
**REPORT FOR THE COMMERCE COMMISSION
ON NEW ZEALAND BROADBAND
PERFORMANCE**

Q1 2008

BY



EXECUTIVE SUMMARY

TelstraClear's Cable and DSL services achieved the highest broadband scores in Auckland, Wellington and Christchurch, while Orcon led the market in Hamilton and Dunedin, according to the first Epitiro-IDC New Zealand Broadband Index (NZBBI) for the March quarter.

Second tier ISPs such as MaxNet, Snap and Compass consistently delivered above average results and took second and third place in their core markets. By contrast, Telecom, Vodafone and Slingshot all achieved mid-range to below average outcomes across all five cities.

These are the findings of the first quarterly Epitiro-IDC New Zealand Broadband Index (NZBBI), commissioned by the Commerce Commission. The Index measures thirteen ISPs every fifteen minutes on a 24-hour basis across eleven sites in Auckland, Hamilton, Wellington, Christchurch and Dunedin. Performance is evaluated on eight key performance parameters - synchronisation speed, time-to-connect, cached and non-cached HTTP download speeds, ping, email round trip time, DNS and packet loss. Collectively these help the industry to understand their performance in managing the speed, throughput and technical parameters that impact the end user's broadband experience.

Key outcomes from the New Zealand Broadband Index for the March quarter include the following:

- TelstraClear Cable exceeded the industry average by between 22% and 41% on key measures affecting speed, time-to-connect and browsing.
- TelstraClear's DSL performance was between 6% and 14% better than the industry average on key metrics. However its DSL performance was highly variable: strong results in the three main centres were offset by the lowest outcomes in Hamilton and Dunedin. Epitiro-IDC believes this reflects where TelstraClear has its own cable or DSL network capability and where it resells Telecom services.
- Orcon achieved consistently good results, particularly in metrics that affect browsing such as synchronisation speed, time taken to access local and international content (cached and non-cached HTTP download speeds) and retrieving web addresses (DNS). A lower email score offset this for Orcon this quarter.
- Telecom, Vodafone and Slingshot all scored average to below-average outcomes on both geographic and key performance metrics. Of the main ISPs, Telecom scored the lowest outcomes in Auckland, Wellington and Christchurch, but was slightly above average in Hamilton and Dunedin.
- Hamilton recorded the highest average broadband score of 3107 across New Zealand's five main centres, 16% ahead of Auckland's 2670 result and 24% higher than fifth-ranked Christchurch.
- Second-tier ISPs, including MaxNet, Compass, Inspire, WorldxChange, Snap and Actrix, scored between two and four of the top five rankings in each city, and collectively were the top performers on packet loss, although other performance metrics were mid to lower range.

Epitiro-IDC believes the overall results portray a market in transition, where recent investment in infrastructure, technology and services has yet to be reflected in the user's experiences. Those ISPs with the strongest subscriber growth are not necessarily delivering the strongest broadband performance: indeed the results indicate their size and success has led to network congestion, contributing to poorer outcomes than much smaller ISPs focused on a dedicated, technology-savvy market. However the outcomes from investment in the unbundled local loop), high-speed ADSL2+ technology, cabinetisation and new fibre backhaul will begin to take effect over the year. Consequently this first report provides critical base data against which future progress can be measured on a quarterly basis.

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INTRODUCTION

The New Zealand Broadband Index is founded on Epitiro's ISP-I technology, which tests Internet services from the end users' perspective. It provides a robust and independent view of broadband performance in New Zealand, producing detailed information on the speed and consistency of internet connections, the time it takes a user to connect, and technical metrics that impact the user's experience when browsing local and international content, exchanging email, gaming online and accessing video or multimedia content.

This study is the first of ongoing quarterly surveys of New Zealand's broadband performance, covering five city centres, 11 reporting sites and a total of 13 ISPs. The output is a series of 'Key Performance Variables' (KPV's) measured by ISP and by city, which collectively provide a guide to broadband performance. These outcomes have been reported in three sections:

- **New Zealand industry performance:** aggregated industry scores, with international comparisons where appropriate.
- **ISP performance by city:** An evaluation of individual ISP performance in the five city centres of Auckland, Hamilton, Wellington, Christchurch and Dunedin.
- **ISP broadband scores by key performance variables:** an evaluation of how the top six ISPs scored across eight key broadband metrics, with TelstraClear Cable and TelstraClear DSL evaluated separately. Second tier ISPs have been aggregated into an 'Other's' category in this section.

