ACCESS Tested on Xohm WiMAX!
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We've long heard rumors of a new, ubiquitous wireless data network on the way called WiMAX, and have been longing to spec out its performance using ACCESS IP codecs. I got my chance recently when I received a WiMAX Express card for testing.

The first widespread commercial deployment of WiMAX technology is coming from a division of Sprint Wireless dubbed Xohm. They currently offer commercial service in the Baltimore market only, with several other cities coming on-line around the end of 2008. After enough begging, we got hold of a sample card, shown below, with intention of 1) finding a way to have ACCESS Portable utilize the card and 2) finding a friendly broadcaster in the Baltimore are to help us spec it out.

Fig 1- Xohm supplied WiMAX express card with PC Card adapter

As it turns out, the card offers literally no Linux support at this time, so the project of including direct support for it was shelved for a different day. For future tests, I'll recommend using the available external modem, which should theoretically have no such interface issues. It may have an advantage as well, since building penetration at the 2.5 GHz frequency used by Xohm can sometimes be challenging. Utilizing the external modem would allow you to position it near a window, and run an Ethernet cable to where the action is.

Fig 2- The Xohm external modem

Before I booked my flight to Baltimore, a little Googling produced some reports that Baltimore WiMAX users have migrated to some other “soon to be covered” cities and had success with their Xohm hardware there. Since one of the reported cities was Boston, I ventured out on a little site survey to see if I could conduct the testing closer to home. Lo and behold, the card in my laptop lit up in various areas in the city and around the Route 128 technology corridor.

Fig 3- This will be easier than I thought!

So I found a convenient location to our office in Devens, which turned out to be the shopping area in Burlington Massachusetts. I went back a few days later, staked a location in a shopping center parking lot, and began testing.

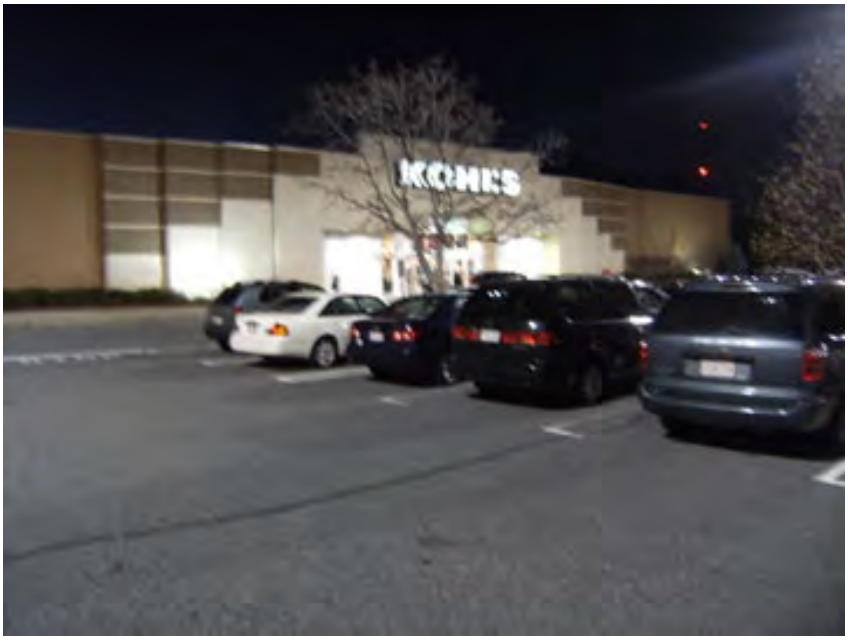

Fig 4- Scene of the crime

First, a round of speed and ping tests. The Xohm Windows client has a built-in link to Speedtest.net, so I ran a couple of tests there. Here's a typical result:

Fig 5- 3.6 Mb/s downlink! 740K up! Very nice.

The tools at DSLreports .com weren't quite as charitable on the downlink side, but we really care more about uplink speed for codecs, and it still appeared to be plenty.

