain convinced that, contrary to "the experts" and most press, the Broadband Era *is just beginning*; in no way is the Broadband Era dead.

Some Aftermath Of 9-11

I began this editorial on September 12, the day after the appallingly successful terrorist attacks on New York City and Washington DC. I can (still true) barely comprehend the appalling loss of life, and have no particular expertise to offer about how it could have been foreseen, or averted, or the response better handled… so I won't try. My grief was no more or less intense than that of any other citizen, so I won't use ***Focus*** to relieve my personal angst.

My further apologies for the lateness and the relative brevity of this issue. I had not intended to combine the September and October issues. Subscribers will have their subscriptions extended by an additional issue. Like most, I was mesmerized by the coverage of the tragedy in New York City, Washington, and Pennsylvania. When I would try to write, the words simply wouldn't come; the muse had fled. It was nearly ten days before the words finally did come, and then fitfully. The September 2001 issue gradually became the September / October 2001 issue.

As the weeks progressed after 9-11, it's become apparent that air travel in the US and Internationally has been irrevocably altered to some extent- undeniably in the short term, and arguably in the long term.

Returning to service after 9-11, air travel is now considerably less convenient. Despite the increase in security measures, there has been a severe near-term decrease in the number of people flying. My personal theory is that much "discretionary" flying has been judged no longer worth doing, with increased time spent in airports, inability to park near terminals, reduced levels of customer service due to layoffs ("service with a snarl"), etc.

Increase in IP Videoconferencing

The rapidly-slowing economy had already caused many companies to cut back severely on air travel, and have moved increasingly to teleconferencing, both audio-only and videoconferencing, especially high-quality Internet-based videoconferencing. Much of the bad reputation that videoconferencing has received to date has been directed at the complexities, limitations, and expense of using of Integrated Services Digital Network (ISDN) to communicate between videoconferencing units. With high-bandwidth Internet connections, videoconferencing over Internet Protocol (IP) is not only feasible, but preferable to the use of ISDN. IP is simpler (it's just another network device to the corporate techies, and unlike ISDN, the complexities of IP videoconferencing such as router

reprogramming, are within their capabilities). ISDN was limited to 128Kbps of data, requiring slow frame rates and heavy (expensive) data compression, and there is little increased cost for use of videoconferencing over an existing broadband IP connection. I take no pleasure in how this increased demand for Internet bandwidth has materialized, but is it's apparent that it has in fact materialized.

Acceleration of "Upper 700 MHz" Band

Another likely result of the events of 9-11 is that there will be a large increase in the demand for two-way radio usage for public safety, especially for coordination between different groups such as federal response teams, national relief agencies, and local public safety agencies. Particularly intense will be demand for digital and encrypted two-way radio systems. Limited inter-agency communications capability already exists, but it is quickly overwhelmed in large scale disasters such as the attack and subsequent collapse of the World Trade Center on September 11. The newly created Cabinet Office of Homeland Security might well spearhead such an effort, or potentially the Federal Emergency Management Agency (FEMA) may be given this task.

The "Upper 700 MHz Band" is a long-term plan to create more spectrum for communications by reallocating spectrum used by television broadcasting channels 60-69 (746 – 806 MHz, a total of 60 MHz). Part of the Upper 700 MHz band is to be auctioned for commercial use, and part is to be allocated to public safety use. Before the Upper 700 MHz band can be converted to communications use, there are approximately 100 television broadcast stations transmitting on channels 60-69 that need to have their transmitters converted to operate on channels 14-59. The owners of those stations are effectively holding the Upper 700 MHz band for ransom, to be paid by the new communications users. I predict that, as a result of the Events of 9-11, the reallocation of the Upper 700 MHz band will be put on a fast-track, with federal funds quietly allocated to pay the television broadcaster's reasonable relocation expenses.

No Reallocation of DOD Spectrum For "3G"

Another effect of 9-11 is that any discussion of reallocating US Department of Defense spectrum for future "3G" wireless telephone services is undeniably *dead*. Some of the DOD spectrum in question is used by the DOD for satellite communications… and satellite systems will be a critical resource in the vastly increased activities of US military forces in the (already in progress) "War On Terrorism".

On September 24th, the FCC declared that the 2.5 – 2.69 GHz Instructional Television Fixed Service / Multichannel Multipoint Distribution Service (ITFS / MMDS) band would not be reallocated for future "3G" wireless telephone services (though it changed the "fixed-only" designation to allow mobile use).

With these two events, it becomes more imperative to the wireless telephone industry for the Upper 700 MHz Band to be made available for communications use.

A subtle effect of 9-11 will be that the "tactical" value of Broadband Wireless Internet Access has become more widely recognized. BWIA technologies, such as high-capacity point-to-point RF and optical systems, are ideal for use in "edge of the disaster" scenarios. ("Edge of the Disaster" refers to relatively localized events, where communications and other infrastructure in the areas surrounding the disaster remains largely intact, requiring only quick-to-deploy "bridging" technologies, such as wireless, to restore communications within the disaster area.) BWIA technologies are inherently quick to deploy, as very ably demonstrated by Winstar's New York City teams in the days following 9-11 (additional information was requested from Winstar, but no response was received).

UWB Publicly Stalled, But Military Use Accelerated

Progress on Ultra Wideband (UWB) technology becoming yet another license-exempt mode will likely become quietly stalled as the existing concerns about UWB as a "stealth" wireless communication system are elevated over concerns that "UWB Stealth Communications Systems could fall into the hands of terrorists". The fears about "stealth communications systems" are, in fact, well founded. Tactical military communications such as those used by special forces troops currently make use of UWB technology (*much* more sophisticated than what has been proposed in commercial UWB systems) to great effect in tactical communications systems. The military's term for such systems is "Low Probability of Intercept (LPI), and that well describes it. If you don't know *exactly* what you are looking for, (low power) UWB systems are extremely hard to detect, and require highly specialized equipment to do so.