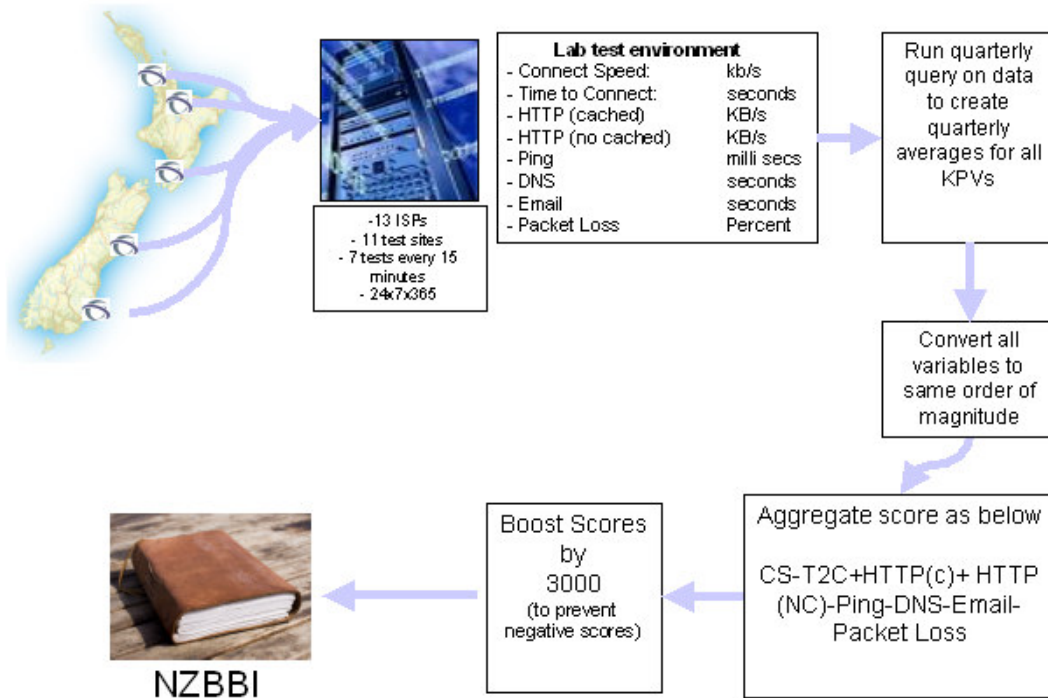
In this inaugural New Zealand Broadband Index report, only one set of quarterly results is presented, providing base data against which future quarterly performance will be evaluated. Email round trip has been included in this study, but it does not capture all ISPs or cover all centres due to technical difficulties in the March quarter with the Yahoo!Xtra mail platform.

METHODOLOGY

The methodology used in creating the New Zealand Broadband Index (NZBBI) has been tested and evaluated through a process of industry consultation and independent review. It does not, however, capture all factors that affect the end user's experience such as home wiring, customer premises equipment and number of devices connected to a telephone jack. Epitiro will introduce a series of tests to evaluate the end-user home experience later in 2008.

It is important to note that the NZBBI does not report absolute results but aggregates then applies a weighting to the data in order to provide a consistent indexed score for comparison, as described below. The quarterly raw data comprises literally tens of thousands of tests, which are conducted at 15-minute intervals on a continuous 24-hour cycle on all broadband services measured.

The Index Process



Report collation methodology

There are three principle steps in the formulation of this report:

- Data Gathering:** The data is collected and managed via Epitiro's ISP-I service. The ISP-I platform primarily consists of a centralised database and reporting system along with geographically diverse deployment of ISP-I-configured PCs or 'Satellites' that are responsible for collecting data on the performance of the monitored network services. Testing is maintained 24x7, with each ISP's service tested every 15 minutes. Tests are performed using satellites that are of a specification typical of the PCs available for home use, which run the ISP-I software. A consistent specification is maintained across the ISP-I network. All satellites are installed with Microsoft Windows XP Professional SP2, with the Windows Firewall enabled. In order to test each ISP's services, Epitiro has subscribed to the premium broadband service available from each ISP at each of its physical testing sites. Epitiro's ISP-I Satellite software runs on Windows and employs Microsoft's .NET framework to control the connectivity and execute tests as and when required. The ISP-I Satellite integrates very closely with the Windows Operating System, which means it uses exactly the same underlying mechanisms as an end user connecting to the Internet and to the services made available via their ISP. More detail on how the ISP-I Satellite software performs its tests is given below.
- Data Processing:** This stage of the process is also managed by Epitiro, and involves the indexation of the raw data. This is conducted for two primary reasons:

