
WHITE



NOISE

Palm Beach Packet Group, Inc.
PO Box 16471
West Palm Beach, Fl. 33416-6471
<http://www.qsl.net/pbpg>
email: pbpg@qsl.net

President Doug Welcker WB4KGY
Secretary Richard Schofield AF4OR
Registered Agent John Green WB4MOZ

Vice President Burck Grosse KC4UEV
Treasurer Marvin Kaskawits KD2CK

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Reach Out and Touch Someone: How Bob and His Binoculars Found More Bandwidth and Learned to Stop Worrying and Love the Bond

By Robert X. Cringely

Bob Cringely is a columnist whose weekly internet articles cover the behind-the-scenes happenings in the computer industry. They enjoy a high priority on my must read agenda while surfing the internet. This article was published on his web site <http://www.pbs.org/Cringely> June 23, 2001. It specially caught my attention because of its content covering broadband, computers, and digital radio. And, for the later reason, I'm sharing it with White Noise readers who also have that interest. As soon as I read it, I emailed Bob requesting his permission to reprint it. Within hours I received a reply indicating that the proper permission must be sought from the Public Broadcasting System and he forwarded my request to them for consideration. Within a week I received their email approval.

We are grateful for the endorsement from Bob Cringely and the permission of PBS - Online <http://www.pbs.org>. to reprint it here.

My house sits on a hill in rural Sonoma County, 36,000 feet from the telephone company central office and 22,300 miles from the GE satellite that provides my Starband Internet service. I have written two previous columns about Starband, but this isn't a third one. Rather, it is a column about my feeble attempts to move beyond Starband and gain better service. Starband is nice, but the latency is real, the upload speeds are a joke, and some protocols can't be carried at all. Internet telephony, for example, works great, but only in one direction. So while I am not ready to dump Starband, I'm certainly looking for alternatives. And now I think I've found one -- an 802.11b wireless link from Hell. Remember, I am a professional. Don't try this at home.

The whole idea was to piggyback off some other person's DSL connection. There had to be someone I could find who was close enough to the phone company central office for dependable DSL service, yet still within line-of-site from me. So I bought binoculars, then a telescope, then a larger telescope. In the early morning and late at night, I would sit on my deck scanning for neighbors with DSL potential. That's when the light was best and the haze was least. My immediate neighbors would be no help because they were all just as far from the phone company as I was. Most DSL needs to be no more than 18,000 feet from the C.O., so anyone else in Bennett Valley was off-limits. That left me peering through two little gaps on the shoulders of the mountain between my house and Santa Rosa. Through one gap I could see what looked like street lights, and through the other I could see what I was sure was a traffic signal, both between five and 10 miles away. To a man with slow bandwidth, such things are exciting. Enter telescope number three, finally big enough to actually see what was there -- evidence of habitation!

It sounded easy. I'd find a house through one of those two gaps, knock on their door, then ask if I could buy them DSL service in exchange for mooching some bandwidth over a bootleg wireless link. It SOUNDED easy, but wasn't. People don't like to hear that others have found them by squinting through a telescope. They are suspicious of free offers. Or maybe they were just suspicious of

me. But finally I had my co-conspirator, a guy who never would have bought DSL, but was certainly willing to enjoy it for free. We ordered Pacific Bell DSL because the phone company sometimes forgets to throttle the bandwidth, something a Covad or Rhythms would never do.

Now for the wireless link. I had done my research on the Net and knew exactly whom to copy, in this case a guy from New Zealand. The connection would be using 802.11b, which normally has a range of 100 feet or so. But that range is using an omnidirectional antenna. Using a 21 dB Yagi directional antenna, other people had built links as long as 14 kilometers while mine would be about 10. Interestingly, this sort of hacking doesn't appear to break any laws because the Effective Radiated Power of the Yagi is still under the maximum set by the FCC.

The set-up is simple. I had to buy a new Apple Airport hub for each end of the link. So I'm already \$600 into it. Then I needed a pair of Apple G-4 internal antenna cables that matched the custom Airport coax connector. These cables are \$30 each. Finally I needed a pair of \$249 Yagi antennas and various cables, clamps, and poles, for a total of just under \$1,400. Then came a little mounting, a lot of aiming, and the darned thing actually worked! Now for \$49.95 per month I have close to a megabit of PacBell DSL to go with my Starband, all arbitrated by a multi-homed Linux Router Project homebuilt BGP-4 router built from an old 486/66 PC. At the other end of the link, no computer needs to be on for me to connect, just the Airport and the DSL modem.

What all this effort gets me is the ability to run a server. It gets me two-way Internet telephony, though at a cost where it would probably have been cheaper for me just to use my regular phone. It gets me AOL and several streaming protocols that just don't work very well over the satellite. But mainly it gets me two things I really value -- reduced latency and a useable Internet time signal. I'll never have to set my computer clock again.

