

HSMM

Communicating Voice, Video, and Data with Amateur Radio

The Hinternet on 5 GHz

What is the Hinternet? The word, actually an acronym, derives from what NASA loves to do so much—the linking of two or more acronyms. In this case, **HSMM** (high-speed digital multimedia ham radio) plus **Internet** equals Hinternet.

The Hinternet under development by many individuals and groups is intended to eventually become the ham radio digital WANs (wide area networks) formed by the linking of numerous local HSMM nodes or LANs. These HSMM nodes or LANs usually consist of inexpensive 802.11g access points (AP) operated under Part 97 rules in the 2.4-GHz amateur radio band, but could just as easily be an ICOM® D-Star network, or any other source of local HSMM amateur radio traffic.

Now to the 5-GHz Band

David Josephson, WA6NMF (wa6nmf@altaphon.com), suggests:

If people are looking for a flexible router solution and don't want to learn Linux (or pay thousands for Cisco or Juniper gear) I can suggest Mikrotik. I have no connection with them except as a customer.

Mikrotik is a small company in Latvia (with local support in the U.S.) making a prebuilt Linux-based system that runs from flash ROM. No hard drive is needed. They also make inexpensive single-board computers with Ethernet and mini-PCI slots built in. Anything we would need to do in current 802.11-based amateur radio is covered in the Mikrotik code, including the ability (for \$10 more) to operate the Atheros chipset-based radios (CM9 and NL5354 for instance) in the rest of the 5650–5925 MHz amateur band, not just the UNII/ISM segments. This greatly alleviates interference issues with WISPs (wireless internet service providers); amateurs have 100 MHz of spectrum not shared with any unlicensed service. You can download the manual, get further details, etc., at <<http://www.mikrotik.com>>.

We are building some stations using this software and 802.11a cards. Mikrotik has a non-ack mode “Nstreme” that allows ranges over 40 miles, and a duplex mode “Nstreme 2” that uses two radios on different frequencies, one for transmit and one for receive. This allows separate transmit PA, if needed, and receive LNA. Together with surplus Telco microwave filters, duplexers, and antennas we are expecting 60+ miles with this, like we presently get with homemade T1 radios using FSK.

As a historical note, we have been operating T1 over 6-GHz FSK radios in northern California since the 1970s and as hams for the Office of Emergency Services since the 1980s. There is a truck on standby operated by Stephen Cembura, N6GVI. It contains a small PBX, phones, a T1 channel bank, and a steerable dish antenna on a hydraulic mast. This was used extensively during the 1989 earthquake and for several smaller events after that. This network predates WISP and VOIP by a “few” years.

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Some Definitions, by Reader Request 802.11 Standards for Wireless Technology

802.11—refers to a family of specifications developed by the IEEE for wireless LAN technology. The designator 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients.

802.11a—an extension to the 802.11 standard that applies to wireless LANs and provides up to 54 Mbps in the 5-GHz band.

802.11b—an extension to the 802.11 standard that applies to wireless LANs and provides 11-Mbps transmission (with a fallback to 5.5, 2, and 1 Mbps) in the 2.4-GHz band.

802.11g—an extension to the 802.11 standard that applies to wireless LANs and provides 54 Mbps in the 2.4-GHz band.

802.11n—an extension to the 802.11 standard that in the future will increase the speed to more than 100 Mbit/s. As projected, 802.11n will also offer a better operating distance than current networks.

Dave Stubbs, VA3BHF, writes:

“To anyone experimenting with the market-forgotten-but-still-very-capable 802.11a, here is a list of suggested channels for use in ham applications. I’m basing this on the channels as found in the D-Link DWL7000AP configuration screens.

Bear in mind, of course, that of the most common C.O.T.S. 802.11a gear, only D-Link and Netgear offer channels in the amateur overlap. LinkSys and SMC do not. These are 20-MHz channels, centered as follows:

Ham Disallowed (channels available on all brands)

Channels 36–48: Completely outside the ham band; indoor use only for Part 15 folks.

Channels 52–64: Completely outside the ham band; outdoor use OK for Part 15 folks.

Ham Band Allowed (channels on D-Link and Netgear only)

Channel 149: 5.745 GHz, ham friendly; falls above “Digital” and below “Weak Signal and EME.”

Channel 153: 5.765 GHz, ham unfriendly, completely overlaps “Weak Signal and EME.”

Channel 157: 5.785 GHz, ham friendly; falls inside “Digital/Video.”

Channel 161: 5.805 GHz, ham friendly; falls inside “Digital/Video.”

