

## Landonline eSurvey Speed Issues Caused by Internet Latency

Some eSurvey users have reported speed issues when using Landonline, particularly in the Plan Generation module of eSurvey creation. For affected users the task of laying out plan sheets can be quite slow, as the individual shifting of text and other plan elements comes with a delay added to every mouse click, along with uncertainty as to whether seemingly-unresponsive clicks/draggs have actually been actioned or not, which can lead to a lot of confusion, doubling-up of actions, and unintended results. Other areas of eSurvey can be similarly affected but generally to a lesser degree, due to their less click-intensive nature.

To understand the possible cause of this unresponsiveness, it's necessary to have a brief look at what's actually happening when you click your mouse in a Landonline window.

When you log in to Landonline, you are connecting to a "Citrix server" which is a computer (or network of computers) located in Landonline's server centre in the North Island - similar to the kind of connections made via programs such as Remote Desktop - i.e. your computer is providing the input/output interface, while the actual processing (work) is being actioned by (and stored on) the remote Landonline servers.

So in a basic sense each time you click your mouse button, your computer is sending that signal (e.g. "mouse has been clicked at x,y location") over the internet to the Landonline Citrix server, which then "actions" your input, and sends information back over the internet to your computer which causes your display to update appropriately. As distinct from a normal computer program, which actions your input and updates your screen relatively "instantly" right then and there on your own computer.

So it must be inferred that a major factor in the performance of Landonline is going to be the speed of the internet connection between your computer/office and the Landonline servers. Specifically, you want your internet connection to be able to speedily convey your input to the Landonline servers, and for the response to likewise come back quickly. The key concept being that a fast "reaction time" (from your internet connection) is critical.

A lot of advice to date regarding Landonline speed has focused on the "bandwidth" of the user's internet connection. That is, the sheer quantity of data that you can send/receive via your internet connection in a given time - be it dialup (56Kb/sec) or low-grade ADSL (256Kb/sec) or higher-end broadband (2+Mb/sec). When people talk about the speed of an internet connection, they are typically referring to the bandwidth of the connection.

Now, in terms of quantity of bandwidth required by Landonline use, virtually any broadband plan (even a low-grade one) should be sufficient. In general use, Landonline download traffic rarely exceeds about 20KB/sec (i.e. about two-thirds of the downstream bandwidth available on a 256Kb/sec ADSL plan), and upload traffic generally hovers at about 5-10KB/sec (which is again catered for by even low-grade broadband plans - albeit not something you'd want to be reliant on in an office with multiple simultaneous internet users).

But the real issue here is what's known as **latency**, or in layperson's terms the "reaction time" of your internet connection. This is an issue somewhat separate from that of *bandwidth*.

Latency (measured in milliseconds) is term used to describe the time taken for a packet of information (such as those conveying your mouse clicks to the Landonline servers) to make the round-trip between your computer and the destination - along the way traversing through several of your ISP's routers (which direct internet traffic through calculated and/or pre-determined internet "routes" on the way to the destination site). It is the efficiency of these routes, along with the responsiveness of your ISP's intermediary routers/equipment, that largely determine the latency of your connection to a given destination site; and will be a significant factor contributing to the perceived speed/performance of remote-server systems such as Landonline.

It's worthwhile to state that latency does, for technical reasons, have a tendency to be lower (i.e. improve) with a higher-bandwidth connection - which is one of the beneficial aspects of past advice suggesting higher-bandwidth internet connections, and which has seen some users gain Landonline performance

benefits as a result of upgrading to a quicker internet plan (e.g. from 128Kb/sec upload speed to 512Kb/sec upload speed). However such improvements are not a guaranteed outcome. It's quite possible to have a relatively high-bandwidth connection yet still suffer from high latency, or conversely to have a low-bandwidth/low latency connection - it has as much to do with your ISP's large-scale configuration as anything.

It's also worth noting that many "wireless"-type connections can have a detrimental effect on latency - if in doubt, simply do a comparative test against a wired connection (which IT staff should be able to do relatively easily in many situations).

Below is a brief case study illustrating one office's Landonline performance issues, with details of how it was tested and resolved. It won't be a solution that everybody will be able to implement as easily, but it may provide some ideas as to how this particular problem can be identified and approached.

### A Brief Case Study

*Internet Type: ADSL, approx 5Mb/sec downstream, 768Kb/sec upstream.*

It was initially noted that Landonline performance had a tendency to be very responsive for the first part of each day (up until about 9am), at which point performance would quickly degrade such that extensive editing in Layout Plan Sheets would be extremely slow.