We're unlikely to hear very much from the surviving UWB companies about the "stalling" because they're likely to be quietly and quite profitably engaged in increasing their production of UWB equipment for the US military as the various services equip themselves for the new kind of conflict that we find ourselves enmeshed in. In addition to special forces communications, the rapidly-increasing armada of Unmanned Arial Vehicles (UAVs) will likely be making use of UWB technology to send data back to ground forces. In addition to UWB's stealth characteristics, it's highly useful for the amount of bandwidth that can be provided; useful for sending back intercepted communications and all kinds of video such as infrared and optical.

What Can You Do? Perhaps Emergency Communications

In the days after 9-11, 2001, many Americans asked plaintively "What Can *I* Do?" The answer that came was 1) Donate blood if you're able to do so, and 2) Donate money if you're able to do so. I'd like to suggest a few

other "direct" answers to wanting to do something that are particularly applicable to techies.

The American Red Cross and the Salvation Army rely mostly on motivated volunteers to assist in *effective* disaster relief. While some volunteer labor can be recruited and trained as needed, by far the most valuable and badly needed skills are those that require substantial commitment to training prior to disasters, such as shelter management, disaster assessment, and first aid. Everyone expects the ARC and SA to be there when it's needed, and it rarely fails that expectation. Increasingly, the ARC and SA are making good use of high-tech skills in its role, such as integrated communications, networking, and database administration. If you'd like to "do something" of long-lasting impact, and be somewhat ready for the next one, consider becoming a long-term volunteer with your local American Red Cross (or International equivalent) or Salvation Army. Both are worthy organizations.

Without exception, Amateur Radio Operators are operating behind the scenes of *every* disaster. Sometimes their role is visible to the public. More often, the role of Amateur Radio Operators are such tasks as helping staff communications positions at Emergency Operations Centers. Amateur Radio Operators can also find themselves *very* personally involved in disaster communications, such as when hurricanes remove *all* wireless communications facilities – wireless telephone towers, fire department antennas, etc. Amateur Radio Operators, because they own their own equipment, and understand the technology behind it, can often establish communications quickly after a disaster, while restoration of commercial communications must await the arrival of technical support services. While Amateur Radio is considered a "fun" hobby by many, there is a substantial portion of the Amateur Radio population that considers their radio skills to be a way of "giving back". Consider obtaining an Amateur Radio License and becoming familiar with Amateur Radio Emergency Communications. Considerable information on becoming an Amateur Radio Operator is available at the American Radio Relay League's (ARRL) web page – www.arrl.org.

As always, I would like to take a moment to ask that, if you find ***Focus*** to be useful and insightful, please take a moment to recommend it to colleagues. A subscription form is located on the last page of this issue for ease of printing and copying.

Thanks!

Steve

Focus On Broadband Wireless Internet Access:

www.strohpub.com/focus.htm

A Look At Public Wireless Internet Access Co-Ops

The popular press has become enamored with the story of Public Wireless Internet Access Co-ops of late. Sometimes called Guerilla Wireless, such groups purport to offer free wireless Internet access from their own locations.

An example is a user of Digital Subscriber Line (DSL) Internet access that lives in an apartment in a densely populated area that includes a nearby, popular coffee shop. The user wishes to use his laptop at the coffee shop and purchases an 802.11b wireless access point to connect to his DSL, and an 802.11b wireless card for his laptop. With reasonable line of sight between the two locations, the laptop can in fact access the Internet via wireless from the coffee shop.

The Co-op aspect comes from the collective decision not to restrict the use of one's wireless access point by others that may wish to use it to access the Internet such as other laptop users with 802.11b cards that happen to be visiting the coffee shop.

One of the most visible manifestations of this movement is Seattle Wireless. Their web page, which has a good collection of links to similarly minded organizations in other areas, is at www.seattlewireless.net. The organizations attempt to coordinate and centrally document coverage areas, as well as sponsor meetings and offer advice such as which wireless units work well.

The popular press coverage of Seattle Wireless and its sister organizations is best described as "fawning", with very little critical analysis offered, and breathless speculation that they pose a growing threat to the promise of the type of Internet Access promised by the promoters of "3G" wireless telephone technology.

For a number of reasons, I feel that the Public Wireless Internet Access Co-op movement will be short lived at best. For the moment, they're having fun seeing what can be done with the concept. In the long term, they will discover that it's real work to maintain such a system, with significant liabilities and irritations.

Some of the more vocal proponents of "the movement" openly advocate the modification of wireless access point hardware, typically to make use of better antenna systems than the short-range stub antennas that most 802.11b wireless access points are equipped with. Such modifications are almost always illegal because they void the manufacturer's Part 15 certification with the FCC. Proponents of such modifications are becoming increasingly bold, and posting of such modifications on web pages have the effect of openly inviting a crackdown on such activities by the FCC.

Longer term, it seems inevitable to me that those offering public access via their wireless access points will tire of the sharing. For example, if the movement does become popular and widely recognized, covered areas will "pull" users to it, and instead of providing occasional Internet access, our mythical apartment dweller finds that most of the capacity of his Internet connection is in use for a large part of the day, rendering it largely useless.

