

Date: 5/18/09

Dear Senator Young,

I am a computer science student at the University at Buffalo going into my 4th of 5 planned years for a master's degree. During the summer, I return home to Humphrey, NY and stay with my parents. Humphrey is a great place to return to for the summer with one exception. The internet connectivity options that are available to me are lacking in one or more respects. I am writing this letter to seek support for bringing better internet options into rural areas of the United States, such as Humphrey.

Before I go into details that explain the shortcomings of the available internet options, I would like to define a few networking terms that will help explain why each connection method is subpar. **Latency** is the time it takes for a single piece of data to be sent from your computer to a remote computer and back successfully (meaning it was not damaged in transmission). The easiest way to measure latency is by "pinging" a remote computer. To perform a ping in Microsoft Windows, you can go to the command prompt (Commonly under: Start -> All Programs -> Accessories) and use the ping command. For example, to ping Google, you would enter "ping google.com". In the output of this command, you will notice a lot of information. The numbers denoted by milliseconds (ms) are the latency values for each measurement. As a general rule of thumb, latencies higher than 200ms often will hurt the performance of many applications that utilize an internet connection. Many applications will not wait on higher latency connections, and this will cause frequent timeouts. A timeout occurs when data is transmitted with an expected response, but that response is not received in time. I will use the term bandwidth in regard to connection throughput (the amount of data that flows through a network link successfully). In a sense, this is the speed of the connection. The current measurement of bandwidth is in Mbps (Mega Bits per Second).

Much of my work involves connecting to remote computers for development, administration, education, and general remote computing. When doing remote work, latency becomes a major factor in determining what connections will work and which will fail (normally over 250ms before this becomes a major issue). In the following paragraphs, I will provide examples of remote connections that are highly affected by high latency connections.

VPN (Virtual Private Networking) is my only option for off campus access to parts of the UB network to which I need access. Such parts of the UB network include newsgroups and remote server development to certain computer science and engineering (CSE) department servers. VPN is a connection protocol that establishes a virtual secured direct connection over the internet to a remote network. This provides access to the remote network as if you were physically within that network. Because of the security, the sender has to encrypt the data being sent and the receiving end must decrypt the data - then pass it to its final destination. This means that latency is usually doubled to tripled in such connections making the speed seem slower, although latency has increased significantly. This causes many timeouts to occur that would not occur normally.

A bulk of my remote computing is through a communication protocol called SSH (Secure Shell). Basically, SSH allows me to connect to a remote server (Linux in my case) and see the remote

computer's console. You can think of the console as your computer's display, mouse and keyboard. Do not think of SSH as graphical because in many instances, Linux uses a command prompt exclusively with no graphics. Because SSH connects directly to a remote computer, the latency between the two computers' is the time it takes for one keystroke to show up on the SSH window. SSH is also very sensitive to latency and will almost always time out and not even connect with latency over 500ms. The fact that I : 1. Do remote development directly on a command prompt based text editor (using nano), 2. Read email on a remote SSH terminal (using pine), 3. Chat on Internet Relay Chat (IRC) and Instant Messengers, and 4. Read RSS feeds on a remote SSH terminal (using newsbeuter), the latency of my connection directly affects my communications with friends and other contacts, both personal and professional.

Internet options available to me currently are 1. Dialup, 2. Satellite (Hughesnet or Wildblue), 3. Verizon Wireless (EVDO), and 4. T1/ISDN/Dedicated Corporate Line. I have explored each of these options and none of these are suitable for what I need for varying reasons.

The main problem with Dialup is the reliability and bandwidth available. Dialup provides a maximum bandwidth of .056 Mbps or in my area, .024 Mbps. The latency varies from 300ms to 500ms depending on the noise in the telephone line. Dialup may be slow, but it provides a decent latency. I am willing to put up with the speed since SSH does not require that much speed, but the reliability of the connection makes it unbearable. Dialup requires a perfect telephone line without any noise to avoid frequent sudden disconnects. These disconnects can happen every 5 minutes in my area because the existing phone line runs directly through a swamp area, and the lines in my area are very old.

