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Background

Let me begin by saying what I know about radio, including amateur, much less packet, you can put on the head of a pin. But thats where I started in computers 11 years ago too, so I guess it is no disgrace.

But I also know an important telecommunications development when I see it — as I did microcomputers in 1977 and modems in 1979. Thus, when Andy Freeborn NOCCZ, whom I had known for several years in Colorado Springs as we hacked out the mysteries of early Tandy computers, mentioned in 1982 something new called 'packet radio' I became keenly interested. My interest then, as now, was how to put grass roots communications technologies to general beneficial public use as I had been doing with dial-up computer systems since 1979 starting with a BBS and now with multi-user 386 unix with vpix, voice mail, fax, conferencing, email and data base use systems for local business, politics, and education.

I swiftly learned that either I had to go the Ham route, or buy pricey equipment from some of the big commercial radio companies. That there was no 'public packet' in between. When Motorola showed me a $4,000 device that cost more than an entire computer system for a small business, I knew that was not the route to take either.

I really admired the work TAPR had done in pioneering packet, but I knew that if I heeded the siren song of Ham Radio and became Ham-licenced just so I could use packet, that I would not be able to apply it directly to small businesses, politics or formal educational uses, or secure the traffic by encryptian — all the things that I was sucessfully developing using modem communications. So I decided to do it the hard way — get a business radio licence from the FCC that would permit packet — and assemble the system out of all the parts needed, at the lowest cost consistent with being usable by small business.

Pulling the Pieces Together

The long and the short of it was that, with no one I could find who had tried this route, it took several years to pull all the pieces together. And I had to work with some small local commercial radio companies who knew nothing about packet! I had bought a big fat copy of the Federal Telecommunications Regulations and I swear I read up on every frequency band which could conceivably be used for packet, and permit mobile operations with a base station. A group in the 150 mhz area looked promising. Then I learned one had to make application through some outfit called NABER which does 'frequency coordination* for the FCC. So a small commercial radio store monitored the local frequencies for several weeks before deciding that 157.62 was silent all the time in my area and application was made for that band. After an agonizingly long time I recieved a licence to operate at 157.62 mhz with a 100 watt base station in Old Colorado City and 6 mobile 50 watt stations. Which, all things being equal (and they never are) would let me cover all of urban Colorado Springs from a mobile, hopefully hand held, station.

One day, while all this was going on, an international trader business associate of mine — Larry Fox — showed up in Old Colorado City with two ministers of government of the Zulu nation of South Africa! They were interested in packet because their field operations have few telephones, but do have voice radios.

Partly because Gwyn Reedy of Pat-Corn operated a Florida non-packet radio bulletin-board (813-874-3078) I chose to do business with him — cause I could do so via modem. I started with his TNC-220. Then just as I was leaving for Montana to install and tend to a powerful small unix system that was designed to link the 116 one-room school houses of Montana to their teacher's college by modems, I got his newly released "Wireless Modem" — a TNC that was optimized for business use, had parallel printer ports, and even KISS — for eventual migration to TCP/IP and the Unix online world with which I was familiar.

I visited every radio store in Colorado Springs when I was looking for a pair of radios. Not one commercial one had a handle on packet, and the Ham stores knew a lot about packet but were not very helpful on business-frequency radios. Finally I settled on a pair of reasonably priced radios from Neutec — a 45 watt transceiver which could be used as either a base station, or operating at 12 volts, be mobile in a vehicle, and a 5 watt hand-held Neutec 'Marathon' which had the critical feature of built in external speaker and microphone ports for attachment to the controller.

Then on a local computer bulletin-board a helpful ham said that since 157.62 was so close to the ham 2 meter band frequencies that he thought a Ringo Ranger-type antenna would be just dandy. That settled that. I got one.

Concept of Use

Now my concept of the value of packet radio

to the general population is as much as an extension of telephone based modem communications as a thing seperate from it. For in situation after situation I saw that the value of using lap portable microcomputers and modems was always limited by **'where** is the nearest phone?' Or worse 'Where is the nearest phone **not-a-multi-line-pbx-** and-with-an-RJll-jack.' Seldom found in any office. Even resorting to using external **battery-** powered modems which have provisions for acoustic cups at 1200 baud is only a partial solution. One is always hooked to the end of the phone line. And not all phones are accessible by RJ-11 plugs.