Security considerations are also an issue. While it's possible to set up wireless networks that provide just Internet access, more often personal wireless networks are used to network more than one computer in an area. Allowing the sharing of such a wireless network invites all kinds of potential mischief – from relatively benign packet sniffing to the introduction of viruses. Unsolicited commercial email (SPAM) can also be injected from unsecured wireless access points, which is likely to cause the immediate termination of the host's Internet connection.

The effort to create free public wireless Internet access is pointless unless there are users that wish to make use of such services. The problem is that users actually want the services to be there as promised, and in such a "hobby" situation, that's problematic. Returning briefly to our apartment dweller, what happens when he moves? Those who've depended on that Internet connection to be able to catch up on their email with their morning espresso will be disappointed when wireless Internet access suddenly doesn't work one morning. Likely they'll complain to the local group. The group will offer a collective shrug – after all, what do people *want* for free?

What they want is reliable service. If they can get reliable service for free, they'll certainly take it. But if they can't get reliable service for free, then they'll pay for it as necessary.

The requirement for reliable service is the main reason that I think the Public Wireless Internet Access Co-op movement will eventually sputter out. To insure reliable Internet access (and a steady stream of users, without which this wasn't worth doing in the first place) costs real money- for a good Internet connection, for good equipment, and the time that it takes to keep it running, cost of repairs as needed, etc.

The obvious answer is to ask the users for money to maintain coverage of the most popular spots for wireless Internet access – and at that moment, the co-op becomes a business. Even if the request is for "donations", it's *still* a business.

Competing with the co-ops to provide public wireless Internet access are a number of companies, the largest of which are MobileStar (www.mobilestar.com) [In early October, MobileStar laid off most employees and is hoping to be acquired. The MobileStar network remains operational at this writing.] and Wayport (www.wayport.com). In contrast to the co-ops, commercial Public Wireless Access Points (PWAPs) are becoming ubiquitous (MobileStar plans to install PWAPs at all company-owned Starbucks in the US) and offer reliable services – in exchange for a fee.

In addition to MobileStar and Wayport, there are a number of smaller PWAP providers, and I fully expect to see an unlimited number of PWAPs that are operated "standalone" to offer Internet access to "one of a kind" facilities – small towns that have a significant tourist business, individual restaurants and coffee shops, small hotels, Bed and Breakfasts, etc. I also expect small Internet Service Providers (ISPs) to begin providing PWAP services, whether or not they currently offer wireless Internet access. Note that PWAP services are quite distinct from wireless Internet access service. PWAPs provide Internet access for itinerant users, and the coverage area is highly localized. PWAPs almost always use the 802.11b (Wi-Fi) wireless Local Area Network (LAN) standard because it is by far the most ubiquitous. ISPs offering Wireless Internet Access often use equipment that is not compliant with 802.11b, so the service offerings are by necessity very distinct.

Another factor that will increasingly limit hobbyist wireless access points is that the Internet connections that are being shared are priced for use by individual families, and the terms and conditions of use do not allow public sharing (even if no fee is charged). Broadband Internet Service Providers will eventually begin cutting off service for those violating terms and conditions by public sharing.

There's an interesting parallel to the rise of Public Wireless Internet Access Co-ops that might prove instructive. The rise of Public Wireless Internet Access Co-ops parallels to at least some extent the rise of hobbyist Bulletin Board Systems (BBS') in the late 80's and early 90's (predating by some years widely available public Internet access). A BBS (they still exist) is a computer with one or more attached modems that allowed users to connect via modem and read and post messages and files. Each successive caller added to the content of the BBS. As a BBS became popular, it became harder to dial in as the modem phone lines were tied up with other users. Another problem that came with popularity was the lack of sufficient hard disk space.

The solution to these expensive problems was to add more phone lines and hard disk space to make the system more usable. BBS operators that did so ended up making a modest hobby into an expensive hobby. Many BBS' began asking for user contributions or offering memberships in exchange for access to special members-only phone lines or more interesting message areas.

As BBS' grew more popular, the tension between user expectations ("Why don't you get more phone lines?") and the BBS operator funding the system out of their own pocket ("What do you *want* for free?") increased.

Such an evolution from "hobby" to "users pay" is incredibly tricky, and most such efforts don't survive. User expectations are often a liability, and unless handled very

delicately and gradually (typically requiring the skills and experience of a skilled marketer), users expect that a system that starts out "free" will remain so. If a user is forced into paying for a service that was previously free, normal behavior is to examine other alternatives. If an alternative is found that has always been for-pay (with the expectation that reliable service is provided), users will more often choose the "commercial" alternative.

BBS' that began life as semi-commercial ventures, charging a fee in exchange for "advanced" features such as large numbers of modem lines, intra-BBS email, large file download areas, etc. were able to continue their growth, and many such BBS systems evolved into Internet Service Providers in the mid-1990's.

Just as hobbyist Bulletin Board Systems faded from widespread public use, I expect that hobbyist PWAPs will fade from widespread public use with the rise of reasonably-priced, ubiquitous, commercial PWAPs. I do expect that commercial PWAPs will indeed be a factor that "3G" service providers will need to take into account. At the moment, few "3G" service providers are willing to concede that Wireless LAN technology will in some, perhaps many, cases be a better solution to connectivity requirements of itinerant users.

The Evolution of 802.11 – On Beyond "B"

There's been considerable confusion in the press about variants of the Institute of Electrical and Electronic Engineers (IEEE) 802.11 Wireless Local Area Network (WLAN) standard. What follows is a brief guide to the various 802.11-derived standards. Note that the 802.11 standards are (by far…) *not* the only WLAN or Wireless Metropolitan Area Standards (WMAN) – there are numerous other wireless standards backed by other standards bodies, as well as proprietary, and semi-proprietary wireless standards that are well-accepted by industry and users. My research was aided considerably by the IEEE 802.11 group's extensive web pages – grouper.ieee.org/groups/802/11/.