- To allow the data to be aggregated and manipulated. Because the tests involve a variety of measures including milliseconds, kilobits per second and percentages, the results exist in a myriad of orders of magnitude. To allow greater flexibility in manipulating the data, all of the values are converted into a score of the same order of magnitude.
- Depending on the variable, a high result will, in some cases, be an indicator of good performance and in others suggest a worse performance. For example, a high synchronisation speed performance is positive, whereas high packet loss is negative. In order to make the report easier to read and to create consistency, indexed numbers have been re-weighted using statistical techniques. As a result, a high index score indicates a better performance in this report.
- **Data analysis and report preparation:** The period of analysis is selected in the ISP-I system and in this case represents three months of data. The system averages the results of every test conducted for every ISP across this period. Over time a database of quarterly processed and indexed results will develop for analysis and comparison in quarterly reports.

Key Performance Variables tested by Epitiro's ISP-I Service

There are eight key performance variables (KPV's) analysed in this report, with two additional parameters assessing consistency of service performance and traffic management. The KPV's are defined as follows:

Synchronisation speed: The first test is synchronisation speed, which is one measure of the speed of the broadband service supplied to the customer. Line connect speed is the synchronisation speed reported by the modem after connection to the ISP has been initiated. It represents an upper limit on the customer experience; sustained data rates are often slower than the synchronisation speed. When connecting to a service via a modem (this includes dial-up, ADSL, fixed wireless and 3G / HSDPA / GPRS wireless connections), the ISP-I Satellite software employs the Windows RAS APIs to initiate the connection. This is the same underlying mechanism that an end user would be using when they manually initiate a connection to their ISP. In the case of connections that use the Satellite's ethernet connection, such as cable or router connections, the Satellite software is able to confirm existence of an active connection, but does not capture any timings, synchronisation speeds or specific failures as the connection itself is managed by the cable modem or router.

Time to Connect: The second test is "Time To Connect." This measures the average time that it takes for an ISP to recognize a broadband modem and connect it to the network after it is turned on. The Satellite captures accurate timings for events that occur during the initialisation and setup of the connection (e.g. user authentication and IP address allocation), as well as the synchronisation speed itself as reported by the modem. Additionally, where a connection failure occurs, the ISP-I Satellite records the specific RAS error code returned by Windows Dialup Networking.

Cached HTTP: Web pages are stored on servers that are often located in foreign countries. To improve retrieval speed and reduce international transit costs, content fetched by users may be locally cached by being held on a NZ-based server. The cached HTTP download speed test indicates how quickly an ISP can

distribute content over the New Zealand portion of their network by testing how fast specific web pages are downloaded. The HTTP test makes a request to the specified URL and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, the satellite is also able to download the embedded content, such as images on a web page, in any HTML that results from the HTTP request. Any additional content downloaded is reflected in the captured timings and size of data downloaded. Epitiro has selected a basket of the most frequently accessed local websites.

Non-cached HTTP: The HTTP test can be configured to run in one of two modes of operation: cached and non-cached. When the test downloads from the specified URL in “cached” mode, the speed of the download can be impacted by any caching mechanisms implemented by the network provider/ISP the Satellite is connected to. The non-cached HTTP download speed test ensures that the web page request bypasses any caches present in the network, and so goes all the way back to the original website, making use of international bandwidth where necessary. This download speed test therefore provides an estimate of the user experience in downloading web pages from foreign locations. Short times equate to a better experience. The “non-cached” mode appends a random query parameter to the end of the URL, which will result in the request bypassing any caches present in the network. The web server specified in the URL, as opposed to any cache, will therefore service the request. If a failure occurs then the HTTP status code is recorded. This can be used as an indicator as to whether the error resulted from the network or from a problem with the web server hosting the URL. Epitiro has selected a basket of popular URLs located in the various regions of the world – the US, Asia and Europe particularly – to test the quality of each ISP’s international connectivity.

