FOCUS On Broadband Wireless Internet Access
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Independent, Original, In-depth coverage of the trends and technology shaping the rapidly-evolving Broadband Wireless Internet Access industry
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--- FCC Releases Notice Of Proposed Rulemaking (NPRM) For Additional 255 MHz of License-exempt Spectrum in 5 GHz Band ---

The FCC has agreed to the Wi-Fi Alliance's proposal to allow license-exempt operation in an additional 255 MHz of spectrum from 5.470 - 5.725 GHz. This spectrum is used by the US Department of Defense (DOD) for Radio Detection and Ranging (RADAR) systems and the US DOD is terrified of the prospect of millions/billions of 5 GHz "RADAR emitters", and so engineered a technical compromise with the Wi-Fi Alliance. In return for not vetoing the additional spectrum, DOD inserted a provision that devices using this spectrum would be subject to "Dynamic Frequency Selection" (DFS) and a number of other technical requirements - including having to listen for 60 seconds for the presence of a RADAR signal before using a channel, and having to "vacate" a channel for at least 30 minutes if a RADAR signal is detected.

The NPRM and the actions that preceded it - a petition from the Wi-Fi Alliance, and supporting efforts by Microsoft, Cisco and others in lobbying legislators to propose bills that mandate such an allocation were aimed at creating more 5 GHz spectrum for indoor / Wireless LOCAL Area Network (WLAN) use. Strictly from that perspective, the NPRM will likely be viewed largely as a success.

One problem is immediately apparent - at least in my admittedly quick reading of the NPRM - there is no stated definition of what exactly IS a RADAR signal that must be detected. RADAR signals are essentially very high power, pulsed, RF energy. It seems likely that 5 GHz systems that adhere to the "RADAR Safeguards" will be easily confused by the presence of sufficient RF energy. If industry agrees on a definition of what exactly is a RADAR system that must be detected, that definition is subject to abrupt revision as the US DOD changes its RADAR systems. Such a scenario could necessitate a simplistic "detection of raw energy" - which would cripple the ultimate utility of this chunk of spectrum.

As part of the NPRM, the FCC proposes applying the "RADAR Safeguards" to the EXISTING "mid" Unlicensed National Information Infrastructure (UNII) 5.250 - 5.350 GHz band. That's the bad news - that much of the utility of this band will be lost (and equipment required to be redesigned). The good news is that the "RADAR Safeguards" requirements were not extended to the "top / high-power" UNII/ISM band at 5.725 - 5.825/5.850 GHz as had been feared. In the initial discussions between the US DOD and industry representatives, word leaked out about this requirement, and I was informed of it by well placed sources. I tried to confirm this possibility with private notes to a number of technologists in the BWIA industry, but responses were unanimous that THEY had not heard of this, and it was highly unlikely that the FCC would tinker with the existing, very, very successful UNII rules.

To technologists, the "RADAR Safeguards" are a bit laughable. That US DOD RADAR systems even NEED such protection is a sad commentary on the state of technology of US DOD RADAR systems that are apparently incapable of discriminating between a valid RADAR return signal and the energy from a communications device. Robert Heinlein, in his wonderful book "The Moon Is A Harsh Mistress" written in the 1950's, anticipated just such a problem when Mike, the self-aware computer system describes to another character how he "tags" outgoing RADAR emissions so that he won't get fooled with false echoes generated from the bad guys. Apparently... US DOD RADAR systems can't do that, and the DOD decided that instead of dealing with the real problem - that there WILL be 5 GHz transmissions other than RADAR systems in this band and adapt to that reality, they decided to try to cripple the emergence of such devices.