802.11

The 802.11 standard was ratified in 1997. 802.11 is a standard for Wireless Local Area Networks that specifies a 1 or 2 Mbps signaling rate and the use of Direct Sequence Spread Spectrum (DSSS) or Frequency Hopping Spread Spectrum (FHSS) operating in the 2.4 GHz license-exempt spectrum under FCC Part 15 rules (and international equivalents). A bit of trivia – in addition to DSSS and FHSS on 2.4 GHz, infrared transmission is part of the 802.11 standard. From the difference in the physical layers (DSSS, FHSS, Infrared) and other reasons, it is entirely possible for a vendor's products to be fully compliant with 802.11 and be completely non-interoperable. Most users found that the only reliable way to determine whether 802.11 products from different vendors would interoperate was to perform their own interoperability testing.

802.11a

The 802.11a standard was ratified in 1999. 802.11a specifies the use of 5 GHz license-exempt spectrum at speeds up to 54 Mbps using Orthogonal Frequency Division Multiplexing (OFDM) modulation. Actual 802.11a products are just beginning to emerge in late 2001. Internationally, license-exempt use of 5 GHz spectrum is considerably less unified than that of 2.4 GHz, complicating international sales.

802.11b

The 802.11b standard was also ratified in 1999. 802.11b specifies the use of 2.4 GHz license-exempt spectrum at speeds up to 11 Mbps using Direct Sequence Spread Spectrum (DSSS) modulation. 802.11b has been very successful, in part because it exceeds the perceived "speed issue" by being (theoretically) as fast as Ethernet (10 Mbps). 802.11b can "fall back" to speeds of 5.5 Mbps, 2 Mbps, and 1 Mbps if necessary to maintain a link. 802.11b's 2 Mbps and 1 Mbps speeds allow some interoperability with 802.11 products that used DSSS.

By 1999, many networking vendors, especially those targeting home and small business users wanted to offer wireless networking products to fill out their product line. In an effort to forestall the interoperability issues that bedeviled 802.11 products, a number of vendors formed a consortium called Wireless Ethernet Compatibility Alliance (WECA). WECA proceeded to develop an interoperability test suite, and WECA members' products that passed the interoperability test suite were allowed to be branded with WECA's Wi-Fi band. WECA's publicity efforts attempting to have "Wi-Fi" synonymous with "802.11b" have resulted in some humorous errors of fact in the popular press, such as referring to "… earlier, slower versions of Wi-Fi".

802.11b-corl

802.11b-corl appears to be a "cleanup" project to update some Management Information Base (MIB) errors that were incorporated into the 802.11b standard. MIBs are used in remote monitoring of networking equipment.

802.11c

802.11c is a completed project to update another IEEE standard (802.1D) with information specific to 802.11 for improved interoperability between LANs and WLANs. There has been some confusion that 802.11c (and other "802.11x" projects are not "product" standards such as 802.11b. In the IEEE, all new projects are assigned a project number in sequence upon approval of the project. Such projects may, or may not achieve wide visibility.

802.11d

802.11d is a project currently in work to enhance the "Internationalization" of the 802.11 standard. 802.11, as originally written, references only a few countries' regulatory policies.

802.11e

802.11e is a project currently in work to add Quality of Service (QOS) mechanisms to the 802.11a and 802.11b standards.

802.11f

802.11f is a project currently in work to enhance the interoperability of WLAN access points. It's generally not feasible to "mix and match" different vendor's Wireless Access Points (WAPs) because each vendor's Distribution System (DS) (the "mechanics"- routing, bridging, authentication, etc. of how multiple access points are distributed and interconnected using [wired] LANs is proprietary.

802.11g

802.11g is a project currently in work to enhance the 802.11b standard to achieve data rates in excess of 20 Mbps (typically quoted as 22 Mbps). 802.11g has been voted on several times, but to date has failed to achieve sufficient consensus to achieve ratification.

802.11h

802.11h is a project currently in work to enhance the 802.11a standard to allow 802.11a devices to be used in countries that have different requirements (power, variations in spectrum, etc.) than the US for license-exempt use of 5 GHz spectrum.

802.11i

802.11i is a project currently in work to enhance the security and authentication mechanisms of the 802.11-based standards. This task was originally part of 802.11e. Concerns over WLAN security issues were considerably elevated in 2001 by well-publicized "breakings" of 802.11 security. In fairness, 802.11 security, called Wired Equivalent Privacy (WEP) was not very strong, nor was it intended to be. Strong security would have considerably complicated interoperability, and likely would have (considerably!) slowed the progress of 802.11a and 802.11b ratification. Users of 802.11a and 802.11b for whom WEP is inadequate can implement "external", well proven security systems such as Virtual Private Network (VPN) technology.

WECA Faces Difficult Challenge In Establishing "Wi-Fi 5" Branding For 802.11a Products

Wi Fi™ The Standard for Wireless Fidelity.

As is probably obvious, I am nothing resembling a skilled marketer. Nevertheless, I have been following with interest the progress of WECA - the Wireless Ethernet Compatibility Alliance (www.wirelessethernet.org) and its largely successful campaign to reduce confusion in the marketplace regarding Wireless Local Area Network (WLAN) technology. Going forward, WECA has an interesting challenge ahead of it in extending its very successful Wi-Fi brand into the next generation of wireless networking based on the 802.11a WLAN standard.