Ping performance: A ‘ping’ is the time taken for a terminal on the Internet to send a request to a remote server and for that server to respond with an acknowledgement. The ping time test is a measure of how quickly the ISP’s network can respond to a request, so it is also known as a measure of latency. Shorter ping times are better. The Ping test measures network latency by sending an ICMP echo request to the specified server. The time recorded by the ISP-I Satellite is the total round trip time (in milliseconds) from the request to the echo response being received from the server. The ping test is conducted on the same basket of URLs used in the HTTP tests.

DNS: A DNS server fulfills a function similar to a telephone directory. A DNS server takes an address readable by humans (e.g www.comcom.govt.nz) and converts the address to an IP address, or a specific set of numbers which identifies a particular website. The quicker this happens, the more promptly the Internet will respond to a click on a hyperlink or resolve a web address. In technical terms, the DNS test records the time taken (in milliseconds) to resolve a fully qualified domain name to a corresponding IP address. The DNS servers used for the query are those primary and secondary servers dynamically assigned by the service provider when the network connection is initiated. Alternatively a specific DNS server can be configured for use during DNS tests. The ISP-I Satellite delegates responsibility for DNS resolution to the underlying operating system, thus using the same DNS resolution mechanism employed when a user enters a URL into a web browser. More details of the specific DNS resolution algorithm used by Microsoft Windows can be found in the Windows XP Resource Kit (Configuring IP Addressing and Name Resolution). Satellites ensure

that the DNS query is performed on the DNS servers, and not returned from any local cache, by disabling the Windows DNS Client Service responsible for caching the results of DNS requests.

Email round trip: The email roundtrip test measures the time that it takes for an email to be sent over the Internet using the ISP's mail servers. If these servers are busy then they may take a longer time to send a message: a shorter time therefore provides a better experience. In technical terms, email testing within ISP-I consists of SMTP tests that run from the Satellite and POP3 tests that are run centrally to retrieve the emails from the POP3 mailboxes. The SMTP test executed by the Satellite can be configured to send an email using the service provider's SMTP server to one or more recipients. Each email sent can be uniquely identified from an ID transmitted in one of the email's headers. The Satellite records the time taken to send the email using the SMTP server, and also any SMTP error codes that result during the course of the conversation with the server. The POP3 component of the ISP-I platform's email testing is performed from centrally-managed servers that are configured to poll the mailboxes of each POP3 account once every minute. Whenever an email is retrieved that was sent from an ISP-I Satellite, the time of retrieval is recorded. Any errors that occur while attempting to connect to a POP3 server are also recorded.

Packet loss performance: The Internet transmits information as a string of packets, which are sent to a destination often via different paths. One of the hazards they face is that they may be lost and have to be resent, resulting in a delay in the transmitted material becoming visible to the user. The packet loss test records the average package loss percentage experienced during individual tests and an overall packet loss test. The packet loss test is not an individual test in the same sense as the other tests that the ISP-I Satellite is capable of executing. Instead, the Satellite records TCP packet loss during all the individual tests executed, as well as an overall packet loss measure over the course of entire network connection during which the tests were being run. Thus, as well as measuring the packet loss present in a network, ISP-I is able to indicate whether packet loss is occurring for a particular protocol or service. The ISP-I Satellite measures packet loss by utilising the Performance Counters for TCP available within Windows. Packet loss is recorded as the percentage of TCP segments transmitted from the Satellite machine that contain retransmitted bytes.

Other factors influencing broadband service experience not covered in this report

The service an ISP delivers to a consumer is not only affected by a number of network-related issues, as measured above; there are a number of factors within the home or business environment that can also play a significant role in repressing broadband service performance. Epitiro's testing has revealed these factors to include:

- Satellite television services, when the decoder is plugged into a telephone jack without an ADSL filter;
- Faxes attached to the telephone jack, even if they are not operating and have a ADSL filter;
- PC hardware specification;
- PC operating system configuration;

- Extent of applications and malware running in the background on a user's PC;
- Telephone line wiring quality;
- Number of cable pairs bundled together (when serving multiple tenancies, for example blocks of flats), and the number of those running broadband services.

This report does not address these factors. However future iterations will include information on service performance from NZ households, and will also examine the effect of some of these factors. The methodology of this report assumes that these effects average out more or less equally across all ISPs, and therefore do not favour or penalize any specific ISP.