Of late, the US DOD hasn't fought too many battles, necessitating the use of DOD RADAR systems, within the jurisdiction of the US and FCC rules. So... overseas... where US DOD RADAR systems ARE used a fair amount... US FCC rules don't apply. With the apparent admission that low-power, inexpensive, ubiquitous 5 GHz communications devices ARE a threat to effective operations of US DOD RADAR systems... it stands to reason that a country that feels vulnerable to attack by the US will put in place thousands... tens of thousands... or more... 5 GHz devices with the DFS and other "RADAR safeguards" disabled. The US military has a way of dealing with undesired transmitters - HARM - High Speed Anti-radiation Missile; essentially a missile that "homes in" on a source of RF energy - RADARS, etc. An enemy of the US may consider it a pretty good bang/buck radio for the US to spend $100,000 and up for a HARM to wipe out a $50 5 GHz radio. But I digress...

The solution, in the mind of the US, is to persuade the delegates at this summer's International Telecommunications Union (ITU) World Administrative Radio Conference (WARC) to adopt the "RADAR Safeguards" rules. Um, yeah... THAT will go over well, given the overwhelming UNpopularity of the US at the moment in the aftermath of Iraq War II. I would guess that the US proposal will be particularly unwelcome because it is being requested specifically to safeguard or enhance the ability of the US to wage war. In contrast to the United Nations, the ITU is "one country one (and ONLY) one vote." It seems to me that the math doesn't add up for enough favorable votes to pass the US position.

One amusing, and quite possible scenario - Microsoft, Cisco, and others as principal brokers of the "RADAR Safeguard" provisions are also intense users of WLANs on their respective corporate headquarters. A ubiquitous WLAN is a proven and potent boost to corporate productivity, and it would be supremely ironic if Microsoft and Cisco's 5 GHz WLANs were to be shut down for 30 minutes at a time by a single overhead pass by a fighter plane with its 5 GHz RADAR system activated. Microsoft, in the Seattle area, and Cisco, in the San Francisco Bay area are both located near major DOD installations where there is extensive use of RADAR systems for both Naval and Flight operations.

The Wireless Communications Association / License Exempt Alliance (WCA/LEA) submitted comments that the new spectrum should allow "high-power" operations as specified for the 5.725 - 5.825 GHz (UNII rules) / 5.725 - 5.850 GHz (ISM rules) band. From my reading the FCC pretty much summarily dismissed this request, stating that the existing "high power" portion of the band was adequate. Despite acknowledgement that Wireless Internet Service Providers, that are making extensive (outdoor) use of the 5 GHz bands, are providing effective competition for Broadband Internet Access services... the FCC decided not to allow "high power" operation in this new spectrum.

What's really damning is that this NPRM makes it abundantly clear that despite the lessons learned (?) from the Spectrum Policy Task Force activities of 2002, the FCC does not understand "The Darwinian Effect Of License-exempt Wireless" which I have espoused for a number of years now*. The ONLY reason that license-exempt wireless is the incredible success that it is, is that the applicable rules do not codify into law any protection of any other system. In essence... any system is "free to interfere" with any other system, so in order to function in the presence of such interference, systems must continually get better... continuous evolution. "Free to interfere" isn't, of course, literally true - systems whose ONLY purpose is to generate interference aren't legal. ENABLING such continuous evolution is Moore's Law, which has been in full force in radio systems for several years now, so such the "forced" evolution is only "mildly" painful - replacing a system with newer, more robust technology is cheaper than the original system and offers better performance in addition to more robust performance.

The "calendar is ticking" - formal comments are due within 120 days from release of the NPRM - on or about October 2, 2003.

* Note to "deeper-pocketed" subscribers - "The Darwinian Effect Of License-exempt Wireless" is, in my opinion, the fundamental reason for the overwhelming success of license-exempt wireless to date. That the FCC simply does not understand this principal will fundamentally handicap all future license-exempt spectrum actions. Perhaps a private seminar on this subject for FCC staffers would help? I'd be willing to speak at and coordinate such a seminar if at least minimal funding could be arranged.

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--- 2.4 GHz RF Lighting Threat Is Over... For Now ---
On May 27, 2003 the FCC terminated work on ET Docket 98-42 - requested rules changes to permit Fusion Lighting to sell its RF lighting devices operating in the 2.4 GHz band. 98-42 had been in work for five years, and much of the original information had become dated, and per the FCC, Fusion Lighting had not expressed an interest in updating the docket or further pursuing the matter.