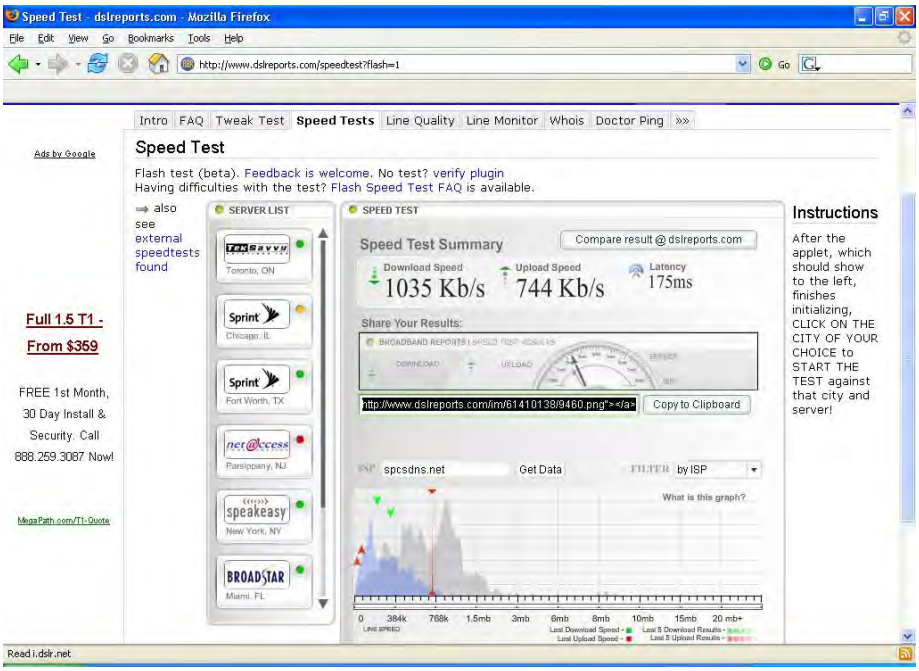

Fig 6- Still not too shabby

But bandwidth is only half the battle, since the IP codec application is so reliant on low network delay. This has been an issue with 3G networks, which can often instill a large fraction of a second of delay in each direction. So some ping tests were performed:

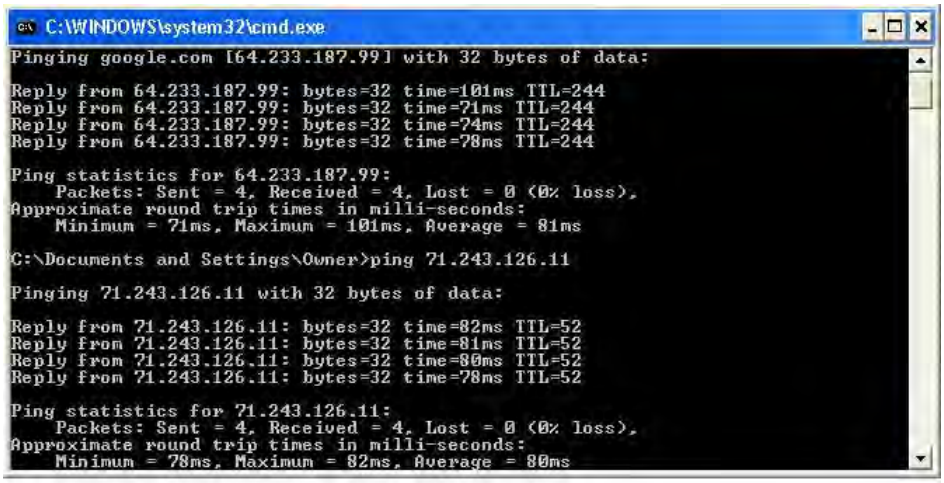

Fig 7- Ping test to Google (81mS avg) and to my lab codec (80mS avg)

Pretty respectable! The last factor that will affect delay is the overall jitter performance of the network. Since the decoder needs to buffer the incoming packets to account for late arrivals, this buffer will add to the overall delay. Now keep in mind, the network I was using was purely in its test phase, and I'm pretty sure I was sharing it with virtually nobody else. So the final results will probably vary from mine.

As mentioned, attaching the card directly to the codec was a non-starter, so I needed to lash up a laptop running the card to a portable ACCESS. This is done via the Windows utility called Internet Connection Sharing (ICS). I ran an Ethernet crossover cable to the ACCESS and that resulted in the mess shown below, but voila! It works!