This suggested that internet congestion (occurring primarily during business hours, when most businesses are actively using the internet) may be at fault. In other words, the quantity of internet users sharing the relevant ISP equipment (routers and so forth) would exponentially increase after about 9am - resulting in a reduction in internet responsiveness during business hours.

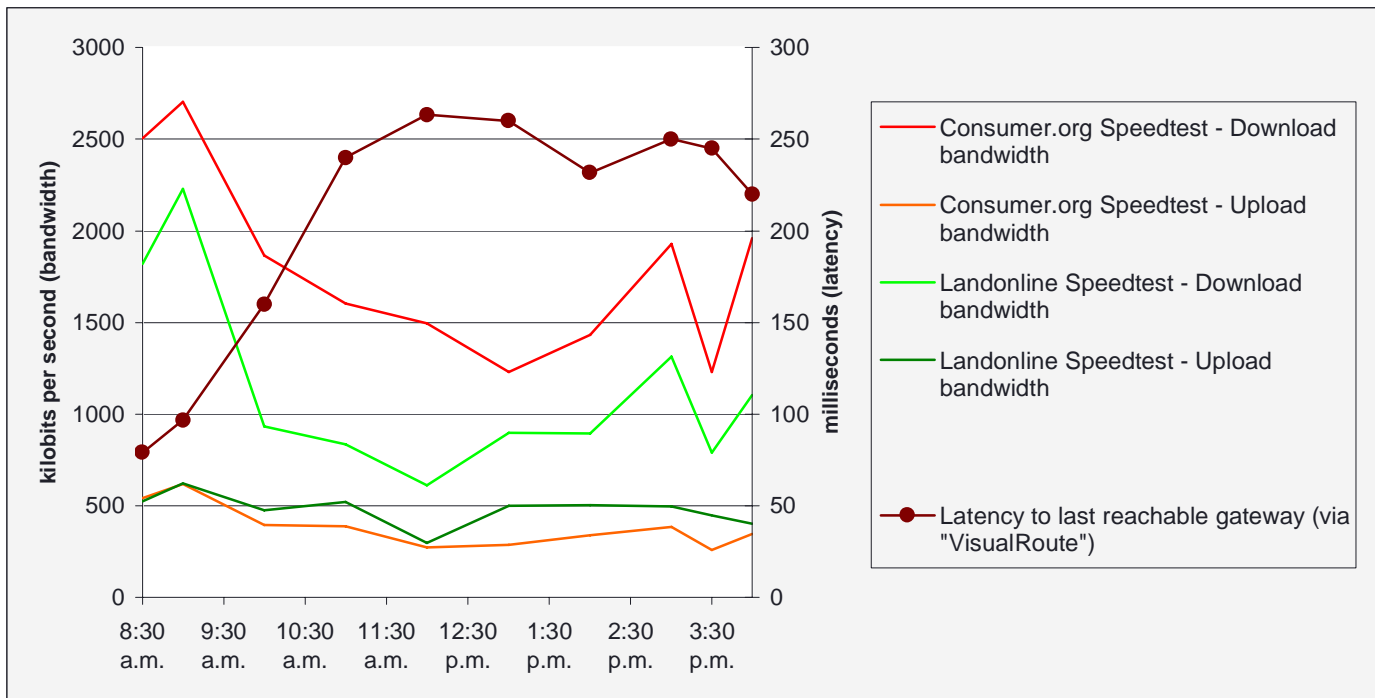
Perception of general internet performance - email, web browsing, etc - is not greatly affected by latency fluctuation (within reason), so there were no problems or performance issues with non-Landonline internet usage within the office.

The first step in identifying the problem was to actually test the latency of the internet connection. This can be done with a number of software tools, ranging from the "tracert" DOS-prompt command (included with Microsoft Windows), to more user-friendly shareware or commercial programs such as [VisualRoute](#) (which has a "free" basic-functionality version).

In order to gain some useful data for analysis, the latency to [www.landonline.govt.nz](http://www.landonline.govt.nz) was regularly tested (using the free "VisualRoute Lite" application) over a period of about three weeks, at different times of day. The bandwidth was also tested, using the OOKLA Speed Tests provided by [Landonline.govt.nz](http://Landonline.govt.nz) and [Consumer.org.nz](http://Consumer.org.nz).