As mentioned in the preceding article, WECA was formed to insure interoperability products based on the IEEE 802.11b Wireless Local Area Network (WLAN) standard. Any product bearing the Wi-Fi logo has undergone interoperability testing to insure that it will work with any other Wi-Fi product. The 802.11b / Wi-Fi market has boomed, with 802.11b products selling very well in the consumer, small business, and enterprise markets.

Although the 802.11a standard was ratified the same year as the 802.11b standard, 802.11a products have been much slower to emerge. 802.11a is a much more complex technology, as it breaks some new ground (for WLAN technology) in specifying the use of new spectrum (5 GHz), modulation technique (Orthogonal Frequency Division Multiplexing – OFDM), and speed (54 Mbps).

Despite the slow start in the market, 802.11a is expected to do very well because it addresses a number of key challenges of 802.11b. There is considerable concern, particularly in enterprises, about the (perceived) "increasing pollution" of 2.4 GHz spectrum. Currently there are few concerns being voiced about "pollution" issues in 5 GHz spectrum, particularly the two "virgin" 100 MHz Unlicensed National Information Infrastructure (UNII) bands at 5.15 and 5.25 GHz. For some wireless applications, "11 Mbps" isn't fast enough (11 Mbps is the "signaling" speed, and like Ethernet, actual data speeds are considerably lower.

WECA has stated that a branding campaign similar to Wi-Fi will be undertaken for 802.11a, using the name "Wi-Fi 5". It will be interesting to see if "Wi-Fi 5" succeeds in the marketplace without creating confusion with "Wi-Fi" and making clear that there is no interoperability between "Wi-Fi" and "Wi-Fi 5".

WECA's branding strategy will get even more complex with the 802.11g standard (22 Mbps @ 2.4 GHz, backwards compatible with 802.11b) expected to be ratified in the near future, with products to follow shortly after. We may soon see brand extensions of Wi-Fi such as (purely hypothetical on my part) "Wi-Fi 2", "Wi-Fi Plus", "Wi-Fi NT (New Technology) or even "Wi-Fi NG" (Next Generation).

In the long term, 802.11a, 802.11b (likely 802.11g will supercede 802.11b) technology could be offered on the same device, much as cell phones transparently meld disparate cellular technologies and spectrum. But in the short term, 802.11a and 802.11b products are likely to remain separate and distinct.

Update on Motorola's Canopy Broadband Radio

I first wrote about Motorola's Canopy (formerly Altair WHiSP, [I called it WISP]) in the July/August issue of ***Focus***. At the time, it was possible that Canopy would not make it out of testing, but I'm told that it is now a product and is in production. It's apparently in stealth mode – there is absolutely *no* mention of the product on the Motorola web page, and calls and emails to Motorola Public Relations personnel inquiring about the product are not returned. As promised, ***Focus*** readers are the among the first to know any details about this new product.

First, the (former) name. Altair is apparently a reference to a previous Motorola product, the Altair Wireless Local Area Network (WLAN). Circa 1991, when Altair debuted, it was an impressive product. Recall that unshielded twisted pair (Category 5, 10baseT, 10base100) was mostly unknown and what little there was was proprietary. Networking wiring was mostly coaxial cable – not very reliable and expensive to install. A WLAN was a welcome product, except for typical Motorola hubris. Altair was horribly expensive, and required a license to deploy (Motorola held the FCC license, and in effect leased you the right to use that licensed spectrum to use your Altair). Altair was an impressive technical achievement, but a business failure. I wasn't provided with the acronym for WHiSP. A guess is Wireless High-speed Internet Service Platform. A quick Google search for "whisp" reveals a that "WHISP" is an acronym for Wireless Handheld Information Services Platform, which seems to be better established in the wireless industry.

My source furnished me with what are reported to be the real specifications for Canopy, and they vary somewhat with what I've previously reported. I won't go into exhaustive detail, but some highlights are:

- Operates in the 5.25 – 5.35 GHz Unlicensed National Information Infrastructure (UNII) band – license exempt
- Modulation "High Index" Binary Phase Shift Keying (BPSK) / Four-level Phase Shift Keying (4FSK)
- Channel Access Method is Time Division Duplex / Time Division Multiple Access (TDD/TDMA)
- Range Point to Multipoint (P-MP) 2 Km
- Speed is 10 Mbps symmetric
- Receiver sensitivity is –85 dBm
- Transmit power is +20 dBm (100 mW)
- Physically the unit is approximately 12" tall, 3 ½" wide and 1 ½" deep, with a weight of 1 pound
- Support is included for the usual Internet and management protocols
- DC power requirement is 24V @ 0.4A
- Temperature range is -30° / +55° C
- Firmware can be remotely upgraded
- The same unit is used for both hub and Customer Premise Equipment (CPE)

Elements of the Motorola Canopy. The lack of complex chips on the board is notable.

As can be seen in the above photograph, there simply isn't that much to the active components of the unit. Motorola has done a commendable job in minimizing complex RF circuitry to a few components. The unit implements one of my favorite features in Broadband Wireless Internet Access – that the radio and antenna are integrated and intended for outdoor mounting, eliminating the need for any coaxial cable (allowing cheap data/power cabling to be used) and keeping the RF completely away from the user.

But the most impressive feature of Canopy will likely be its cost. As a function of its (lack of) complexity, the projected price of the unit is approximately that of a cable modem - $200 - $400. For a unit that can do 10 Mbps P-MP at 2 Km, and Point To Point (P-P) at greater ranges, this is an impressive price point.

Hopefully Motorola will get over its corporate shyness about Canopy soon. There are numerous applications for such a system, and it will be good, for both Motorola and

the Broadband Wireless Internet Access industry to have Motorola as a vendor.