The following is purely speculative, but my guess is that: 1) With the Summer 2001 "energy crisis" exposed as a purely artificial shortage caused by Enron-esque energy traders, Fusion Lighting lost much of the potential interest for its product. 2) If Fusion Lighting pursued the matter, they would be up against the very deep pockets of Microsoft, Cisco and the rest of the 2.4 GHz license-exempt wireless industry, and 3) Fusion Lighting's technology was problematic - making a device that uses molten sulfur and a rotating globe work reliably and inexpensively would be QUITE the challenge.

Not to mention that with the FCC taking credit for the success of 802.11b/Wi-Fi, Representatives and Congresspersons sponsoring legislation to create more license-exempt spectrum, and license-exempt wireless being the only area of growth in the entire telecommunications industry... 2.4 GHz RF Lighting faced a very uphill battle for approval and acceptance. I've been credited in various venues for "breaking the story" in FOCUS Issue #2 - July/August 2001. I excerpted that article - "Part 18 RF Lighting - A Potential "Extinction Level Event" For Communications Users Of The 2.4 GHz Band" and made it available for download from my web page. The article was subsequently mentioned in a number of venues - Slashdot (http://www.slashdot.org), PBS/Robert X. Cringely (http://www.pbs.org/cringely), and DSL Reports (http://www.dslreports.com). As I point out in the article, I was first made aware of the issue of RF Lighting by Dewayne Hendricks citing an article in the Wall Street Journal discussing the effect of 2.4 GHz RF Lighting on the adjacent 2.3 GHz WCS band. Dewayne pointed out that the effect of 2.4 GHz RF Lighting would be miniscule on the 2.3 GHz band compared to the interference caused to 2.4 GHz communications in the same band as RF Lighting devices.

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--- Challenge To License-exempt Usage Of 900 MHz Band Is Denied ---
On May 30, 2003 the FCC denied a petition by Telesaurus that if granted would have resulted in the virtual elimination of license-exempt operations in the 902-928 MHz band. Telesaurus was founded to provide "Location and Monitoring Services" (LMS) - essentially active location tracking of high-value items. Much of the utility of LMS was obviated by the emergence of cheap Global Positioning System (GPS) receivers. Licensed use of 902-928 MHz was auctioned by the FCC with the provision that licensees must "tolerate" the operation of license-exempt devices in the band... which Telesaurus agreed to. In its petition, Telesaurus argued that the 902-928 MHz band was largely vacant - cordless phones and WLAN devices had largely moved to 2.4 GHz. In fact, the 902-928 MHz band IS being used extensive, especially for Wireless Internet Service Providers (WISPs) and users such as utility systems. For example, Puget Sound Energy, the primary service provider for natural gas and electricity in the Seattle area has completely automated their meter-reading using 902-928 MHz radios on each meter and an extensive network of relay stations on light poles. 902-928 MHz is so valuable to such users because 902-928 transmissions can penetrate extensive foliage such as trees. Using 902-928 MHz equipment, WISPs are now able to offer service to customers located in heavy

foliage areas that were previously only sporadically accessible using 2.4 GHz. In conjunction with the WCA LEA, WaveRider Communications worked directly with the FCC to help them understand the impact that granting the Telesaurus petition would have on the WISP industry's emerging use of 902 -928 MHz. WaveRider's LMS system will be joined this summer by a 902-928 MHz product from Alvarion, and at some point a 902-928 MHz derivative of Motorola's Canopy system.

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--- Competitive Landscape 1: VDSL, Ethernet As Last Mile, and Fiber To The Premises ---
In my reading in the last few weeks, I've seen a lot of breathless prose that new technologies have emerged to allow much greater distances and/or bandwidth over last mile wired infrastructure. VDSL extends distances and increases speeds over current DSL systems. Ethernet has been (very seriously) proposed for use over existing last mile copper infrastructure. BellSouth, SBC, and Verizon have decided on a common technical standard for Fiber To The Premises.