Fig 8- Ugly but effective

And because the ACCESS rack back in my lab has on-line statistics available, I was able to monitor the network quality and jitter rates on both ends simultaneously. I was very impressed.

I was running the ACCESS AAC-ELD stereo option, which utilizes around 80 kb/s in each direction. The network jitter on the return link, as read on the portable, required a jitter buffer of about 60mS for stable operation. And stable it was, without so much as a packet drop over the hour-long testing.

Fig 9- Portable RX stats—holding up very well

But of course the real test is what was getting back to the lab, since that would be the "over the air" link. Luckily the WiMAX link had plenty of bandwidth for me to log into the web page of my lab unit to check that.

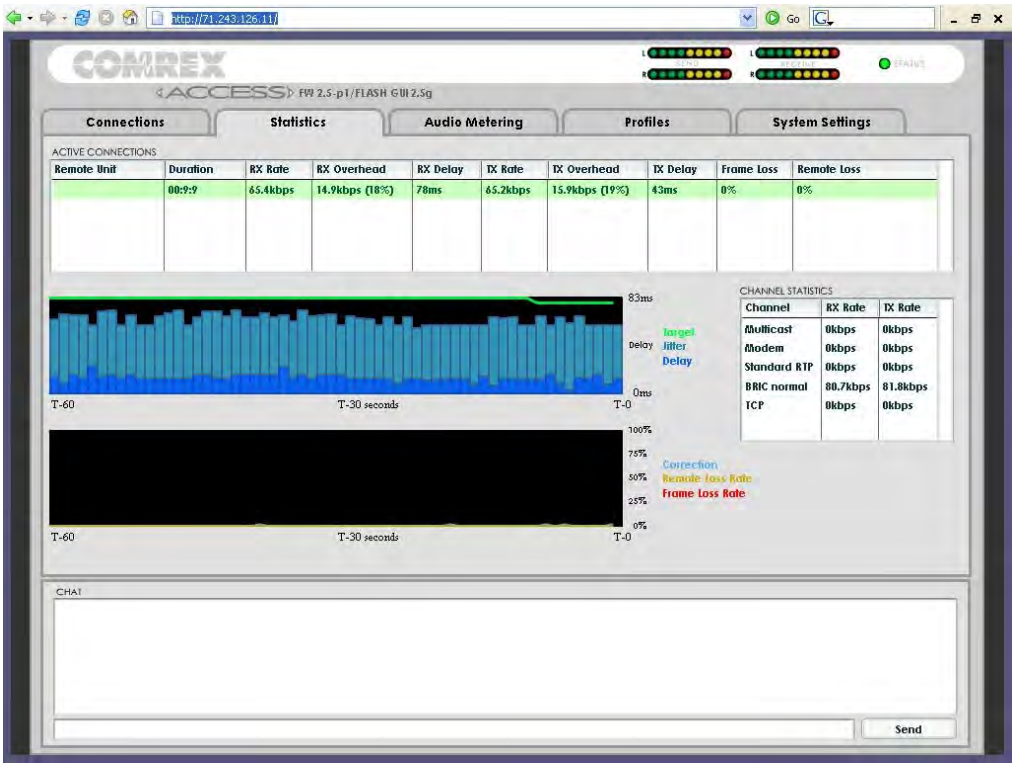

Fig 10- Perfect transmission with jitter buffer around 80mS

So the "broadcast" was perfect. Sounded great in my car, and the remote stats page showed it sounded perfect in the lab as well. What was the overall delay? The numbers:

1) AAC-ELD coding and decoding cycle: 50mS
2) ½ Ping time transmission delay: 40mS
3) Decode jitter buffer: 60-80mS

Total one-way delay of this system was around 170mS. That's in the same range as some digital mobile phones. Given a mix-minus feed, it should be quite manageable on an interactive basis.

Summary

While I must add a couple of caveats in that the Xohm WiMAX system is not heavily deployed or used, early tests are extremely promising for use of this technology for remote broadcasts using ACCESS IP codecs. We'll gather more info as customers get subscriptions (and hopefully support the card directly) so keep checking our website for all the latest details.