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Can HSMM Find a Real Home in Ham Radio?
A Commercial Alternative, plus more on RSQ

High Speed Multimedia (HSMM) has gone commercial, in a big way. All that is keeping you from deploying a large, carrier-quality HSMM network is money, and not much of it, at that.

After my brief mention of the SkyPilot system in February's column, I did some research on the current state of HSMM in amateur radio. My finding is that people are interested, but nobody has really put together a network *a la* packet. A group down in San Antonio, Texas has a map of just over a dozen stations posted on its web page (http:// home.satx.rr.com/wdubose/), the largest I've found. The ARRL HSMM pages (http://www.arrl. org/hsmm/) don't list any active networks, and a search page off the ARRL site showed only 20 stations registered as HSMM stations. In the heyday of packet, there were a few hundred stations in the NEDA (North East Digital Association) network alone.

A SkyExtender installed at the top of a tower. The SkyExtender is the white tube near the tower worker's head. Its relatively compact size, simple interface requirements (Ethernet UTP for power and data), and relatively high power (44.5 dBi) using unlicensed 802.11a spectrum and equipment (with proprietary software and protocols) make it an attractive alternative to Cable and DSL for internet access. (Photo courtesy SkyPilot Network Inc.)

What's the Roadblock?

The equipment is there, as are the software building blocks—routing, access control, DAMA. It just seems as if no one in amateur radio has put them all together and on the air.

My first thought is that the "Hinternet" (the ARRL's name for a ham radio internet) and packet share at least one important trait: The internet is better/faster/cheaper. My cable connection to the internet might cost $45 a month, but it is plenty fast at 3 Mb/s, is reliable, has no Part 97 content restrictions, and required no new equipment on my part. A wireless equivalent under Part 97 might end up costing me only a few hundred dollars, with no monthly cost, but what can I do with it? To be honest, the local hams don't have a lot of data that I might find interesting to download or share.

I'll admit that HSMM is a great idea and has its uses, especially for ad-hoc get-togethers and emergency operations, but the world is content-driven, and without a lot of very interesting and/or useful content, the local support just won't be there. This is also part of the reason why packet is where it is today, at least in North America.

On a side note, the packet network in Germany remains viable and useful, arguably because there is useful content available and good performance. Both of these exist for the same reason: If you want to get into packet networking in Germany, you have to be serious about it—very serious. You see, every packet network facility operating unattended needs the equivalent of a Special Temporary Authority (STA) from the RegTP (like the FCC), and to get the STA you need to show to whom you're linking, how you're making the link (band, mode, data rate, etc.), and a signed frequency coordination. In the U.S. you can put up a network facility at will.

The forced cooperation and forethought imposed by Germany led to all resources being focused on the single goal, rather than diluted across protocols, competing groups, and poor technical implementations, as we have in the U.S. Since the same situation exists with HSMM, the same issues will no doubt arise. We're not necessarily doomed to failure, but we'd best remember history!

Can We Make Something of HSMM?

Looking at the issue from a different angle, though, reveals some different possibilities. If the main issue is content (which, in my opinion, it is), then how can we address that? One way would be to mirror existing internet content that is deemed "OK" for Part 97 operations. Another way would be to abandon Part 97 in favor of Part 15. Heresy, you say? Perhaps. However, I didn't create the

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issue, I'm not the only one with this opinion, and there is really no advantage to Part 97 operations with HSMM anyway, as you'll soon see. I'm ahead of myself here, though.

Think of an HSMM system that can be deployed over an area such as, say, New York City or Los Angeles, easily a few hundred square miles. Any ham who wants in gets in—you just have to get the right radio and antenna—while outsiders can be (and are) excluded. Data rates normally are way above DSL, in the 3 Mb/s range like my cable modem. Connected to the internet, no restrictions on content, just like my cable modem. Maybe it will slow down a bit when there are a lot of users, but cable does that, too. It would be polite, but not mandatory, to donate time, talent, or treasure to keep the network running, kind of like the way a repeater often is funded. You can do that today. It's under $10k for the network, maybe $300/ month for a commercial T1 line to the internet, and each user needs to spend about $350 for his/her own equipment.

The SkyPilot Approach

The clever folks at SkyPilot (http://www.skypilot. com) are selling an integrated system to folks who want to compete with the cable and DSL networks. Note that this leaves BPL in the dust, economics-wise, and is currently far ahead of WiMax, although that might change.

The key to the system is the "SkyGateway." This is the central hub of the network and the gateway to the internet. If you need the capacity you can add more gateways, but each one is $2500 and can handle at least a thousand users, so maybe we'll wait on that for a while. The Gateway controls the network, and nothing runs without it.

The Gateway's range is extended using a "SkyExtender." Think of this $500 item as an intelligent digipeater. Both the Gateway and the Extender look the same—an 18-inch diameter radome about two feet high (see photo). Both have the same effective isotropic radiated power (EIRP)—about 44.5 dBm, or just about 30 watts.

