

Alison Kelly
Department of the Senate
Secretary
Select Committee on the National Broadband Network
SF61.1 Parliament House
Canberra ACT 2600

Dear National Broadband Network Committee;

Thank you for your interest and request regarding the potential broadband quality for the 10% of your population without fibre to the premise. This is an important topic as you are making decisions which will define the long term future economic viability of a significant portion of the country.

The internet is still in its infancy. Over the next 10 years we will see great advances and continued internet integration into our daily lives. In most of the developed world children are growing up with the fundamentals of the internet and communications deeply embedded in their minds. They embrace it and advance it without the burden of history which enables new perspectives and ideas for new world changing applications. People today are as likely to have friends half way across the developed world as down the street. This connected world enables new levels of understanding, sharing of ideas and has great impacts on the opening of economies, freedom and democracy.

At the same time, the un-developed world is stagnated by the lack of communications infrastructure. Learning, experience and opportunity are limited, and consequently so is growth, development and economy.

O3b Networks is building a core internet infrastructure designed to bridge this gap and level the playing field. We will connect even the very remote regions to the rest of the world with a high speed low latency internet link. Primarily our customers are telecom operators and ISP's where we provide the "middle mile" link between the cellular tower and the global fibre network. This enables even smaller entrepreneurs to begin village ISP's, building their part of the internet and creating jobs and prosperity. In some cases our satellites will connect directly to homes, schools, health centers and civic institutions. All of this will be done with the quality expected of terrestrial broadband.

With the adoption of HTML version 5 and eventually ongoing versions of the core web standards, websites will also continue their migration from flat pages with text to rich dynamic desktop like interfaces. You will not know whether you are running Microsoft Word on your desktop, or on a server at a data. These rich web pages have a lot of server/PC interaction, and it is here that the Latency will determine the reaction times of every click and keystroke. We are moving to a wholly connected world where applications will run in data centers and the browsers display the images and create the connections of keystrokes and mouse clicks with the servers:

- 33,000,000 netbooks are expected to be sold in 2009.
- Google recently announced "Chrome OS", a new operating systems optimized for netbooks and internet only applications.
- Microsoft announces a web based Office to be available in 2010

All this points to a more connected web in the future and a bigger divide between the low Latency internet have's and the high latency have nots.

While we understand the Senate has focused on the “throughput” of the broadband available, we suggest that the Latency and Oversubscription also be specified. The throughput of 12mbps for the regional areas will adequately service even the creative of users, *provided* you limit both the Latency and the Oversubscription.

In particular, this paper will focus on Latency and the fact that whatever the maximum throughput (12mbps or greater), the round trip latency to your Australian data centers should be no greater than 150ms in order for everyone to participate in what the web has to offer.

Latency and its effect on web performance

Latency is the round trip time between each packet takes between your computer and the server. Latency is primarily a function of three things: 1) the speed of the packets (light speed), 2) the network design (routers and switches) and 3) the distance between your PC and the server.

Throughput is measured in the steady state flow of megabits per second (mbps) and is important for downloading large files, watching video or other bandwidth intensive utilization.

12mbps is adequate throughput, but the Latency must be kept low. With high Latency web pages will load slowly, video conferencing will be stuttered with unnatural gaps and web 2.0 desktop applications will not function well.

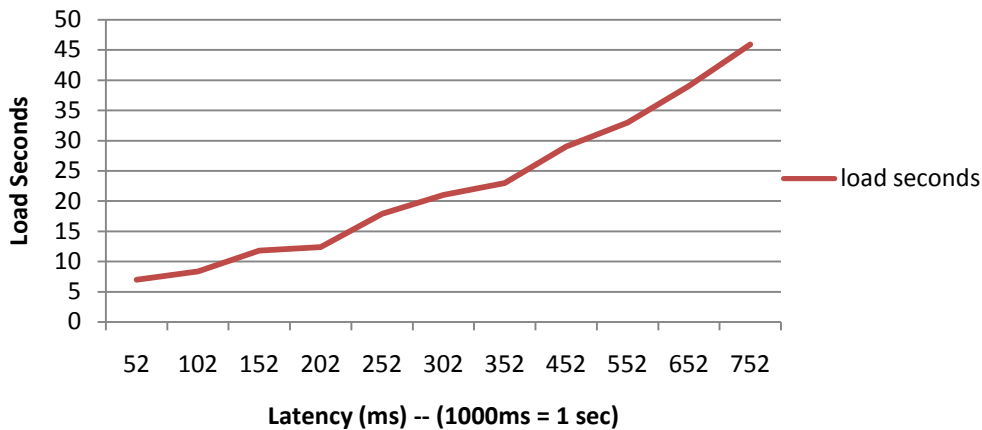
Web pages are really amalgamations of components from many different web servers. The Wall Street Journal (wsj.com) for instance, will grab different components from different servers and then display them as a “page” in front of you. The stock tickers come from one server, the currency quotations from another, and the advertising from yet another. The speed at which the Wall Street Journal will display on your screen is a function of the many different round trips necessary to pick up each of those small bits. Thus, provided you have the minimum amount of bandwidth the time for the web page to load will depend on the Latency.