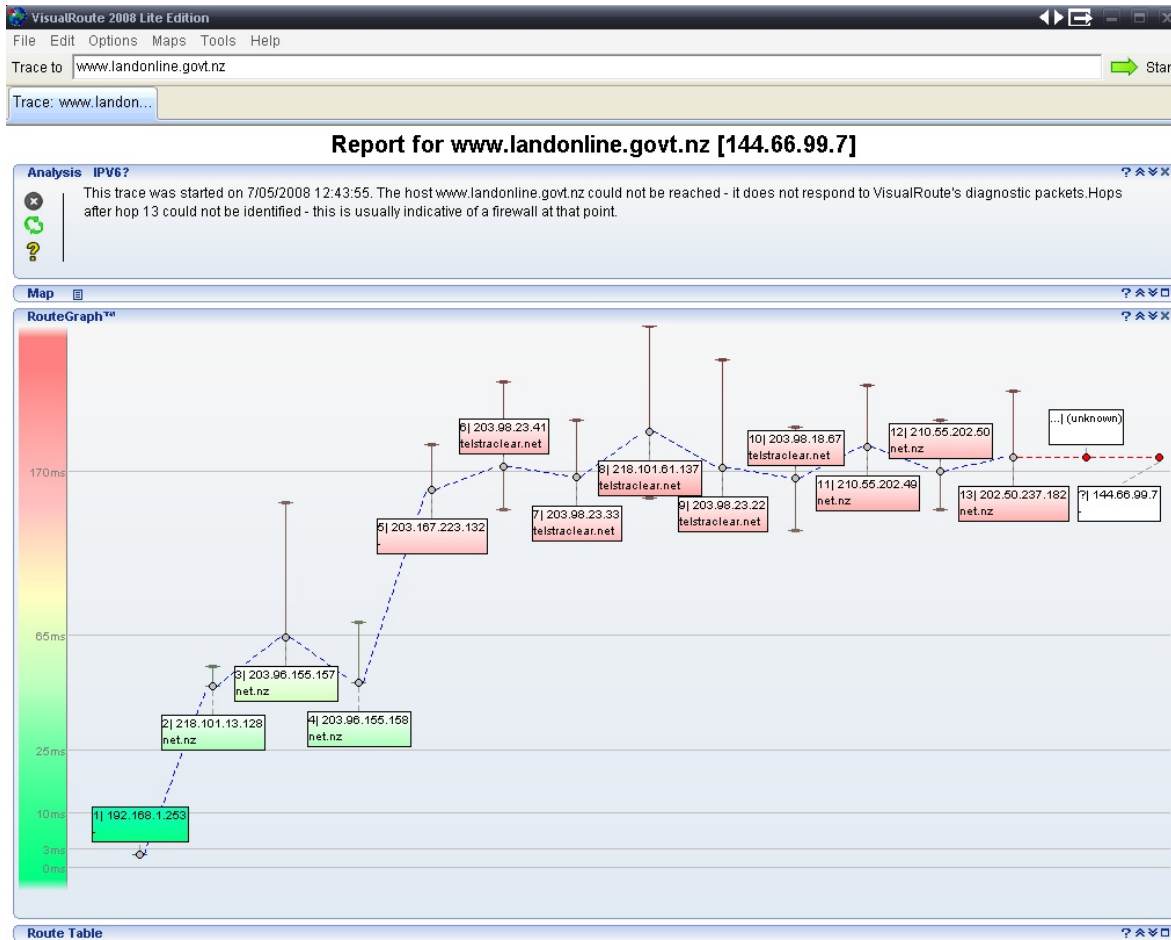
*(see next page for results..)*

The compiled results are displayed below:



The bandwidth, while fluctuating (with a general trend downward during peak business hours, as could be expected), is nonetheless quite sufficient for Landonline's requirements. However the latency rises dramatically after 9am, in line with the perceived responsiveness of Landonline (based on user observations).

Below is a screenshot from VisualRoute, graphically illustrating typical latency during business hours:



Each rectangle in the preceding diagram is a router that the office's internet traffic is traversing through on the way to its destination (landonline.govt.nz). In this case the traffic is going through about 15 routers along its route.

Thankfully, all of the above routers are based in New Zealand. In some unlucky cases (dependent on the ISP and its routing policy), internet traffic may even be routed overseas before eventually coming back to its New Zealand destination, which generally brings with it a significant latency increase. This was the case for one South Island surveyor spoken to, who was able to observe superior Landonline performance at another local site (where a different ISP was used), and subsequently switched his own office's internet connection to the same ISP with good results.

Despite the traffic staying domestic in this particular case, it can be seen that routers after the 4th "hop" become significantly slower to respond (depicted by the red-coloured rectangles). The first four routers have a latency well under 100ms, while subsequent routers' latency is well above 100ms.