Channel 165: 5.825 GHz, ham unfriendly; partially overlaps “Amateur Satellite Downlink.”

Based on all of this, it is probably best to use Channel 149, 5.735 to 5.755 GHz centered on 5.745 GHz, because this channel falls completely outside of any reserved or suggested-use parts of the band plan. Channels 157 and 162 are also workable, as they would easily be classed as “Digital/Video” and thus fall inside the suggested use for those frequencies. Comments welcome, as always.

Dave Stubbs, VA3BHF
(e-mail: va3bhf@rac.ca)

References: <<http://www.rac.ca/service/micropla.htm>> and <<http://www.arrl.org/FandES/field/regulations/bandplan.html#5650>>

HSMM Wireless Network

Dave Stubbs VA3BHF	1/28/2005	Draft 3
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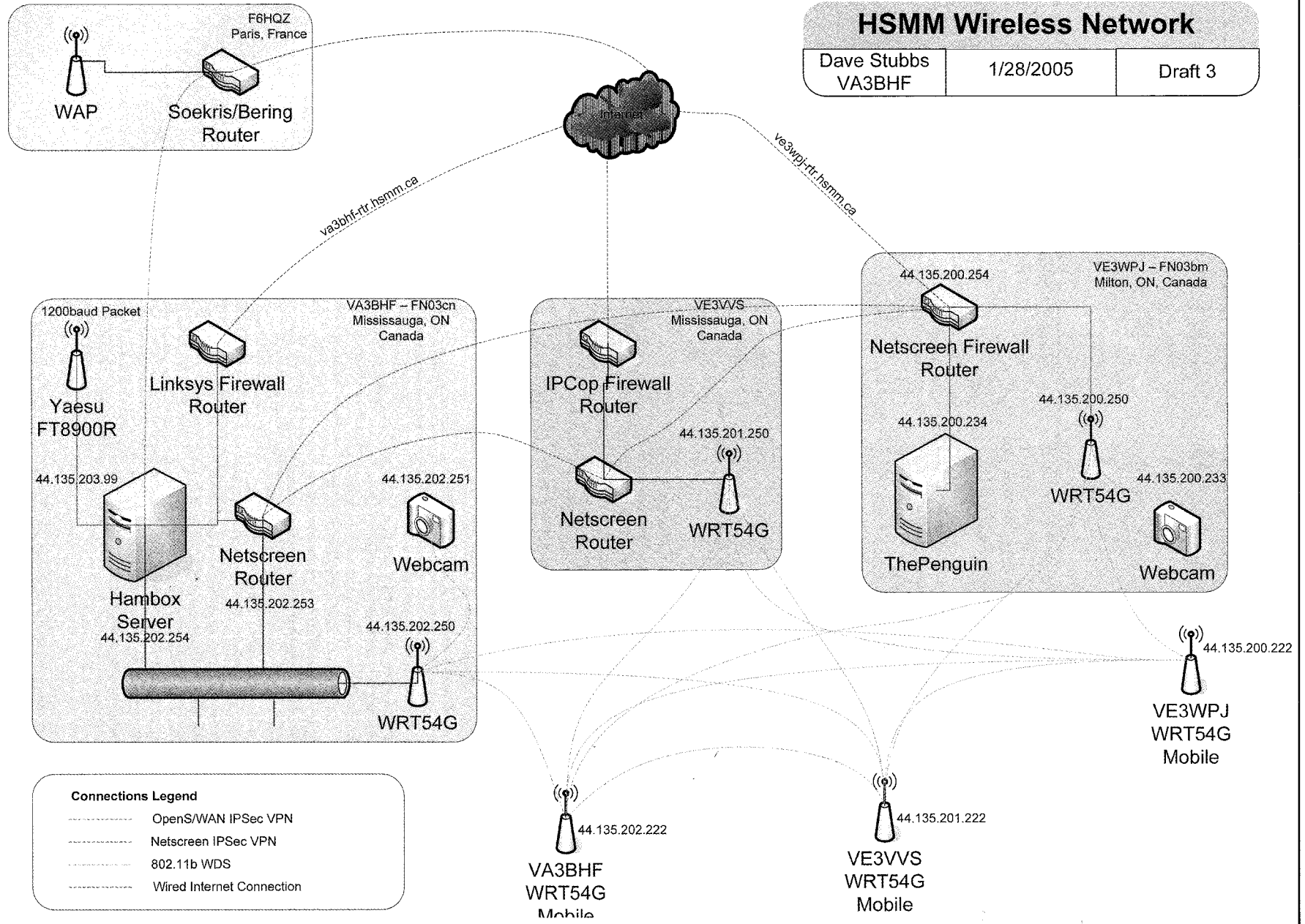


Figure 1. Client solution for DWL-900ap+.