I'll bet that EIRP figure raised some eyebrows. Yes, it is well within Part 15 limits for a point-to-point link on 5.8 GHz, using off-the-shelf chipsets designed for 802.11a networking, along with proprietary protocols and signaling. Because of that, you can't use standard 802.11a gear on a SkyPilot network, but the savings from the company's innovative leveraging of off-the-shelf hardware are passed on to the buyer.

Here's the secret behind the power levels: The Gateway and Extender are omnidirectional, but only 45 degrees at a time. They each have eight directional antennas and a clever switching system, so they really are communicating point-to-point with relatively tight antenna beams, while being able to move the signal around a circle. The user's equipment (known as a SkyConnector, $350, both indoor and outdoor versions) has a directional patch antenna, a radio, and a single RJ45 connector for 10/100BaseT and power, making it easy to install.

The entire network is synchronized, using GPS, to tightly control data flow, allowing latency-sensitive applications such as VoIP (Voice over Internet Protocol) to perform smoothly. Every user station is dynamically allocated bandwidth (time on an antenna), so there are no collisions and no hidden transmitters, and all users get what they need when they need it. The routing algorithm is very good, always using the path between stations measured as the "lowest cost." The on-air data rate is up to 54 Mb/s, and there are four non-overlapping channels, so even with overhead, you end up with each Gateway or Extender being

able to support more than 30 direct users at full data rate, and a hundred or more with a typical usage pattern. Running backhaul links on another band, on dedicated channels, or even over wire or fiber, dramatically increases network capacity when needed.

Of course, RF at 5.8 GHz is still RF. The same propagation issues that hams face also apply here. At the least, Near Line of Sight (NLOS) paths are required. For a commercial installation, excellent sites are necessary and comprise a significant expense. For an Amateur HSMM network, given the money involved, it would require some effort to secure good sites, but this is nothing new. The promise of emergency operations capabilities, even if internet access is down, might open some doors with the local authorities. Hams are quite resourceful in this area, but there's no magic formula.

SkyPilot also requires system operators to use its SkyProvision software ($500/1k users). This is how you configure and control the entire network, even allowing for remote firmware upgrades (such as the ROSE packet network used to have). You can also get the optional SkyControl software ($2500/1k users), which gives you a real-time view of the network's performance and usage, as well as powerful network management tools.

Do-It-Yourself?

When I began writing this column, I was going to suggest that amateurs study the SkyPilot system to replicate the functionality at a lower cost, but in retrospect I think that the equipment probably represents an excellent value as it is. The equipment is available today, and the whole package is very nicely integrated, with guarantees and warranties, at a price point that many larger clubs could afford.

On the other hand, one of the definitions of a hobby is any activity in which you can do something yourself that is available cheaper and better commercially. The whole point—at least for some people—is not to buy gear, but to have the fun and educational experience of making it yourself. Thus, the approach that best fits the interests of you and your club is the one worth considering.

More on RSQ

February's column on RSQ (www.psb-info.net) must have hit a nerve, if incoming mail is any indicator. I received quite a few e-mails on the topic, all of them agreeing that maladjusted PSK31 operations were a bane of the mode. Unfortunately, the folks who need to know this probably are not the ones reading this column.

During my first stint as WW2CQ/62 in early January, I was exclusively on PSK31, and exclusively on 40 meters, mainly because that's the only antenna I have operating at this time. There wasn't a night when at least one station wasn't on the air with a beautiful set of vertical stripes caused by tremendous overmodulation.

One fellow was taking up over 700 Hz of bandwidth on this 31-Hz wide mode. I spent a bit of time and contacted him, and tried to explain that his signal was too wide and how to correct it. You'd have thought I was typing in Swahili for all he acknowledged it. I got back his brag list, QTH, and other canned data, but it was as if I never sent anything. Days later, the same lousy signal was on the air, wiping out the fun for the rest of us. Why is it that these folks also tend to have very loud signals?

The moral of the story is persistence. I will tell this fellow the same message every time I work him, and continue to do so until there's no need. If every single contact this fellow had, or even a fair percentage of them, mentioned the same point—kind of like telling a CW op of his key clicks—I'd have to think that eventually it would sink into his brain.

The other side is much nicer. One fellow was a long-time QRP CW op trying PSK31 for the first time at about 5 watts. He thanked me profusely for the help in adjusting his transmit audio level and found that he could work more stations after the adjustment. Now that he wasn't wasting any of those precious watts on useless sidebands, of course he had a better signal. Now there's a happy ending for you.

Summary

This month's column is a little short. I said what I had to say, and there's no good reason to fluff it up with useless words, so I'll sign off a little early. I've been very busy helping a local high school team build a robot for the FIRST competition (www.usfirst.com). There's no real involvement with amateur radio, but building robots is just as much fun, and the kids really appreciate having someone experienced to bounce ideas off and to help explain the science behind their actions—not to mention a ready supply of aluminum. So instead of researching the next *CQ* column, I've been building robot arms and explaining how to calculate torque.

Until next time . . . 73, Don, N2IRZ