Wireless ISP Profile
Odessa Office Equipment
Odessa, Washington

Traveling to Odessa from Seattle is a pleasant ride of 3 ½ hours or so. From Seattle, you travel West into the Cascade Mountains, and when you're thirty miles or so East of the Cascades, you notice the terrain changing abruptly. The mountains are gone and your horizon to the West is clear and mostly flat… and it's abundantly clear from the brown scrub vegetation (in vivid contrast to the wet and always green climate West of the Cascades) that you're entering what is essentially Western desert.

Towards the end of the journey (according to the map), you expect to see the town of Odessa on your horizon. But Odessa isn't visible until you're perhaps 2 miles from it because it's tucked down in a valley and you realize how isolated Odessa is.

A typical grain elevator in Odessa, Washington

Odessa is a small farming community of approximately 1000 people. The main industry of the town is grain elevators and support services for the wheat farmers in the area. Yet, for its small size, residents of Odessa are offered faster (and, surprisingly, *cheaper*) broadband Internet access than is available in many urban areas.

If I had tried to find Odessa Office Equipment's (www.odessaoffice.com) nondescript office, I could have easily been hunting for a while. But, I was visiting during Deuthesfest, Odessa's version of a German Oktoberfest, so my instructions were to find "the small store with the line out the door". I quickly discovered that the line had formed for excellent German food, and in the alley behind the store, cooking sausage, is where I met up with Marlon Shafer, the Founder, Principal, Chief Technologist, and CEO of Odessa Office Equipment.

The first and most obvious question for Shafer was "Does wireless broadband make sense… can it be profitable in a town the size of Odessa?" Shafer's reply was that farmers are aggressive users of Internet and that they need to see graphics of weather, they monitor commodity crop prices, do research on farming techniques, etc. During the growing season, they're very impatient to "get their business done" and get out on the farm, so it's pretty easy to justify the expense of a fast Internet connection. Winters are long and cold in Odessa, and having fast Internet access is a good way to pass the time.

Typical Eastern Washington terrain: flat and dry. (Gives new meaning to the term "line of sight" when you can see objects 17+ miles distant without optical aids).

Odessa Office Equipment began as an ISP offering dialup services. In a small town, the digital circuits necessary for 56 Kbps dialup access are problematic, so Shafer began searching for other broadband alternatives to service his customers. His discovery of "Do It Yourself Digital Subscriber Line" (basically, the ability to communicate at high speed over "unbundled" copper pairs using line driver modems) made him briefly famous by being featured on the popular Slashdot.org web page (and the subsequent brief saturation of his Internet bandwidth and near-collapse of his web server).

Eventually Shafer discovered the ISP-Wireless mailing list and began posting questions. Shafer became a regular on the list, and after he began gathering some firsthand knowledge of wireless, became one the ISP-Wireless List's most popular contributors.

Shafer is very much a "hands-on" person, so when he felt he had enough basic knowledge of wireless to begin some experiments, he put up a hub on a nearby grain elevator. While that particular project didn't work very well, Shafer was hooked on wireless and began building a series of hub sites to cover Odessa. At this writing, Shafer has three hub sites covering Odessa, providing something in excess of

70% coverage. The remaining area is shadowed by terrain from the current hub sites.

Shafer chose to use 802.11 Direct Sequence (no misprint – 802.11 DS, *not* 802.11b) equipment from Teletronics International (www.teletronics.com) largely because it was inexpensive and recommended by others on the ISP-Wireless list. Another factor is that since the Teletronics equipment is Direct Sequence, 802.11b (which also uses DS) equipment is backwards-compatible with the Teletronics equipment. At typical link distances, Shafer's Teletronics equipment "falls back" to 1 Mbps (from 2 Mbps) signaling, with a resulting real-world throughput of 256 – 512 Kbps.

Odessa Memorial Hospital, one of Odessa Office Equipment's commercial customers. The wireless equipment and router (to interface to the hospital's existing network) is located in the elevator shaft. The square, flat panel antenna is barely visible near the tail of the helicopter logo.

Odessa Office Equipment's backbone connection is a burstable T-1 (1.544 Mbps), with a Committed Information Rate (CIR) of 768 Kbps. The T-1 is shared with another commercial user in town, so the T-1 bandwidth is shared. (The other user isn't active in the evenings, allowing Shafer the economical use of what would otherwise be a big expense.)

In addition to inexpensive, but functional wireless equipment, Shafer exhibits equal ingenuity in mounting antennas. Shafer has sufficient experience in mounting antennas to have designed, and have custom manufactured, his own non-penetrating roof mount hardware. Shafer also uses economical materials for mast-mounted antennas – a particular brand of muffler pipe was a favorite until the stock at the local auto parts store was exhausted and that particular type could not be reordered.

When he began offering Wireless Internet Access services, Shafer installed each customer's equipment. Equipment was sold at cost, and installation was free. Installations were tricky, as the Teletronics radios were PC (formerly known as PCMCIA, or "laptop" cards), and it can sometimes be a tricky process installing a PC card adapter and "Card and Socket Services" for Windows installed on a desktop PC. The installation process has been considerably streamlined by the availability of Universal Serial Bus (USB) adapters that work with the Teletronics PC cards. On PCs using Windows 98 (and higher), opening the case is not required. Shafer has evolved his technique to allow the user to self-install the equipment, and offers "backup" installation help as needed.

