

TECHNOLOGY BRIEF

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Special points of interest:

- Maxed out on WiMAX? Want to know more about WiMAX, but overwhelmed by the marketing hype? Read Part III of our WiMAX Update Series.
- Check out Wimaxxed online - the eXXclusive online news source for everything WiMAX. www.wimaxxed.com
- WiMAX Trends is the leading information gateway for WiMAX, based on the IEEE 802.16 standard for wireless MAN technology. www.wimaxtrends.com
- What's the best radio for the job? Trango? RedLine? Canopy? RadWin? Tranzeo? Mikrotik? Orthogon? Want to know the "hidden secrets" that salespeople "conveniently forget" to tell you about? Read real-world user reviews at www.wispreviews.com

WISPNOG != BRIDGED (A ROUTED EVENT) FEBRUARY 17-18, 2005

As networks grow, a major decision facing operators on all levels is whether to continue bridging or to find an appropriate mix of integrating a routed architecture within their networks. For the start-up, bridged networks provide several benefits, including ease of installation and protocol transparency. However, such blissful ignorance is shown only to continue indefinitely in the smallest of networks.

By bridging, or simply gluing the network together, devices initially installed as "plug-and-play" in a small bridged network eventually evolve into "plug-and-pray" when troubleshooting is required in the context of a larger network.

Like our broadband wireless networks, the license-exempt broadband wireless industry has also experienced spectacular growth these past few years. Unfortunately, it seems that the industry hasn't had the foresight to "route" things out. The growing buzz around emerging wireless technologies has resulted in nothing more for industry events than what "community-wireless hippies" with Pringles cans and Best-Buy amplifiers have done to license-exempt spectrum; an all-around increase in the general noise floor.

Independent Operators have been using license-exempt wireless technology for over 10 years now, yet "technical" wire-



less symposiums are still filled with "experts" spending 95% of a session teaching us how to spell RF.

WISPNOG is a "routed" event; a high SNR symposium that cuts through the "noise-floor" surrounding us. WISPNOG is for experienced operators; our focused discussion forums bring experienced industry professionals together to discuss and exchange ideas and solutions. In addition, we provide a coupon book to ensure that you leave with **SOLUTIONS IN HAND**.

The WISPNOG Coupon Book, given to every registered attendee, offers over \$10,000 in savings on BWA infrastructure solutions. The Coupon Book provides **IMMEDIATE ROI** for registered attendees by covering the cost of attending WISPNOG through Coupon Book Savings, and guaran-

tees that every registered attendee leaves WISPNOG with a solution to save them money.

We hope WISPNOG provides you with enough information to create a flurry of ideas to carry home and share with you colleagues back in the office. With the generous support of our advisors, our distinguished faculty of panelists, our exhibitors, sponsors, media partners, and most importantly you, a member of the vibrant, unwavering WISP community, I believe that we have made WISPNOG the most timely and valuable symposium for Wireless Network Operators everywhere.

-Charles Wu
Operating Manager - CWLab

www.wispnog.com

MAXED OUT ON WiMAX

PART III: WiMAX != BWA?

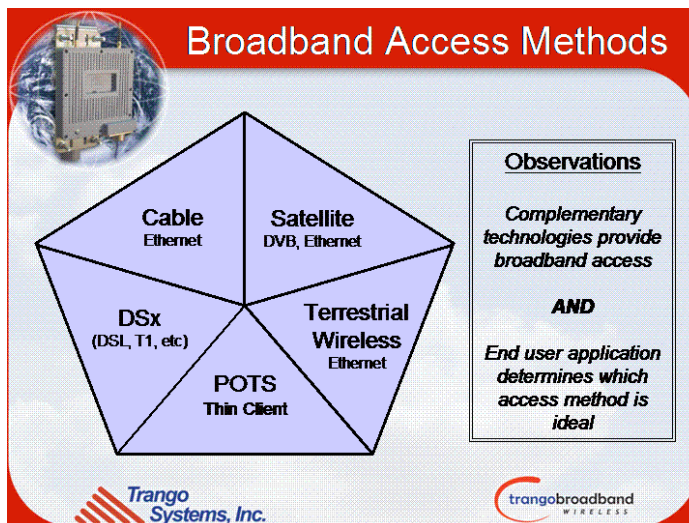
A recent report released by the Yankee Group in October 2004 states that:

“WiMAX wireless broadband is gaining in popularity and is poised to become the third-most used high-speed internet access technology after DSL and cable modems...”

