

T.K. Backman
Microsoft Development Manager
Microsoft Corporation
One Microsoft Way
Redmond, WA 98014

Comments on "National Broadband Plan"

Dear Sirs:

As a seasoned computer professional with 30 years of experience, including managing the key Windows technologies at Microsoft like Multimedia Devices, Digital Television and the Network User Experience, I would like to offer you some of my observations experiences with computer networking and what I believe that we as a country need from Broadband Technology in the future.

Here are some of the topics I would like to touch on:

- **Competition: Monopolies vs. Innovation**

I believe that the time of government granted monopolies to telephone, cable tv, satellite and wireless companies **must end**.

While you may enjoy the irony of a Microsoft employee calling for an end to communications monopolies, the fact of the matter is that monopolies, whether earned (Computer Industry) or granted (Utilities), severely inhibits competition and retards innovation. I believe that the role of the FCC must change from granting exclusive access to bandwidth for telecommunications companies to ensuring that all bandwidth is usage is maximized at the highest quality of service possible. To some extent, you've already done this by creating "unlicensed spectrums", but the unlicensed bandwidth there is too little, too short range and not suitable for creating actual public networks. I'm not advocating a completely hands-off regulatory approach, just one that favors **innovation, competition and maximum bandwidth to everyone**.

If you grant, encourage or even allow monopolies at either level, the rate of change will become moribund compared to the rest of the world which will put America at a permanent disadvantage. The last thing we need to have happen in the 21st century is for our country to fall even further behind other countries in communications infrastructure.

What I think you need to do is re-evaluate the FCC's oversight approach from allocating resources to monopolies, to ensuring maximum usage of shared public resources.

Please make sure that both the physical plant infrastructure providers(wiring) AND the internet services providers(ISPs) remain in vigorous competition in ALL locations in the United States.

- **Autobahn vs. Privately Maintained Roads**

I believe the "Information Superhighway" analogy was Almost Right. I believe a slightly different analogy is perhaps more illuminating. I happen to live on a privately maintained road which has a homeowner road committee that oversees the rules, maintenance and funding for the

shared right of way. The problem is, my road is very marginally maintained, has never been paved, engineered or even upgraded to public road standards. As a result, I have a pot-hole infested and rarely graded dusty country road. It's a lot like what I get from my telephone company in terms of broadband because "they dont care, they dont have to".

I think the entire United States road infrastructure was like this in the first half of the twentieth century. The turning point for public roads was the advent of the German Autobahn in the 1920s & 1930s; it was this highway model that inspired how all modern highways are built. Instead of being privately designed, maintained, and underserving the needs of the citizens, the Autobahn became a the modern freeway. The whole thing is designed to maximize the ability to move people and goods at the highest speeds.

Why is this interesting for Broadband? The Autobahn is not owned by private companies. It does not have formal speed limits (at least in Germany). It is very well maintained and it has a very high "uptime". It has no tolls to slow traffic in any way. It is built for speed and maximizing national commerce. While our US freeways were modeled on this notion, we have failed to increase the available capacity over time to the point that OUR freeways are non-performant. I believe this is because our freeways are federally managed rather than having private competition.

Neither a fully public National Broadband Network nor private communications monopolies will deliver optimal results.

While there are many things about Germany that are not to be admired, their Autobahn roads and Deutchbahn train systems are incomparable. We would do well to have a national communications infrastructure that was the equivalent of the Autobahn, but privately maintained to ensure that it never becomes non-performant like our national freeway system. What we need is **regulated, private "Broadband competition"** that maximizes available bandwidth, maximizes innovation and minimizes the cost of bandwidth.

- **Build it and they will come**

The US national freeway system was built in the 30s and 40s not for commerce but rather using DoD funds to ensure that our armed forces could move about the country efficiently and even land airplanes on the freeways if needed. While no mainland invasion ever happened in the US, the freeways have helped make America great. Today, much of the commerce of the country and thus the source of a large part of our GDP is because of our freeway infrastructure. Even today, as it starts showing it's signs of aging, it remains the pride of the worlds highways. But others are starting to catch up...

The United States has the largest network of highways, including both the Interstate highways and United States Numbered Highways. At least one of these networks is present in every state and connects most major cities. The Expressway Network of the People's Republic of China, also known as National Trunk Highway System (NTHS) has a total length of about 53,600 km at the end of 2007, which is the world's second longest system of expressways only after that of the United States.

A high speed national broadband system will provide similar benefits to national commerce, information flow, leisure and national defense. Today, a large percentage of the US populace either has **NO access to broadband** or **cannot afford the costs of broadband**. The last two go hand in hand in a feedback loop. Underserved customers are often poor customers -- these are each both both cause and effect.

If you want to grow the GDP faster, you need to expand communications to include everyone.

- **Velocity of Data => Velocity of Money**

One of the more interesting things about the Autobahn is that it has no artificial speed limits. This means that the only limiting factor on highway bandwidth is the cars themselves. German automakers have led the world in making high-performance, high quality vehicles as a result. No country dirt road would have inspired the likes of Porche, Audi and Mercedes. These car makers have been responsible for a significant portion of the German GDP over time. All because the roadways were **very high capacity, high quality** and had unrestricted national speed limits.

Similarly, German companies moved their goods at high speed and thus moved their sales at high speed. The velocity of money is closely related to the velocity of trade and commerce.

If trade and commerce in the future are based on data, which is almost a certainty in a service sector economy, then the velocity of data will directly drive the velocity of money.

- **Measured Quality of Service**

Looking at networks today, their inhibitors to network traffic are bandwidth and latency. Networks that dont have most of their bandwidth available are already congested and failing, similarly network that have noticeble delays due latency are also failing. The way to ensure high bandwidth and high latency is to establish national standards for both, constantly measure them in the field and report on how they are doing across the entire landscape.

Another less obvious point is that network uptime will become a crucial issue as we become more and more reliant upon network traffic for many of our needs. Today, telephone companies and electric companies are held to VERY high uptime requirements for life safety reasons. This will be more and more true of Broadband as well, particularly since broadband is starting to supercede traditional telephone service worldwide. Broadband needs to have **nearly 100% uptime** with **almost no service outages**. This will require both public measurements and probably network redundancy so single point failures are not catastrophic.

I believe the FCC should take the lead in establishing standards to ensure the quality of the bandwidth, latency and uptime and publish them for all to see, thus ensureing maximum economic benefit for all.

What we need is the fastest possible broadband with near zero latency that maintains a very high, 6 nines quality of service (99.9999% uptime).

- **IPv6 and Network Redundancy**

The days of 32-bit IPv4 network addressing are numbered. There are theoretically 4 billions addresses avaiable from IPv4, but the address space is pre-allocated to companies that will never use up their address space. As a result, we are already nearly out of room in terms of internet addresses. The solution to this (IPv6) is already implemented in all the major operating systems, including Windows and Unix. The catch is that ISPs have archaic equipment and other limitations that have prevented them from moving to IPv6 addressing in earnest. Any new national broadband initiative should be fully based on IPv6 (with tunneling for older IPv4 traffic).

Interestingly, moving to IPv6 also enables network redundancy.

If you have Internet access via IPv6, you can have multiple ISPs connected to your private network. This means you can get very high reliabilty by not having a single point of failure

through one ISP. While no single internet service provider can give you 100% uptime, it is quite possible for multiple service providers to ensure that everyone will have access to emergency services, internet commerce, marketplaces and other vital communications.

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Thank you for letting me share my opinions on this matter with you. I hope you'll consider the facts that I've mentioned above as they come from a lifelong involvement with and devotion to computing and networking.

Sincerely,

T.K. Backman