The problem with all these systems is that the wireline telephony companies simply have very little motivation, other than doing small test/demonstration deployments (to be able to say with any credibility that they've deployed such systems), to actually DEPLOY such systems throughout their network. More damning, even if they had the motivation... they cannot afford to do so without additional external capital investments. The latter is VERY unlikely given the precarious, and worsening finances of the wireline telephony companies. The only potential savior for last-mile wireline to remain relevant in the long term is government financial subsidy, or a MASSIVE capital infusion required to completely rebuild wireline infrastructure as an IP network - making extensive use of fiber, routing, switching, and TCP/IP.

The FOCUS perspective on last-mile wireline is that the copper-based infrastructure is rapidly becoming non-cost effective from a maintenance perspective, and has become a slowly-tightening noose around the necks of the Incumbent Local Exchange Carriers. A government subsidization or massive capital infusion is highly unlikely. In contrast, Broadband Wireless Internet Access, in all its myriad forms, is cost effective and is becoming more so in pace with Moore's Law, and highly scalable.

--- Competitive Landscape 2: Wireless Telephony Companies - Remember The 8-Track Tape! ---
"Wi-Fi has become the golden child, and the wireless carriers are like the red-headed stepchild. We spend so much time to get more spectrum, and we are paying through the nose for it. But it is important not to get caught up in one technology like Wi-Fi. Look what happened to eight-track tapes." - unnamed wireless telephony executive as quoted in InfoWorld, May 26, 2003 page 15 - New Spectrum Adds Wi-Fi Channels. This is a oft-uttered plaint of the wireless telephony companies - that "new service providers are getting THEIR spectrum for free" (using license-exempt spectrum) while they have to pay for their spectrum. This argument is so specious it's laughable. 1) The wireless telephony companies paid to have exclusive access to their spectrum, and they want it to be so. 2) The wireless telephony companies have chosen to use technologies that cannot tolerate interference, such as what is experienced in the license-exempt bands. If they want to expand their services using license-exempt spectrum, using robust equipment, nothing is stopping them. They, and most other users of licensed spectrum, cannot "get their heads around" the reality that better technology allows EFFECTIVE use of license-exempt spectrum. That willful ignorance will likely prove fatal, or severely wounding as new service providers that DO "get license-exempt" deploy wireless networks using license-exempt spectrum and offer wireless telephony customers attractively priced and compelling new services.

--- Competitive Landscape 3: SUPERCOMM, The Wireless Show
Most of the news this week coming out of SUPERCOMM, the primary tradeshow of the Telecommunications Industry Association (TIA) was about wireless - telling, on several levels primarily because this was once a wireline tradeshow. One of the most telling presentations was AT&T CEO Dan Dorman stated that they'll spend $500M making their existing customers happier, doing things like consolidating billing systems from 30 to 1. The only new initiative Dorman cited was that AT&T is now in the Wireless HotSpot business. Reading over most of the announcements, the new wireline products and

services merely dabble at the margins... except for vendors of wireless systems such as Aperto Networks and Cirronet that offer products to allow service providers and enterprise customers to simply bypass the worst of the wireline telephony industry's poor pricing, products, and services. In reading a number of Weblogs, news stories, and mailing list postings about SUPERCOMM, most of the "buzz" at SUPERCOMM appears to have resulted from the wireless products on display.

--- Competitive Landscape 4: Mr. Peabody Assists The ILECS With Their Fiber Problem ---
This is so WICKEDLY funny, incredibly well written (absolutely true to form with the old Peabody and Sherman cartoons), and amazingly on target. Highly recommended - please DO take the time to read it. It's a crash course in some of the worst of the perfidy of the wireline telephony companies. Kudos to author Kevin Maney!

Mr. Peabody and Sherman try to save future of telecom

http://www.usatoday.com/tech/columnist/kevinmaney/2003-06-03-peabody_x.htm

We have discovered the lost 92nd episode of Peabody's Improbable History, in which Peabody and Sherman meddle with historical events to make sure they turn out right. In this one, our boys turn to telecom.

"Hello again. Peabody here. And this, of course, is my boy, Sherman."