And for schools! Well I am a passionate advocate of the formal teaching of **'telecommunications'** right along with computers in schools, starting at a young age. For we are as much in a global **'communications'** revolution as we are a **'computer'** revolution. Nowhere do I see the subject taught. Frankly I am even tired of recent college Computer Science graduates telling me they never were exposed to digital communications in all four years of college, and never heard a modem tone!

But whenever I have suggested to educators that they integrate telecommunications into their **curriculla** , I get back the arguement that today's cost of telephone installation — especially into a modern large school whose architects never anticipated running phone lines to classroom areas, plus the running monthly costs of a phone dedicated to modem use, is a major deterrent. For large modern schools the problem is cost of installation through new walls. For tiny rural schools it is the monthly cost for an instrument which may be only used a few hours a week, and only 9 months a year or less.

So to me, using packet radio is the answer, with a packet and low power radio at the classroom computer, or even on a rolling tray with the computer, a packet and radio at the nearest already-installed phone in the building, or nearby building, with a second external modem properly configured to permit a **'patch'** into the phone to give outside access! With a total capital investment for the entire setup of two packets and radios in the range of $600 to $1000, no real monthly running costs, the **'cost'** problem for schools would be solved! (Or at least that 'excuse' dismissed conclusively)

Now I couldn't find any local hams who used a packet hooked to a modem, rather than a computer. So I had to hack away with RS232 **pin-** outs, modem settings, and packet commands until I got that mighty modem AT command set **'OK'** prompt back on my computer screen via packet and knew it was feasible.

Graphic Radio

I also wanted to do something else. I may not know my radio, but I really do know my modem communications. On one of my dial-up systems for several years we have supported dual **Ascii-Naplps** sessions. NAPLPS is a very important ANSI-Canadian Communication's Board standard for the encoding, transmission and display of animated color graphics and text between unalike computers over

telecommunications. So important that the new national **'Prodigy'** computer dial up **advertising-** marketting service by IBM and Sears, after spending hundreds of millions on it and **4** years — is based on Naplps. And new services are being brought out by Bell Canada.

No one yet has made a go of Naplps based services, but it is more than accidental that it is still being used as a standard. For it is highly compressed code — like 2 to 5 k for a full color screen, instead of **500k** for a 'bit mapped' one. And it is terminal independent. What you see on an IBM PC you can see on a **MacIntosh,** a CAD/CAM workstation or a C-64. Thus, as all communications should be, it approaches universality.

But NAPLPS uses all 256 chars of an 8 bit set. It is a 'super-set' of ascii. Yet it includes Ascii. So what goes over the modem line is any possible combination of all 256 chars. Would packet handle this without corruption? Lets try, I said. So on a trip to the IEEE Conference in Monteray, California, my host happened to be Ham Marc Kaufman **WB6ECE.** He and his Ham son Matthew picked me up at the San Jose Airport and we drove down US 101. As any self-respecting Ham would have, Marc had his 2 meter gear in his van, his MFJ packet, and his son operated a Model 100 hooking up to a rich variety of packet stations, starting with a guy on a bike in Mountain View through digipeaters. **Aha,** I said. Can we try my computer? A Toshiba 1100 at the time. So with me issuing the Procomm and PC commands, he running the packet commands, we connected to a Red Cross Packet BBS, opened an upload file and uploaded without either error-checking from the terminal programs or the Transparent Mode of the packet a 5 k Naplps file. Then turned around and slipped a Naplps Terminal Program into the lap top, and called for the remote BBS to **'type'** the file.

Voila! Uncorrupted, came back the code and smartly displayed the graphic of Old Colorado City's Roger's Bar on the screen.

We had Graphic Radio! Using a very compact, near universal graphic code standard! I knew we were home free.

Applications in Montana

So then I carried these just-proven-out (hardly perfected) techniques, economics, and standards to Montana, to introduce them to Western Montana College where, over the last six months I had been retained to set up a powerful desk top, multi-user unix dial in system to link the 116 one-room school houses of Montana in 'Rural Net' to their teacher's college. I designed the system running all the 300 features of any good unix system, including e-mail, computer-conferencing, data base with 6 phone lines, including 800 numbers and it went on line in February 1988. The system, called Big Sky Telegraph has been an instant success, with teachers who had never seen a modem, but getting one for their tiny school's Apple through the mail, logging on and for the first time connecting up with, not only the college, but each other across the state.

But as I suspected, in case after case, the

telephone is not in the one-room school room. They have to lug the Apple to the phone. And school boards in schools with only 8 kids are understandably reluctant to go to the constant expense of an installed year round voice phone. So, my idea of a packet radio-phone patch was demonstrated to 9 faculty members of the college who immediately also saw the application as 'cordless lans' across campus to link valuable resources to each other without the cost of hard wiring, or the limitation of modem phone.