This use of 802.11b or WiFi is not all that unusual and probably indicates one direction where we will see commercial products headed soon. What I cobbled together for \$1,400 could probably be put together in volume for half that price. I wish someone had done it and saved me the trouble.

This experiment is also a testament to the versatility of 802.11 -- a protocol that was never intended to do anything even remotely like this. But 802.11 isn't what it used to be. There were a number of technical problems to be overcome along the way.

For one thing, the 802.11 protocol had some significant problems scaling up from LAN to WAN. First, there is the problem that, as the standard is written, every node on the network is supposed to be able to hear every other node so they can detect collisions much as CDMA Ethernet does. This "hidden node" problem -- the node that is active on the network but can't be seen by the other clients -- can lead to significantly reduced throughput if hidden nodes account for more than 10 percent of the total hosts.

Then there is the polling problem. 802.11 uses standard 802.3 polling, which means that a host first listens for traffic on the line, then transmits if none is heard. If a collision is detected, both colliding nodes wait a random time interval then try again. This works fine for Ethernet, but not for 802.11 because the signal strength can vary so much from one radio to another depending on where it is in the building, etc. So the 802.11 standard is very conservative with the result that it can take a lot of time for each computer to finally get a chance to talk. This is fine when the average LAN size is a few nodes, but when there are hundreds of nodes it's horrible -- or was.

Finally, there is the packet size problem. Most of the 802.11 overhead goes into creating, then shutting down communication events. The actual data transfer is trivial. This suggests that the bigger the packets the more efficient the communication. Alas, 802.11 ramps up packet size in such a way that short packets are much more the rule than longer packets. And the spec even mandates that the first packets be as small as possible. This means another hit on throughput.

All of these problems were solved by Doug Karl, a guy who until recently helped to run the network at Ohio State University where all these wireless tricks were perfected. His company, Karlnet Communications solves these problems with its Turbocell technology, which uses the hub almost as a wireless switch, controlling for hidden nodes, maintaining polling priorities, and aggregating smaller packets into larger ones. Turbocell makes 802.11 far more useful than it really deserved to be, which is exactly the way Internet standards should evolve. Apple, Lucent, and other companies license Turbocell code for their products. So if you are reading this over a wireless connection at Starbuck's, be grateful to Doug Karl. I know I am.

But now what do I do with three telescopes?

(More Bob Cringely wrote a follow-up article for his web site of July 14: "I Network Therefore I Am - Further Adventures in the World of Bootleg 802.11b". Cringely elaborates on alternative hardware selections and notes that the idea of piggy-backing broadband connections is spreading. If this first article whet your appetite, his second (and perhaps more?) is a must to read. - Bill Manley KB4XE)

THE MOXON ANTENNA A Compact 2-element Beam

Bill Manley KB4XE

As you may have presumed, I do spend more time surfing the internet than I do hamming (or just about any other single activity). Here is another article, gleaned from the internet, having extraordinary interest to hams.

The Moxon Antenna, first suggested by Les Moxon G6XN, has been the topic of much description and analyses on the internet and other media. It is a fascinating antenna having about 70% the size of a 2 element yagi but very close to the same gain and superior front-to-back ratio.

Check out <http://www.cebik.com/moxgen.html> . L. B. Cebik W4RNL presents analyses, charts, tables, and descriptions of the Moxon configuration. He defines optimum dimensions for each of the antenna segments based upon frequency and wire size. His article includes the basic language source code to determine the optimum configuration for any size Moxon using your home computer.

Unfortunately many modern PCs no longer have the capability of running basic code. Using Cebik's data, I coded his analysis in Visual Basic and have placed an installable application on our web site. It can be downloaded and installed on any Windows ready computer. Connect to <http://www.qsl.net/pbpg/downloads> and click on OPTIMIZED MOXON DESIGN PARAMETERS APPLICATION. This will download moxon.zip. Unzip the file, and run the setup.exe . The resulting application will install on your computer and become available from START/PROGRAMS/MOXON ANTENNA DIMENSIONS.

Run the application. The Moxon form will appear on your desktop. Enter the frequency of operation and wire size for the antenna to be configured in the form. The wire size can optionally be specified in inches or as a ratio to the wavelength. Press CALCULATE and the six element dimensions will be presented. Exit by pressing QUIT.

Oh yes, don't forget to read the readme.txt file which is included in the package.

And also, when you visit the Cebik [moxgen.html](http://www.cebik.com/moxgen.html), check out his other pages as well. You can spend a week surfing Cebik's site!

MEETING MINUTES

May 10, 2001

Board Members Present:

President - Doug Welcker (WB4KGY)
Secretary – Dick Schofield (AF4OR)
Treasurer – Marvin Kaskawitz (KD2CK)
Registered Agent – John Green (WB4MOZ)

The meeting was called to order at 7:30PM by President Doug Welcker.