Although the WiMAX marketing machine has done a decent job of blurring the distinction between WiMAX and broadband wireless, in understanding the realities of WiMAX, it is VERY IMPORTANT to remember that WiMAX represents JUST ONE TYPE of terrestrial broadband wireless access technology. This point was strongly stated in the “WiMAX: Why Wait?” session at ISPCON Fall 2004 presented by Michael Cochrane of CTI, a provider of BWA infrastructure solutions. One of the panelists, Chuck Eapan of Trango Broadband, a manufacturer of proprietary (non WiFi or WiMAX) license-exempt BWA infrastructure solutions, illustrated these differences with the following slide.

(Opposite Page)

Today, WiFi is used (due to the world-wide adoption of the 802.11 standard) to generically describe wireless local area



networking technologies. The WiMAX marketing machine is trying to impose WiMAX as the generic term for terrestrial broadband wireless access. HOWEVER, reality shows that terrestrial broadband wireless access technologies today consist of a combination of cellular, WiFi, and proprietary solutions. Today, WiMAX accounts for **ZERO PERCENT** of the technology behind today’s classification of “Terrestrial BWA” as an alternative method for Broadband Access. As of February 1, 2005, WiMAX equipment DOES NOT EXIST...it is PURELY HYPE.

On an interesting side note, although this document was originally written in November, 2004,

it was recently announced last week that WiMAX certification testing would be delayed by a minimum of 6 more months. As a result, a certified “WiMAX kit” will not launch until the end of 2005.

Going back to the previous Yankee Group statement, if properly amended, should state:

“Broadband Wireless Access Technologies are gaining in popularity as an alternative access medium and are poised to become the third-most used high-speed internet access technology after DSL and cable modems...the WiMAX forum, a

(Opposite Page)

“the WiMAX forum...represents **ONE POSSIBLE** solution towards overcoming some of the hurdles involved in choosing Terrestrial Wireless Technology as a method for delivering last-mile broadband.”

CWLAB TECHNOLOG-E-ADVISORS ALL WiMAXED OUT...

Starting this month, joining Roger May Stoj, Adlane Fellah from Maravedis Inc and Suzanne Yingling from WiMAXetc, CWLab Technolog-E-Advisors will begin providing editorial content for WiMaXXed.com - the eXXclusive online news source for everything WiMAX.

WiMaxxed.com brings you the



latest on equipment, providers, manufacturers, markets, news stories and press about advancements in WiMAX and the emer-

gence of the IEEE 802.16 broadband fixed wireless standard.

www.wimaxxed.com

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(Previous Page) consortium of equipment manufacturers and service providers within the Broadband Wireless Access space who are trying to solve some of the technological and economical problems faced by today's BWA technologies via a common IEEE standard, represent one potential solution towards overcoming some of the hurdles involved in choosing Terrestrial Wireless Technology as a method for delivering last-mile broadband."

WiMAX was created to provide one such solution to overcome "WiFi's shortcomings" in outdoor BWA deployments.

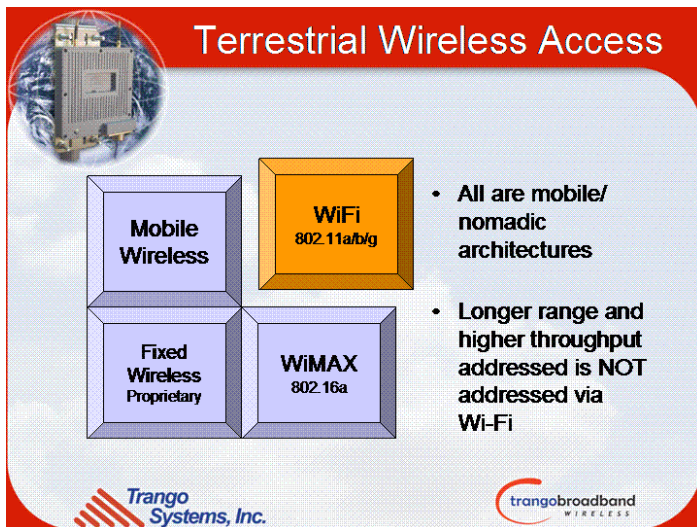
ONE IMPORTANT FACTOR TO NOTE in terms of the development and acceptance of WiMAX is the lower left hand box that reads "proprietary fixed wireless." Since the early 90s, the shortcomings of wireless LAN technology in outdoor environments have been acknowledged and several proprietary solutions have already been developed to address these issues. An early

n't robust enough to handle this task, Doug rewrote the protocol driver to create TurboCell.