WISPs

Mark Koskenmaki (not a ham, e-mail: <mark@neofast.net>) writes:

I would like to point out that hams should not be feeling like they are competing with WISPs (Wireless Internet Service Providers). On the contrary, think of it as having more people joining your force to do more. Many Wireless ISP types are soul-mates to the ham community, in that they are creative, think fast, and are often single or 1-10 person businesses. They (WISPs) understand working on their own, moving fast, and making do with what you have or can get.

After the initial efforts with Katrina are over, I would suggest that the ARRL and WISPA and maybe Part 15ers, as well, get together and see how each can complement the others in their emergency response roles. The ham community may wish to slightly change its role, if it can partner up with the wireless license exempt community. This isn't a competition; this is about lives and cooperating to save them. There are limitations to the WISP's technology that the ham community has invaluable means of filling. And the reverse is true, as well.

Hams are admirably prepared for such deployments, and have a great structure in place for organization and deployment. WISPs have higher capacity data and voice capabilities in their technological bag of tools. I can imagine no better partnership than the ham community with their extensive networks helping direct and deploy large capacity voice and data. While it is invaluable to have a voice person on the ground, hams partnering with a WISP or other wireless community can multiply the results and impact of their efforts. . . . Ham operators have no competition, in my view, for what they can do best, and that's being the absolute first responders, coordinating those who follow, and the WISP community is a natural second to follow. You (hams) could teach us WISPs a lot about organizing and preparedness.

IPv6

Regarding Internet Protocol version 6, Gerry Creager, N5JXS, Hinternet architect, writes:

One of the things I'm working toward is getting a large IPv6 allocation for our HSMM activities. IPv6 offers several benefits: We can encapsulate callsigns inside the 128-bit address space; it incorporates innate IPsec capability in the protocol stack (is it better than IPv4 IPsec? probably not, but it's built in, not hacked on), and it offers some inherent IP Mobility options. It also puts the ham community on the leading (bleeding?) edge of IP implementation for the USA, as there's a fair bit of research activity, but not too much real action on moving toward IPv6 that is visible.

As we get further into this, I'll be providing information on how to do IPv6<->IPv4

translations, and gateways. It's not too hard, but requires some consideration and thought. One caveat: Win9x, WinME, and Win2k are *not* IPv6 compliant, and thus, we're going to consider backup plans until Bill Gates kills off all those legacy systems. Wimp, OpenFree BSD, and Linux, as well as most all the *nix's, are IPv6 compliant. Linux is actually happier in IPv6 than IPv4 now, although you have to go way under the hood to determine that.

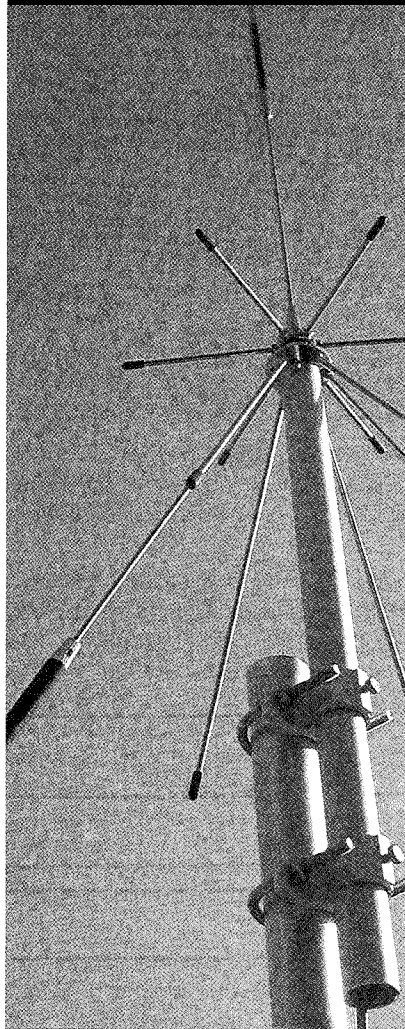
HSMM Fox Hunting

Ending on a fun note about HSMM fox hunting, Dave Stubbs, VA3BHF (va3bhf@rac.ca), suggests, "We need to get some hams doing this kind of stuff. Check it out at <<http://wavehunt.redbrick.dcu.ie/>>. It is fun to do."

Until next time . . .

73, John, K8OCL

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