The Treasurers Report was read by Marvin (KD2KD) and accepted. (see last page)

The Secretaries report was read by Dick (AF4OR) and accepted

Doug gave the Technical Committee Report and again all is well with the West Palm Beach and Stuart SWITCH sites. The APRS Digi equipment for Marathon Key is under assembly and expected to be completed by May. Andy installed the crystal channel elements and tuned the radio. Several 486 computers were donated to the club including monitors. Contact Doug if you need a spare monitor as he has several to give away.

Under Old Business there is not much to report. If you have an interest in a particular digital subject and would like more information contact a club member or officer. Due to Bill Manley's situation White Noise mailing will be delayed. A new SWITCH/NODE list for Florida was handed out.

In our New and Info section Bill Manley (KB4XE our WN editor) is in the hospital with possible heart problems. For this reason there will be a delay of WN publication. All our prayers are with you Bill. Doug thanked Jamie (KD4LXB) for his generous contribution of a APRS weather station. It is planned to install this equipment in the Belle Glade area to show conditions in western Palm Beach County. In regard to the Radio/Sound Card interface, it has been difficult locating some of the parts. John (WB4MOZ) will continue he search while at the Dayton Hamfest this month. The South Florida S.E.T. is now underway. This is a state wide simulated hurricane drill (South Florida ARES Net frequency is 3940 kHz. New purchases for the PBPG library include books on cubical quads and wire antennas. If you would like to help either technically or otherwise even if you can't attend the meetings please contact one of the club officers.

Under the category of New Business; as reported last month Adam (N2PNO) has advised the PBPG that there is site availability to install a SWITCH and APRS weather station at his place of employment, the Belle Glade Hospital. Currently the hospital is preparing for a State inspection on the 1st of May and after that is complete we can proceed with equipment installation.. The PBPG has been looking for some years for a suitable location in Belle Glade and has equipment ready to install.

The workshop was presented by Doug who showed a video of a possible new Lake Placid Switch site. The video included the current Lake Placid Switch site and the Okeechobee site including the tower and antennas. The next meeting will be June 14, 2001. This ended the meeting that was adjourned at 8:30 P.M.

Respectfully submitted by Secretary

Dick Schofield AF4OR

MEETING MINUTES

June 14, 2001

Board Members Present:

President - Doug Welcker (WB4KGY)

Secretary – Dick Schofield (AF4OR)

Treasurer – Marvin Kaskawitz (KD2CK)

The meeting was called to order at 7:30PM by President Doug Welcker.

There is no Treasurers Report as Marvin is on vacation.

The Secretaries report was read by Dick (AF4OR) and accepted.

Doug gave the Technical Committee Report and again all is well with the West Palm Beach and Stuart SWITCH sites. The APRS Digi equipment for Marathon Key is under operational test in Doug's garage. Instead of using a TR relay on the shared antenna, the commercial service and the APRS Digipeater will be diplexed onto the same antenna, which allows both to operate simultaneously. The long awaited western Palm Beach County Switch site has come back to the front burner. Jim Johnson (W4JBZ) informed Doug that the building, the anchor points and tower base are all completed. Work will begin in a few weeks on the tower construction. Final tower height will be 493 feet and it is designed primarily for FM broadcast. Our thanks to Jim for inviting us to install a Switch at this Lake Port location. Four six-volt deep cycle 125 AH batteries have been donated to the PBPG. Preliminary testing reveals these batteries to be in excellent condition. Two of these batteries will be used for backup power at the Lake Port Switch.

Under Old Business the best news is Bill Manley (KB4XE), our WN editor, is home and doing well. As reported last month Adam (N2PNO) had advised the PBPG that there is site availability to install a SWITCH and APRS weather station at his place of employment, the Belle Glade Hospital. After several efforts to make good on this situation we have been unable to move this effort forward. Jamie (KD4LXB) suggested contacting Allen Kessler (WB2BQK) as he has been instrumental in getting amateur radio stations installed in other county hospitals.

In our New and Info section Gary Arnold (WB2WHA) from the Naples area passed in late may. Gary was one of the original packeteers and was instrumental in installation of systems in the Naples area. The Radio/Sound Card interface has been slowed by difficulty of locating some of the parts. John (WB4MOZ) was able to locate some of the parts at the Dayton Hamfest but we are still looking for a few that are still missing. If you would like to help either technically or otherwise, even if you can't attend the meetings, please contact one of the club officers. As Jamie (KD4LXB) found you could hear the ISS with a hand held in the house and get S-9 signals. There is an active conference bridge in the Stuart LAN. Connect to W4HYK and type //info for information.

Under the category of New Business Dick reports changes in the 5 wpm code test have deleted the ten questions multiple choice. There will be a shelter test drill on Saturday June 10th. With Field Day coming on June 23rd the Wellington Radio Club has invited members of the Palm Beach Packet Group to participate.

The workshop was presented by Doug who distributed PACKCOM software and demonstrated its operation. The next meeting will be July 12, 2001. This ended the meeting that was adjourned at 8:30 P.M.

Respectfully submitted by Secretary

Dick Schofield AF4OR