To solve his "campus connectivity issues," Doug combined his new TurboCell protocol with standard PC components, circuit board radios and off-the-shelf antennas to create one of the world's first fixed broadband wireless access systems. According to business partner Doug Harman, "That made a pretty big splash. We were doing something unique and selling at a price point that was very hard to beat." The fixed wireless systems very quickly became the company's lead products.

Then big competitors like Lucent - soon to be customers as it turned out - persuaded KarlNet to give up making complete systems and to sell its market-leading fixed wireless software as an OEM firmware offering. KarlNet put the software on a circuit board and sold it to companies like Lucent which then integrated it with their own radios and antennas to create the final product.

"Remember, WiMAX represents ONE PORTION (that incidentally doesn't yet exist) of the various terrestrial BWA technologies available to the independent operator."



If there is anything that is important to remember, it is to note that WiMAX REPRESENTS JUST ONE PORTION of the various terrestrial BWA technologies available to the independent operator.

Today, the popularity of the WiFi standard resulting in its low costs have made it a very popular BWA technology platform for operators. However, this standard, originally engineered for indoor wireless LANs spanning several hundred feet, lacks many of the needed mechanisms required to address the many issues that a multi-mile outdoor BWA solution faces. 802.16a &

such solution is the story of Doug Karl and KarlNet.

History of KarlNet.

In 1992, KarlNet founder and chief technology officer Doug Karl was on the computer science faculty at Ohio State University (OSU) in Columbus and managing the school's Internet-connected network. Doug had some remote facilities several miles out that he needed connected where, due to distance or right-of-way limitations, it wasn't cost effective to pull fiber. At the time, wireless LAN technology had just been introduced, and Doug used it in an early attempt to "bridge the last mile." Realizing that wireless LAN technology was-

By the late 90s, an accidental technology based on emerging wireless 802.11 LAN standards, commonly known today as WiFi, had emerged as the basis for an alternative last-mile delivery medium. Frustrated with lack of access into the cable infrastructure and unable to make the DLS business model work (as exhibited by the spectacular bankruptcies of CLECs like Rhythms and Northpoint), a few innovative operators (including the author here) realized that it was possible to "extend" the range of low-cost "indoor wireless LAN" equipment by adding amplifiers and antennas. Take a 1-2 Mb wireless LAN device,

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add a couple thousand dollars for accessories and a high point (tower or building rooftop), and you now have (a) created a cost-effective method of delivering last-mile broadband access to your customers (NOTE: it was 1997/1998, and at this point, the SMB/SOHO T1 replacement market was the main target) and (b) by "owning" your infrastructure, you have become facilities based and "freed" yourself from the Incumbent Telephone Company. An illustrative example of such an "innovator" was Midcoast Internet Solutions out of Maine.

The MIS Story

We started investigating this method [wireless broadband] in December 1997 as a way to control our own destiny, rather than rely on the Telco and/or Cable industries to make the next step. Since that time we have chosen a wireless method that we felt had the best chance of allowing us to succeed as a wireless ISP, but also a product that gave the best service to our customers. We will continue to operate as a dial-up ISP and are working to provide DSL services in some of our areas.

In the fall of 1998, MIS activated a 130' tower in Owls Head, Maine in the first step of our wireless network. Today (2000) MIS operates a wireless access system from 8 distribution points with many more on the way. Our recent acquisition of a 300' tower in Westport, Maine, will anchor the southern territory of the MIS wireless network. We are thrilled to be able to bring affordable, high quality, high-speed access to the mid-coast of Maine.