Reporting methodology on different technologies

TelstraClear

Epitiro has separated, for clarity, reporting on TelstraClear's two broadband platforms, cable and DSL. It is important to understand the nature and architecture of TelstraClear's network, as this has a significant impact on its broadband performance.

- **Cable:** TelstraClear owns and operates a hybrid coaxial cable network in Wellington, Kapiti and Christchurch.
- **DSL:** TelstraClear also owns and offers its own DSL broadband services, in addition to reselling DSL connections from Telecom. TelstraClear's DSL service has only partial coverage in metropolitan areas and is a premium service only. TelstraClear owns the copper loop and the DSLAM equipment, providing control of speed and provisioning. As the TelstraClear loop length is short – typically less than 1000 metres – TelstraClear can offer relatively high synchronisation speeds. The company has some DSL wholesale resellers, but these are very small and are not included in this index.

The DSL services owned and controlled by TelstraClear are described as 'on-net'; those resold from Telecom are described as 'off-net' as TelstraClear does not own access to the customer in these circumstances. As a consequence, Epitiro tracks three distinct TelstraClear DSL services;

- **PPPoA "Off-Net":** This is the Telecom DSL service TelstraClear resells in certain parts of the country where it does not have its own network coverage;
- **PPPoA "On-Net":** This technology is used by TelstraClear ADSL services when offered over TelstraClear's own network via Alcatel DSLAMs;
- **PPPoE "On-Net":** This is an alternative technology used by TelstraClear ADSL services, when offered over TelstraClear's own network via Ericsson DSLAMs.

Woosh

Woosh is targeting users more interested in mobility than high-speed access because of limitations in the technical capability of its fixed wireless technology, and therefore no longer attempts to directly compete with DSL providers. For example, those in transitory occupations such as university students or those

users who live in rental accommodation will often favour the convenience of moving their broadband connection when it is not associated with a fixed line. For the purposes of this report, therefore, Woosh's fixed wireless performance has not been compared individually with DSL-based ISPs, although we have included Woosh numbers in the overall totals.

Reporting on "Other ISPs"

A total of thirteen ISPs were measured, but a number were only measured in one site or one city. In order to create consistency, Epitiro-IDC's analysis of key performance variables (KPV's) only specifies the top six service providers measured across all cities and sites, while the second and third-tier ISPs have been aggregated into an 'others' category. The report does, however, note individual performances where appropriate in the text.

Results for all thirteen ISPs have nevertheless been reported in each city they have been measured in. The second tier ISPs and sites measured include:

- WorldxChange (11 sites)
- MaxNet (2 sites)
- Kiwi Online (1 site)
- Inspire (3 sites)
- Compass (2 sites)
- Actrix (1 site)
- Snap (1 site)

All data in this report is gathered, processed and indexed by Epitiro. IDC New Zealand has been commissioned by Epitiro and the Commerce Commission to review the methodology and provide independent analysis of the presented data and findings.

NEW ZEALAND INDUSTRY PERFORMANCE

Overview

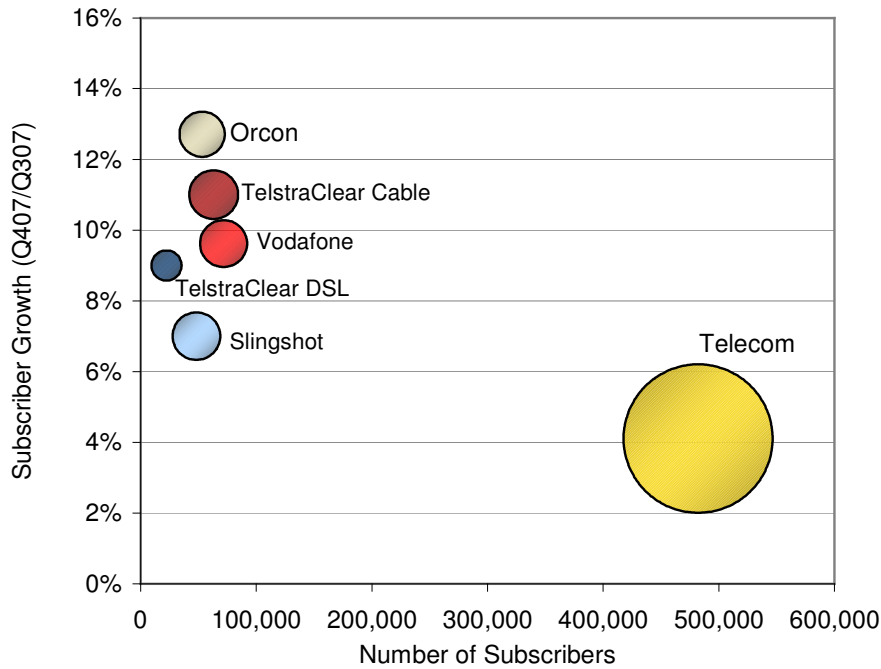
New Zealand's broadband market continues to grow strongly. In September 2007, the number of broadband subscribers exceeded dial-up customers for the first time. By December, penetration per hundred inhabitants had grown 4.4% year on year to 18.3, based on OECD data, although New Zealand is still below the OECD average of 20.