"Hi! Where are we going today, Mr. Peabody?"

"I'm setting the Wayback Machine for 1993 - Nynex headquarters in Westchester County, N.Y."

"Why there?"

"Well, Sherman, just last week the three biggest regional Bell phone companies - SBC Communications, Verizon Communications and BellSouth - made headlines by saying they'd taken a major step toward building high-speed fiber-optic networks right to homes. In 1993, the Bells were making some of their first promises to do exactly that. But by 2003, only 39,000 U.S. homes were connected to fiber lines. And Nynex, you see, is now a part of Verizon."

"I don't get it, Mr. Peabody. Why do we have to go there?"

"Simple, Sherman: to make sure the promises of fiber networks made over the years are NOT kept. If the Bells actually built the networks when they said they would, technology might have advanced faster, broadband services like video on demand might have developed sooner, demand for bandwidth might have grown more robustly, and the whole telecom and tech crash might've been averted."

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<End of fair use excerpt.>

Again... DO read the entire column - HIGHLY recommended! Maney is EXACTLY on target with his comments.

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--- New Products! ---
* Atheros New Dual-Band WLAN Chipsets - It's "just wireless" - multi-standard, 802.11a/b/g including the additional 255 MHz at 5 GHz proposed by the FCC. These chipsets are faster, cheaper, and smaller than previous versions. Atheros seems to be the chipset vendor to beat in WLAN components. http://www.atheros.com/news/AR5002.html
* Telex New Integrated Radio/Antenna - At the very first WISPCON in March 2002, in response to the widespread grumbling that "what the WISPs needed to succeed was really cheap Customer Premise Equipment (CPE)", I stated that if a WISP's business was dependent on cheap, self-installable CPE,

then what they should do was build out access points near concentrations of potential customers. For example, if an apartment building had potential customers, put a sector antenna and high-power 802.11b/Wi-Fi access point at the 7-Eleven across the street and customers in that apartment building could then buy and install cheap 802.11b/Wi-Fi clients attaching via USB or Ethernet to be able to position them to have a good (RF) view of the access point. One clever WISP tagged this concept "The StrohSpot". I saw a pre-release Telex 2473 at WISPCON III earlier this year, and it's apparent that Telex has been listening. The 2473 is an outdoor 2.4 GHz panel antenna with an integrated 802.11b radio. It features maximum allowable transmit power, sensitive receiver, bandwidth limiting, web-based configuration and management, and reasonable price. Best of all, it's COMPLETE and already integrated - no need for Do-It-Yourself. The Telex 2473 is the kind of equipment that is enabling the emergence of Wireless HotSpots and Wireless HotZones. A pretty dated spec sheet (my up-to-date information was snail-mailed) is available at http://www.telex.com/Wireless/files.nsf/Pages/telex_cpe_features/$file/telex_cpe_features.pdf
* fSONA Debuts "Lower" Speed FSO System - fSONA, whose existing Free Space Optical (FSO) products range up in speed to 1 Gbps+, now offers the 155-E. The primary differentiation of the 155-E is that it's designed to offer the benefits of FSO to those who have extensive networks of legacy telecommunications equipment which requires legacy interfaces and "lower" speed - up to 155 Mbps. fSONA keeps innovating, delivering FSO systems to paying customers, giving lie to the bigotry of RF vendors that say "FSO isn't reliable, you MUST use RF". The 155-E is the first of a new product line for fSONA. http://www.fsona.com/company.php?sec=pr_jun4_2003