Historically, the license-exempt

Part-15 bands were dubbed "junk" bands because of the plethora of devices and manufacturing equipment occupying them - devices and equipment not used for communications purposes, but occupying spectrum only because RF energy was a byproduct of their operations. In the early days, innovators like Doug Karl were forced to "jerry-rig" solutions pieced together from off-the-shelf PC & wireless LAN components. In time, however, there were enough such operators to convince startup wireless LAN manufacturers, like Alvarion, that this "accidental market" actually had potential. By 1999, amidst the spectacular telecom meltdown and the ensuing failures of licensed (MMDS & LMDS) BWA operators, Alvarion (then known as BreezeCom) went beyond KarlNet's "software hacks" and reengineered its wireless LAN product line to fit the needs of this fledgling industry, and in 2000 introduced one of the first proprietary products build exclusively for license-exempt Wireless Internet Service Providers (WISPs)

BreezeCOM Announced Launch of New Carrier-Class Product Line

TEL AVIV, Isreal/CARLSBAD, CA, November 6, 2000—BreezeCOM (NASDAQ: BRZE), a leader in the design and manufacture of high-speed wireless access solutions, today announced the launch of BreezeACCESS II™, a new carrier-class line of wireless access products. Designed for operation in the 2.4 GHz ISM band, BreezeACCESS II™ brings a new level of system reliability, network manageability and easy of installation previously only available to licensed carriers. Now, service providers operating wireless networks in the 2.4 GHz license-free band can leverage the same technologies developed by BreezeCOM for carriers in the 2.5 MMDS and 3.5 GHz licensed frequencies.

Over the years, as this accidental industry matured, more independent operators, frustrated with last-mile access, turned to license-exempt BWA either to retain their existing dial-up customer base or as a means to compete against incumbent cable, DSL and leased line providers. And such a "disruptive technology" flourished. In 2002, amidst the "telecom meltdown," Research Firm In-Stat MDR estimated that in North America alone, there were over 1,500 independent WISPs with aggregate annual BWA access revenues of approximately \$250 million.

Spectrum that was formerly the exclusive province of microwave ovens and industrial equipment today plays host to wireless broadband networks that not only provide last-mile connectivity, but last 30-50 mile connectivity. There are license-exempt BWA networks spanning hundreds of miles and covering several states, servicing rural and remote communities that have no broadband options. Today, innovative operators like MIS, who pioneered the license-exempt broadband wireless access market in the late 90s, number in the thousands, as the 2004 North American License-Exempt BWA Point-to-Multipoint Access Hardware Infrastructure have exceeded \$100 million (Sky Light Research) and aggregate North American annual BWA access revenues in 2005 are projected to exceed \$1 billion (Jupiter Research).

Next Month

So what does WiMAX have to do with all this?

www.cwlab.com/wimax

"Spectrum that was formerly the exclusive province of microwave ovens and industrial equipment today plays host to wireless broadband networks that not only provide last-mile connectivity, but last 30-50 mile connectivity..."

THE HOLY GRAIL OF 700 MHz? AN OVERVIEW OF 802.22

Over-the-air broadband TV channels are separated by unused frequencies. This “white space” in the broadcast spectrum varies with the channels present in a locale and creates opportunities for other applications. As a step in putting these unused channels to practical use, the IEEE has started work on a standard to enable the deployment of wireless regional area networks using the unused TV channels, while not interfering with the licensed services now operating in the TV bands.

IEEE P802.22™, “Standard for Wireless Regional Area Networks (WRAN) - Specific requirements-Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications:

Policies and procedures for operation in the TV Bands,” will specify a cognitive air interface for fixed, point-to-multipoint, wireless regional area networks that operate on unused channels in the VHF/UHF TV bands between 54 and 862 MHz.

“Signals at these frequencies can propagate 40 km or more from a well-sited base station, depending on terrain,” says Carl R. Stevenson, Interim Chair of the IEEE P802.22 Working Group. “This is ideal spectrum for deploying regional networks to provide broadband service in sparsely populated areas, where vacant channels are available. Our goal is to equal or exceed the quality of DSL or cable modem services and to be able to provide that service in areas where wire line service is economically infeasible, due to the distance

between potential users.

“This standard will enable the creation of interoperable IEEE 802 WRAN products. It has generated a great deal of interest from wireless internet service providers, community networking organizations, government bodies and other parties.”

Protocols in the standard will ensure that this new service does not cause harmful interference to the licensed incumbent services in the TV broadcast bands. The standard will provide for broadband systems that choose portions of the spectrum by sensing what frequencies are unoccupied.

www.cwlab.com/wiTV

CWLAB “BACKHAUL BASH” SCHEDULED FOR BBW WORLD 2005 IN VEGAS

CWLab, the Broadband Wireless industry’s real-world consumer reporting and independent equipment testing organization, will present an exclusive afternoon Pre-WiMAX Equipment Review Workshop at the Broadband Wireless World Conference this April 2005 in Las Vegas, NV.