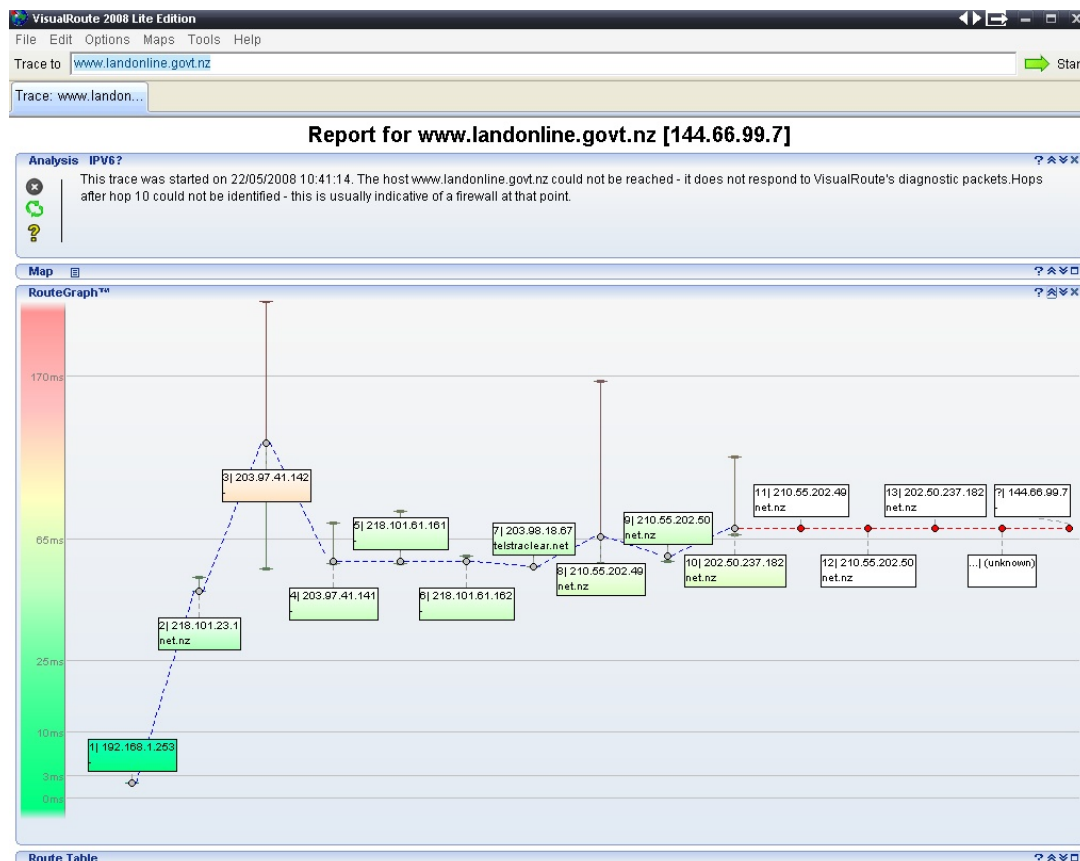
This is indicative of a congested ISP network, with certain routers unable to respond quickly - hence mouse clicks in Landonline are being "delayed" for a fraction of a second, long enough to significantly impact performance in an environment where clicking and dragging are in constant use.

General hearsay suggests that end-to-end latency of less than 100ms is "good" and will provide a fairly responsive experience when using a remote Citrix system, while anything approaching or greater than 200ms can result in a detrimentally-unresponsive user experience.

Armed with the above information, the ISP was approached and the issue discussed. ISP representatives agreed that the observed latency was relatively high for domestic traffic, and that it was likely due to internet congestion during business hours.

In many cases there is no simple solution, because the ISP cannot go to the trouble of re-configuring their entire network to reduce latency performance for one customer. But in this case, the ISP (one of the major NZ ISPs) had two separate physical networks and were able to offer the option of switching the office's internet service from one to the other, which they believed to be less-congested.

After the changeover took place, the below was observed during peak business hours:



As can be seen, latency along the entire route is now reduced to well under 100ms - and as a result, Landonline's responsiveness/performance in Layout Plan Sheets is now good regardless of the time of day. Testing indicated that bandwidth was not affected by the changeover.

While most users affected by slow Landonline responsiveness will not have the easy option of switching to an alternate network within the same ISP, for many there may exist the option of discussing Landonline performance with other local survey industry colleagues, and looking into the possibility of changing to an ISP that's proven to provide a quick and responsive route from their general locality to the Landonline servers. Survey Institute groups could even provide a possible means of centralised discussion, if there were sufficient demand.

Written by: Riki Wi  
Date: July 2008

### Important Notes:

*This document is not intended to cover all possible Landonline performance issues; it describes problems specific to latency issues caused by ISP performance, and provides a general guide for a method of identifying these issues, along with suggestions for possible resolution or improvement.*

*There are other possible causes of Landonline performance issues such as network or computer issues within the Landonline user's own office, the scope of which are well outside the limitations of this document and which are best identified and resolved by IT staff.*

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