But there was another reason to introduce packet to the educational needs of this very rural state. To introduce adult non-traditional 'students' from the tiny communities to the newest, but low cost, communications technologies so that they might better introduce them into their daily work. No reason a struggling rancher who already has a microcomputer to perfect his herd shouldn't be able to track the fluctuating price of beef on the Chicago Board of Trade, or the markets of Billings, from a pick-up truck - or even a horse - while out on the range. And enter orders to his agent.

Then the college itself, in Dillon, Montana is 60 miles from Butte, where the closest Tymnet Packet Switching phone node is. Since part of the idea is to link those tiny schools, the teachers, students, and even ranchers, farmers, businesspersons from the surrounding community not only to the college, and each other, but the outside world via Unix's UUCP, Newsnets, international telecom networks, it will be necessary for Big Sky Telegraph to be linked to Tymnet. Either direct dial phone costs, or dedicated circuits are prohibitive for this purpose between Dillon and Butte. Packet radio digipeated off a tower, perhaps on Red Mountain to a local phone in Butte seem both economically and technically feasible,

Then as it happens, Asst Professor of Computer Education Frank Odasz, the key faculty member responsible for Big Sky Telegraph and his wife Reggie - both faculty members (with Master's Degrees in Educational Technology from University of Wyoming) live on a ranch 5 miles out of town. With one voice telephone. With two communicating computers. And the need to check into Big Sky in the early morning, evening and holidays. So the phone gets tied up too much. Could packet radio....?

So even before getting my packet rig set up in Colorado Springs, I carried it to Montana, and in a series of brief experiments, bench tests, demonstrations, and many calls to state officials who - as it turns out are using government packet radios for a variety of purposes- to determine both the regulatory and radio-technical scene, both very promising.

The attitude of those Montanan% toward both the modem and packet radio technologies couldn't be better. Already Big Sky Telegraph is famous across the state - with its integrated modem communications, voice mail, fax, optical scanner, naplps and over 7,000 messages having been left on it by exited teachers, student, faculty and outsiders who see the promise of digital devices overcoming their distance problems - which are both a blessing, for quality of life considerations, and a curse, for business and access to resources reasons,,

We had many laughs too, as the juices started flowing when the possibilites were discussed. Elaine Garrett, Assistant Sysop for Big Sky Telegraph is also a Fishing Guide and Outfitter. So we started sketching out what it would take to make the fly rod the antenna, put the electronics in the handle and reel, the battery in the tackle box and enable the big city guy to be a packet-connected stock-broker fisherman. And a three-day FCC licence to operate, just like a temporary fishing licence?

They want packet. I expect to be mosying up there in a few more months, help fill out their FCC licence applications, and as a consultant, system intergrator, and trainer, bring the first packet radio equipment to the small business and educational communities of Big Sky Country and integrate it into their already successful phone-modem based system.

The Importance of Ham Development

During the 6 years it has taken me to explore every alternative and finally put packet radio technology to practical and economical grass roots public use it became obvious that without the work of a large number of Hams over the past decade I could simply not have done it.

Oh sure, large communications or computer companies could have been doing research and development of this area. But when large corporations pay for their own development, they understandably try to keep the technology for themselves, or charge large fees for its use by others. It is clear that there would not be the rich and diverse development of packet devices and techniques - much of which has not even yet found its way into commercial systems - nor the really low cost access to the technology by 'we the people' without Ham Packet Radio development efforts - and FCC authority.

Potentially packet radio is to communications what micros are to computing. A technology for Everyman. It is going to take very wise Congressional and FCC policies to insure that it stays that way.

Packet to Go

Meanwhile here in Old Colorado City I have acquired an old brown brief--case in valise form, where I now carry not only my lap top portable Toshiba 1000, a 3 lb Diconix ink jet printer, wireless modem, power supply, and radio with telescoping antenna. 25 lbs. I now routinely log on to my base station on L57.62, go through an external modem to an outside line, and call any system needed through the patch. And never worry about finding a suitable phone.

So I am doing business by packet radio. And am working with Pat-Corn to deliver even a smaller packet controller with the radio built in. So others can do business too. At 17 lbs. Solar

rechargable.

By daily use of packet in the small **business-**professional environment I am learning those things you who read this already know. But which the small business, small government, small

educational world already needs to extend its micros and modem reach to every comer of America and the world.

I might even understand what I am doing with these radios one of these days.