One way to consider Latency is as the time it takes to get to the store and back, and bandwidth is the number of lanes on the road. As long as your car has an open lane and can reach the speed limit, the number of lanes will not affect your performance. Latency dictates how fast your web pages load and how well collaborative online applications function.

Some technologies, known as “acceleration” or “TCP Spoofing” help improve the download speed over high Latency links, by modifying the way the TCP/IP interactions work in order to achieve higher throughput. This is necessary for achieving full throughput performance, but does not change the Latency. Thus such technologies have minimal impact on interactive rich dynamic content where there are lots of server/PC interactions such as web 2.0 applications, gaming or video conferencing.

As an example, below is a chart which demonstrates the effects of latency on the loading of a Wall Street Journal. In our test procedures we modified the Latency using Shunra Virtual Network Emulator¹ while using the same 10mbps connection in Florida, USA. This demonstrates that as the latency increases the load time for the web page increases.

¹ <http://www.shunra.com/shunra-ve-desktop-standard.php?keyword=VED%20Standard>



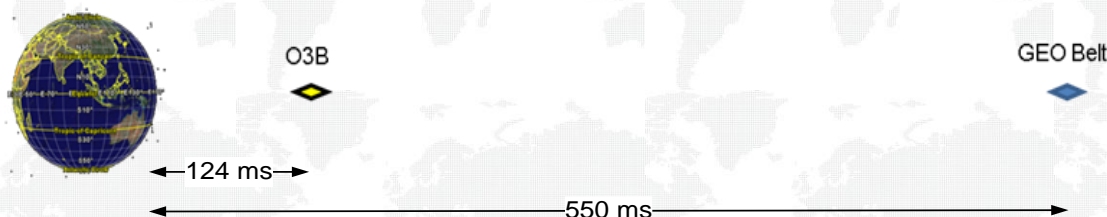
Numerous articles on the web can be found which discuss this in detail:

- “One concept that continues to elude many IT managers is the impact of latency on network design.”
 - <http://www.edgeblog.net/2007/its-still-the-latency-stupid/>
- “*Latency, Bandwidth, and Station Wagons* focused primarily on the limitations of network bandwidth, and **the time required to transmit massive data volumes**. While that is an interesting topic, and one that produces some surprising results (like the fact that *FedEx is still faster than the Internet*), it is not particularly relevant to the subject of *Web* performance, which depends on **the time required to transmit many small files**.”
 - <http://www.webperformancematters.com/journal/2007/7/24/latency-bandwidth-and-response-times.html>
- “A common misunderstanding is that having greater throughput means a “faster” connection.”
 - http://en.wikipedia.org/wiki/Relationship_between_latency_and_throughput

O3b Networks Satellites are designed for low Latency

O3b has designed a satellite network specifically to bring low Latency connectivity to emerging markets. This system, funded by Google, Liberty Global and HSBC, has been designed to ensure end users will enjoy full web performance with all current and future applications. With only 124ms of round trip Latency, and 62ms one way Latency, voice, video conferencing and interactive gaming and web sites allow natural conversation. Video Conferencing for educational, business and Medical uses require low Latency so that users can interrupt, motion, and maintain proper lip synchronization. Online gaming requires low latency where reflexes and response times are key to the enjoyment.

O3b’s satellites provide low Latency because they are very close to the earth. In technical terms the “path length” the bits travel is 1/5th that of legacy satellites. The round trip Latency of the two technologies can be seen from the graphic below. The distances from earth are to scale. This gives an idea of how far the bits must travel up and back, twice, for a round trip signal.



Cost and Infrastructure, Fiber and Wireless

Fiber quality performance, defined as high throughput and low Latency is possible over wireless systems whether via O3b satellites or terrestrial networks. While wireless systems cannot carry the total throughput of Fiber (measured in terabits), this is most important for core trunking and high customer density environments. In lower customer densities the total required throughput can be handled by wireless systems provided the Oversubscription rate is appropriately set.

O3b satellites are designed to provide high bandwidth links (up to 10gbps) to telecom operators as a direct substitute for fiber. O3b can also provide cost effective fiber quality links directly to cellular towers for rebroadcast over WiMAX or 3G networks, as well as high bandwidth directly to the home, schools and businesses.

In the Australian environment a combination of terrestrial wireless and O3b satellites will be a cost effective way to reach the remaining households not connected by fiber. For significantly less than 10% of the budget, the remaining homes can be reached.

Summary

We applaud your vision to level the connectivity playing field for all Australians.

O3b Networks is dedicated to building a cost effective global internet infrastructure for the “Other 3 billion” unconnected. As our satellites circle the globe, every satellite put to use for Australia will improve connectivity globally in the developing world. In effect, the Australian broadband system could have further great impact on building a system which will connect the world.

While there will be a lot of focus on the throughput of the links (i.e. 12mbps), we suggest you carefully specify the Latency as no greater than 180ms to ensure everyone can both use and develop all of the exciting web 2.0 applications and beyond.

Sincerely Yours,

Greg Wyler
O3b Networks Limited