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--- BWIA In Other Media ---
* IEEE Spectrum Online - Broadband A Go-Go http://www.spectrum.ieee.org/WEBONLY/publicfeature/jun03/bb.html
Author Steven Cherry describes his experiences with MeshNetworks in Orlando, FL, Broadband Solutions of Sandy, UT, Lariat.org of Laramie, WY, and Aerie Networks / Ricochet of Denver, CO. While the article gives a good overview of various Broadband Wireless Internet Access implementations, it suffers from the usual "lack of context" when those generally unfamiliar with BWIA attempt to describe a system they see in operation. For example, Cherry's statement "Mesh is the only company to have figured out how to dynamically hand devices off from one access point to another at broadband data rates and six-lane free way velocities.", apparently ignorant that, among others, Alvarion's BreezeNet and to a lesser extent BreezeAccess II, and Flarion products possess this capability. Another glaring flaw is that the author describes several points of similarity between MeshNetworks and Ricochet, but totally misses the primary technical similarity that Richchet is a mesh system; albeit in its present (Ricochet II, 128 Kbps) implementation more of a static mesh than a dynamic mesh like MeshNetworks.
* Forward Concepts Releases Wireless HotSpot Study - http://www.fwdconcepts.com/Pages/press45.htm
Authored by Daniel Sweeney Ph. D., ìWi-Fi Hotspot Opportunities: Exploiting the New Phenomenonî appears to be yet another glancing blow at the financial potential of Wireless HotSpots... while completely missing a number of key factors. An excerpt from the sales information - "In most cases where repurposed technology has succeeded in big way, such as the Internet, it has exhibited a strong grass roots component in terms of the user base. In hotspots to-date the grass roots aspect of the phenomenon resides in the service providers themselves, which are often very small, single-location businesses linked in a franchise arrangement with a hotspot aggregator or platform developer. Unless hotspots inspire a similar degree of enthusiasm among subscribers, the same fate could befall the hotspot industry as befell e-commerce at the turn of the millennium, where similar vendor enthusiasm far outstripped market acceptance.î Sweeney misses the key point that Wireless HotSpot access WILL in many venues become a accepted, expected amenity... which does not detract in any way the viability of the market for backhaul services, Wireless HotSpot equipment, and various value-added services that are poised to take advantage of such ubiquitous high-speed Internet connectivity. Sweeny (in common with all other such studies to date that I'm aware of) ignores the acceleration effect that 802.11b/Wi-Fi Personal Digital Assistant (PDA) devices will have on the demand for Wireless HotSpot services, or the vastly lower pricing for backhaul services available from Wireless Internet Service Providers (WISPs).

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--- BWIA-related Events Of Note ---
* 802.11 Planet - June 25-27, 2003, Boston, MA - http://www.jupiterevents.com/80211/spring03/index.html
802.11 Planet is targeted mostly at "indoor" applications of Broadband Wireless. I will be chairing a panel discussion on Disruptive Hotspot Technologies from 4:00 PM - 5:00 PM on June 27. My co-panelists are Phil Belanger, Vice President of Marketing for Vivato, Martyn Levy, Chairman and founder of RoamAD, and Wanda Posehn, VP Canadian Sales for Wi-LAN Inc.
* WCA 2003 - July 8-11, 2003, Washington, DC - http://www.wcai.com/event/03general.htm
This will likely be the defining event for 2003 for the overall Broadband Wireless Internet Access industry. It was inspired of the WCA to move their annual event to DC to be within easy commute range of lawmakers and FCC staff, and reschedule (it's traditionally held in August) it while Congress is still in session (DC largely shuts down during the month of August while Congress isn't in session). In the wake of seminal events in the Wireless industry last year and this year, such as last year's Spectrum Policy Task Force, introduction of bills requiring allocation of additional license-exempt spectrum, and increasing awareness of Broadband Wireless Internet Access in general, this event will likely be a huge success for exhibitors and attendees alike. I will be attending, but not speaking.
* Broadband Wireless East Conference & Expo - September 25 & 26, Baltimore, MD - http://www.scievents.com/bwwEast03/
Shorecliff Communications is extending their annual Broadband Wireless World Forum into a semi-annual, apparently bi-coastal event.
* WISPCON IV - October 27-29, 2003, Dallas, TX - http://www.wispcon.info/
Dates are tentative per the Part-15.Org WISP discussion list. Targeted specifically at the small-to-medium Wireless ISPs, this conference brings together those that are WISPs, those who want to be WISPs, and the equipment and service vendors who wish to aid and abet them in deployment of WISP services.

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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 ìlast mileî, 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 ñ 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, distributed via email.

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