Satellite internet is plagued with latency, among other problems. The WildBlue internet at home provides an average of 1500ms latency. In addition, during peak hours WildBlue rarely will achieve 25% of the speeds advertised by their company, and latency will often exceed 3000ms. Satellite is shared bandwidth, meaning that everyone on the same channel of the satellite shares the available connection. During peak usage hours which occur normally on the evenings and weekends, speeds are decreased to everyone based on the package they subscribe to. This means that during my peak development hours, satellite is completely useless even for researching using Google because of the frequent timeouts. WildBlue shows little sympathy when questioned about why the speed decreases so drastically during peak times. I have also tested the latency of Hughesnet. Although it has an average latency of 850ms, it is far too latent to be considered an acceptable connection for SSH or VPN. Hughesnet also experiences similar slow down issues.

Verizon wireless (using EVDO- Evolution Data Optimized) is a feasible option provided there is a signal. Typically with 3-4 bars on a cell phone or data card, Verizon can provide a latency of 200-300ms to google.com with speeds approaching 1.5 Mbps. Verizon presents a few problems that makes it not feasible. Unfortunately, this location has poor Verizon coverage, without an expensive booster system. Thus, this makes it difficult to afford. Verizon also requires a 2 year contract for their data plan which makes it a tough sell for someone in my area that is unsure what will happen to the existing signal by the end of the summer (when the signal drops to almost nothing). Another downfall to this connection method is the total data allowed. Verizon limits its customers to 5GB per month (and then \$0.25 per

MB over per month) because its EVDO network is not meant to replace land connections. I also must comment that at this overage rate, 1GB of data over would cost \$256 (1GB = 1024MB). This is simply outrageous, considering the plan to begin with is about 60 dollars per month. For my family, getting into such a contract is not feasible, knowing what the end of the summer will bring to the connection signal strength and possibility of huge overage fees. We have looked into other wireless carriers but they do not support our area.

The last option involves a dedicated land line. Such lines include ISDN (provides 0.128Mbps over 2 phone lines coupled together), T1 (1.5Mbps over a dedicated cable run directly to the home), and Fiber (1000Mbps to 10,000Mbps). These lines can be run by the phone company anywhere based on how much the customer is willing to spend up front. Then, these lines carry a monthly fee. Other than the price, these options are all that are left for decent rural internet access.

DSL lines run by the telephone company (such as Verizon) normally provide low latency, high bandwidth (1.5Mbps) internet access that is comparable to a dedicated line or a very strong EVDO signal. Cable can also provide very fast connections that can reach 25Mbps. FIOS (Verizon Fiber to the home) can also provide stronger connections that are exceptional (up to 55Mbps). It is a shame that our area does not have any of the above options available to us yet.

About 3 years ago, to our knowledge, a cable company ran cable in our area connecting Olean and Ellicottville. We have contacted the only local provider that we are aware of (Atlantic Broadband), and they have told us that cable is not available in our area. We are clueless to what this cable does ,or if we could even get hooked into it.

For the past 4 years, I have been inquiring about when Verizon will make such services available to Humphrey. Without decent internet, I cannot see myself living in Humphrey NY after I graduate in 2 years.

Unfortunately, the companies that I have contacted have said that high speed internet is in the plans, but they have not done much other than talk about it. There are many other people in the immediate community that have also had similar results when dealing with these companies.

In conclusion, I would like to urge you to support rural internet access through technologies that are run on the ground for lower latency access. It is hard enough to live in New York as it is, but having to pay outrageous fees for a decent internet line is not feasible and will drive out technology savvy people such as myself.

Thank you for your time.

Philip Matuskiewicz

P.S. For your convenience, I have sent both a hard copy and an electronic copy of this letter to you.