Deputy Kelly Watkins of the Lincoln County Sheriff's Department, and his patrol car equipped with mobile Internet access

One of the more startling demonstrations of OOE's wireless Internet access service that I was given during my stay was *mobile* wireless Internet access. OOE has outfitted several patrol cars from the local Sheriff's department for wireless Internet access, which is accessed via existing laptop computers. Reports can be composed in the field, and transmitted via email. Deputy Kelly, who graciously gave me a brief ride to demonstrate the system, was startled when I burst out laughing at the situation of, being *mobile* in *Odessa Washington*… I had better Internet connectivity *than what was available to me at my home in Woodinville, Washington only a few miles away from the high-tech colossus of Microsoft Corp. in Redmond, Washington*. I can attest that mobile Internet access in Odessa Washington works, and works well.

Shafer has begun expanding his fledgling wireless Internet access empire into nearby communities, some *smaller* than Odessa. Part of the expansion was from a buyout of a former competitor, and some is simply organic growth into new markets.

Shafer's pricing for wireless Internet access reflects the realities of his markets, where he feels that his competition is dialup (both actual competitors, and the perceptions of his potential customers) at approximately $20/month. In

Odessa, for the "low speed" service (256 – 512 Kbps), the price is $30/month. In other markets, for higher speeds, the price edges up to $50/month. Eventually, bandwidth consumption will be monitored, and use in excess of 1GB of data transfer per month will be charged an additional fee.

Marlon Shafer at Odessa Office Equipment's Primary Point of Presence (POP) in downtown Odessa. Marlon is holding a BreezeCOM radio that's used as a point-to-point link to a hub site located on a nearby hill.

The main lesson I came away with is just *how usable* Broadband Wireless is, and how valuable it is to the citizens of Odessa and surrounding communities. There was, literally, nothing special about Odessa that was unusually favorable towards wireless Internet access. Or, for that matter, little that's special about Shafer himself, other than curiosity, enough self-confidence to learn and try new things, and a supportive family. Despite the gloom and doom scenarios of wireless technophiles who calmly (and, obliviously, incorrectly) state that "802.11 equipment is intended for wireless LANs and it can't be made to work reliably for Wide Area Network [WAN] use", Marlon Shafer, and many more like him, *are* making Wireless Internet Access work, serving customers, and making money in Odessa Washington, surrounding communities, and similar communities all over North America. Indeed, Shafer is in sufficient demand that he is a part-time salesman of Broadband Wireless equipment, a principal in a manufacturing venture, and a consultant who is brought in to build up Wireless Internet Access systems.

My brief time in Odessa, and seeing Odessa Office Equipment's wireless Internet access system in operation, convinced me that *any* small town, *anywhere*, could establish a similar system and offer broadband services to its citizens and business, totally irrespective of whether the local cable company or telephone company chooses to offer broadband services.

Letters

Since we've just begun publication of ***Focus*** *on Broadband Wireless Internet Access*, we don't have any letters yet specifically directed at the contents of ***Focus***.

This month I'd like to explain what my policy, and hopes, are for letters. A number of other newsletters that I admire have made the reader's letters, and the editor's responses, a significant part of the content of those newsletters. This serves several purposes: 1) It makes the newsletter more interesting to read, 2) It provides something of a reality check on what's written in the newsletter, 3) the readers likely know of things that the editor doesn't.

So, Letters and Editor's replies will be an integral part of Focus. Initially, while readership is relatively low, this will be a pretty intimate exchange of ideas and points of view. As ***Focus*** grows, it may not be possible to include all letters that are submitted… but we'll do our best.

Here are the initial guidelines for Letters to ***Focus*** *on Broadband Wireless Internet Access*:

- All editorial commentary letters (including email) to ***Focus*** *on Broadband Wireless Internet Access* will be considered to be submitted for inclusion in the Letters section of ***Focus*** *unless otherwise stated*.
- Letters may be edited for space and relevance (and such edits will be noted)
- If you do not wish for your letter to be included in the Letters section of ***Focus*** *on Broadband Wireless Internet Access*, please state that in the letter.
- If you prefer to remain anonymous, but have your letter included in the Letters section of ***Focus*** *on Broadband Wireless Internet Access*, please state that in the letter and the request will be honored.
- All letters must include contact information; no anonymous communications will be published.

So, Please write! I very much look forward to exchanging ideas with ***Focus*** readers!

Upcoming, In Future Issues Of *Focus*:

- The embers of Metricom's funeral pyre flare back to life as the Ricochet Networks subsidiary of Aerie Networks
- Sprint Freezes Deployment of Sprint Broadband Direct Broadband Wireless Internet Access System
- Rest In Peace, Project Angel
- Adaptive Broadband Resurfaces As Axxcelera
- The Death of MobileStar
- The Darwinian Effect of License-Exempt Wireless
- A Modest Proposal – My Last Boardwatch Column

- Profiles of innovative Wireless Internet Service Providers
- An introduction to the Amateur Radio Service – it's *not* just old white guys in the basement sending Morse Code to each other any more

Focus On Broadband Wireless Internet Access Companies To Watch

"Companies To Watch" is a new feature in Focus to highlight companies that I consider to be particularly innovative and therefore worthy of watching. A number of companies will be added each month, and the list will be cumulative – and dynamic.

Equipment Suppliers:

- Alvarion – www.alvarion.com
  Largest supplier of equipment to Wireless Internet Service Provider (WISP) market
- Aperto Networks – www.apertonet.com
  PacketWave product blends numerous RF technologies into a highly effective system
- Time Domain – www.timedomain.com
  Primary proponent of Ultra Wideband RF technology

Service Providers:

- CAVU Inc. / e-xpedient – www.e-xpedient.com
  Uses 60 GHz radios and Free Space Optics (FSO) to provide 100 Mbps Internet Access at prices beginning at $100/month
- hereUare Communications – www.hereuare.com
  Provides "back end" billing services for independent operators of Public Wireless Access Points (PWAPs).