This four-hour workshop will provide an independent 3rd party comparative review, based upon REAL-World implementation and field testing, on the capabilities of various high-capacity broadband wireless backhaul and bridging solutions available on the market today. Presentation material will cut through marketing “feature speak” by giving participants an in-depth “nuts-and-bolts” view of “the good,

bad & ugly.”

Each radio solution presented will undergo the following implementation scenarios and comparative testing criteria:

1. Field Implementation Scenarios

- 50 foot “controlled” Lab Setup (for best-case benchmarking purposes)
- 4 mile Line-of-Sight Real-World Setup
- 20 mile Line-of-Sight Real-World Setup
- 2 mile Non Line-of-Sight Real-World Setup (if applicable)
- Basic Throughput Test #101
- Basic Latency Test #202
- QoS Support Test #203

2. Comparative Testing Criteria

- CWLab Throughput Certification Score #201



Registered attendees will receive a complementary copy of CWLab’s “WiMAX-What Now?” Analysis Paper (\$995 value) and the WISPNOG Coupon Book.

www.cwlab.com/Certification/

the IEEE has started work on a standard to enable the deployment of wireless regional area networks using the unused TV channels (700 MHz)...



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Have you read up on...

WIMAX Trends

A Leading portal for WiMAX
www.wimaxtrends.com

Upcoming Events



February 17-18, 2005
<http://www.wispnog.com>



April 21-22, 2005
<http://www.shorecliffcommunications.com/bww05/>



May 24-26, 2005
<http://www.ispcon.com>

-----Original Message-----

From: Trango-owner_at_part-15.org

Sent: Friday, December 31, 2004 3:56 PM

Okay UPS just hand delivered a 2 page letter describing the NEW Verizon Fiber now available in my neighborhood..

Starting out at 5 megs down and 2 megs up for \$39.95! 15 megs 2 meg down at \$49.95

My question to you is HOW do I compete with only 3-6 megs available to me (other 3 megs have not been provisioned yet so I only have 3 so far) I am calling now to see if I can resell this service and then NAT some IPs to clients and see if I can do that???

-----End Message-----

More Upstream and bigger wireless pipes are not going to solve these issues, as wireline technologies have an inherent economic and technical advantage over wireless (hence why in the late 90s, large carriers replaced their x-country microwave backbones w/ fiber).

It is necessary to remember that as independent license exempt operators, we are all "Davids" vs. the incumbent cable ops, ILECs, etc - the "Goliaths" of Telecom. Now, if we try to match "Goliath" w/ sheer brawn (in this case, competing head to head on bandwidth and price) - it's only a matter of time before we lose due to "Goliath's" greater strength (in this case, manpower, money, resources, government support, etc).

As the "underdog" - what is necessary is that we utilize our inherent speed and flexibility to our advantage. How is this done? Well, for starters, rather than competing on their terms, we should work on "rephrasing the problem" and fighting them on our terms...

For an analogy, just take a look at one of history's most effective generals - Alexander the Great. What's notable is the fact that when going up against the Persian Empire, Alexander was the underdog (imagine, his 30,000 man army defeating a million plus man Persian army). How did he win? By redefining the battlefield and fighting the Persians on HIS TERMS.

Case in point, early in his campaign, before he could invade into the heart of Persia, he faced the problem of the Persian Navy. Facing hundreds (if not thousands) of ships piloted by seasoned mariners who had the ability to cut off his supply lines, he at the time had no navy, and his army had never fought a naval battle. So, did Alexander try "fight the Persians on their terms" by building, equipping and training a navy? No, he instead focused on winning control of all the sources of fresh water along the Mediterranean coastline, and by redefining the playing field, he conquered the Persian navy without a single naval battle.

Today, as independent wireless operators, in order to survive and flourish, it is necessary to think along these same terms. License Exempt Fixed Wireless has definite advantages; flexibility, ease of install, potentially nomadic capabilities, etc - in addition, we as independent operators also have similar type advantages and should be exploring value-added services - like personalized, local & better service, the ability to adopt the latest technologies, break-fix internal networking services...

So, what to do? Rather than butting your head against the wall while trying to compete against incumbents on their terms, let's focus on using our innovative and independent spirit to redefine the playing field with new ideas (underserved areas, mobility, roaming, VoIP, retirement communities, etc) so we can **WIN ON OUR TERMS.**