Events Of Interest To The Broadband Wireless Internet 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.

- October 9-11, 2001, Las Vegas, NV – ISPCON Fall 2001, Penton Media, Inc.
  www.ispcon.com/fall2001
  (I plan to attend this event.)
- October 10-12, 2001, Sarasota, FL – Wireless Training Class, Wave Wireless Networking
  www.wavewireless.com/whatsnew/
- October 16-18, 2001, Cincinnati, OH – Wireless LAN Workshop, Wireless-Nets Ltd. / Jim Geier
  www.wireless-nets.com/ws_overview.htm
- October 22-23, 2001 – Leuven, Belgium – OFDM Forum meeting
  www.ofdm-forum.com/index.asp?ID=8&MID=0
- October 24, 2001, Bellevue, WA – Alvarion Wireless ISP Seminar
  www.alvarion.com/CorpInf_30210.asp?tNodeParam=1
  (I plan to attend this event.)
- October 29-31, 2001, San Diego, CA – Wireless LAN 2001
  www.it-telecomsolutions.com/pages/conferences/wirelesslan.htm
- November 4-6, 2001 (rescheduled), Lake Tahoe, CA – Gilder/Forbes Telecosm Conference – Telecosm V, Forbes, Inc. and Gilder Publishing.
  www.gildertech.com/public/conferences.html
  (I still wish I could attend this conference!)
- Novenber 5-7, 2001, Amsterdam, Netherlands - Fixed Wireless Broadband Access Technology Europe 2001
  www.kc-global.com/FixedWirelessBroadbandAccessEurope2001.asp
- November 7-9, 2001, Sarasota, FL – Wireless Training Class, Wave Wireless Networking
  www.wavewireless.com/whatsnew/
- November 12-16, 2001, Austin, TX – IEEE 802 Plenary meeting (includes meetings for 802.11 and 802.16) ***(updated!)***
  grouper.ieee.org/groups/802/meeting/meeting_files/MI-1101-01.html
- November 13-15, 2001 – San Francisco, CA – SDR Forum Annual Meeting
  www.sdrforum.org/MTGS/next_meeting.html
  (I plan to attend this event.)
- November 20-22, 2001, Rome, Italy – Broadband Fixed Wireless Access World Congress
  www.iirconferences.com/site/_prod-grp.cfm?DirName=cb0420&ConfCode=cb0420&iv=23
- November 27-28, 2001 (rescheduled), Santa Clara, CA – 802.11 Planet Conference and Expo, Fall 2001.
  seminars.internet.com/80211/la01/index.html
  (I plan to attend this event.)

- November 28, 2001, Portland, OR – Alvarion Wireless ISP Seminar
  www.alvarion.com/CorpInf_30210.asp?tNodeParam=1
  (I plan to attend this event.)
- December 12-14, 2001, Sarasota, FL – Wireless Training Class, Wave Wireless Networking
  www.wavewireless.com/whatsnew/
- January 14-16, 2002, San Jose, CA – WCA Technical Symposium
  www.wcai.com/events.htm
  (I plan to attend this event.)
- January 21-25, 2002, Levi, Finland – IEEE 802.16 Working Group Session 17
  grouper.ieee.org/groups/802/16/meetings/mtg17/index.html
- February 12-14, 2002, Anaheim, CA – Broadband Wireless World Forum
  www.scievents.com/bwwf02/default.asp
  (I plan to attend this event.)
- March 11-15, 2002, St. Louis, MO – IEEE 802.16 Working Group Session 18
  grouper.ieee.org/groups/802/16/calendar.html
- May, 2002, Date and Place To Be Determined – IEEE 802.16 Working Group Session 19
  grouper.ieee.org/groups/802/16/calendar.html
- June 2-6, 2002, Atlanta, GA – SUPERCOMM
  www.supercomm2002.com
- June 23-26, 2002, Boston, MA – WCA Annual Conference
  www.wcai.com/events.htm
- July 8-12, 2002, Vancouver, BC – IEEE 802.16 Working Group Session 20
  grouper.ieee.org/groups/802/16/calendar.html
- September, 2002, Date and Place To Be Determined – 802.16 Working Group Session 21
  grouper.ieee.org/groups/802/16/calendar.html

With Thanks To…

As an *Independent* Technology Writer, I don't have access to the resources of large news and publishing organizations. What I do have are a number of people I've found over the years that offer high quality information that is highly relevant to the content of ***Focus***, at no cost. Such "free" content providers don't get thanked nearly often enough, and, as part of ***Focus***, I'd like to acknowledge their efforts.

- David Farber – Interesting-People List
  www.interesting-people.org
- David Harrow – Harrow Technology Report (formerly Rapidly Changing Face Of Technology newsletter)
  www.theharrowgroup.com/
- David Isenberg – The SMART List
  www.isen.com
- Dewayne Hendricks – Dewayne-Net Technology List
  www.warpspeed.com
- Robert Hoskins – Broadband Wireless Exchange Magazine
  www.bbwexchange.com
- Ed Mitchell – Ham Radio Online: Common Sense Views On Technology
  www.hamradio-online.com

Other paid membership / advertising-supported resources include: Broadband Wireless Business Magazine, Cellular Telephony and Internet Association's (CTIA) Daily News, Slashdot, San Jose Mercury News' Good Morning Silicon Valley, Strategic News Service, Wall Street Journal Interactive, Wireless Communications Association International… and, of course, the many companies and organizations that contact me directly with relevant news.

Focus

On Broadband Wireless Internet Access

Steve Stroh, Editor

www.strohpub.com/focus.htm

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