IDC's quarterly telecommunications market tracker shows that in the December and March quarters, competitive carriers acquired over 70% and 50% of new broadband connections. This led to 5.8% growth in broadband subscribers to 740,561 for the top five ISPs. However broadband revenues grew only 2.4% to NZ\$103.9 million, a reflection of the aggressive price plans and multi-play phone, broadband and mobile promotions driving market growth.

Figure 1 compares subscriber growth in the last quarter for New Zealand's five largest ISPs with total broadband subscribers. The size of the bubble denotes quarterly revenues.

FIGURE 1

ISP Snapshot (subscriber base, subscriber growth and revenue)



Note: Bubble size represents quarterly revenue

Source: IDC March 2008

As Figure 1 shows, Telecom continues to dominate the retail broadband market, with an estimated 65% subscriber market share among the top five ISPs and over 60% revenue market share. The balance of the market is relatively fragmented: TelstraClear and Vodafone hold an estimated 11.5% and 9.7% subscriber market share respectively, followed by Orcon with 7.2% and Slingshot with 6.5%.

In the March quarter, Telecom gained 48% of new broadband customers, which led to 4% subscriber growth. By contrast IDC estimates Orcon, TelstraClear Cable and Vodafone had double-digit broadband growth of between 13% and 10% over the period. TelstraClear DSL and Slingshot's broadband subscriber base grew 9% and 7% respectively.

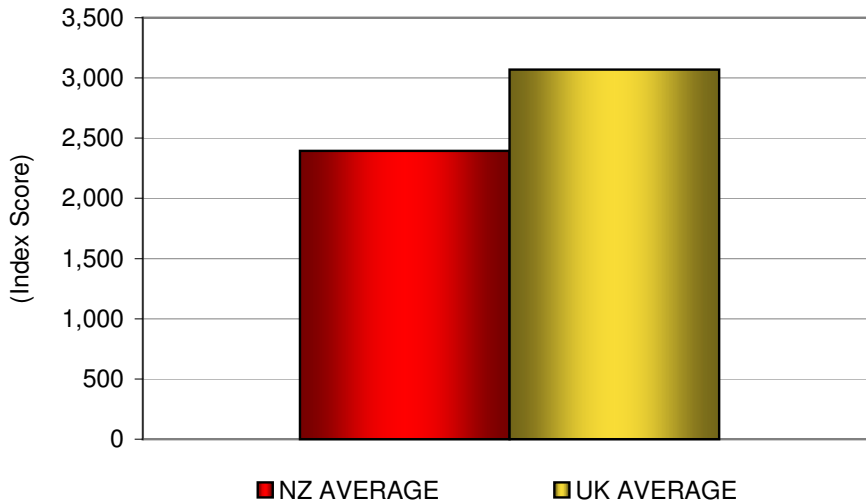
While it is difficult to attribute growth to any one event, contributing factors to this quarterly performance include publicity over Orcon's first-to-market unbundled local loop services in Auckland, Telecom's targeted strategy of migrating users from dial-up to broadband, and increasingly competitive home phone and broadband bundled offers. Vodafone recorded very strong take-up in the December quarter, underpinned by its mobile, home phone and 'free' broadband bundle, but the rate of growth slowed in the first three months of 2008.

New Zealand and the UK: broadband performance 1Q 08

New Zealand's broadband industry score for Q1 2008 is 2397, 28% behind the UK's 3070 broadband performance benchmark, based on Epitiro's UK data. This reflects the UK's more developed and competitive broadband market.

FIGURE 2

New Zealand and UK quarterly average performance



*Note: NZ score excludes email round trip for March quarter

Source: Epitiro, March 2008

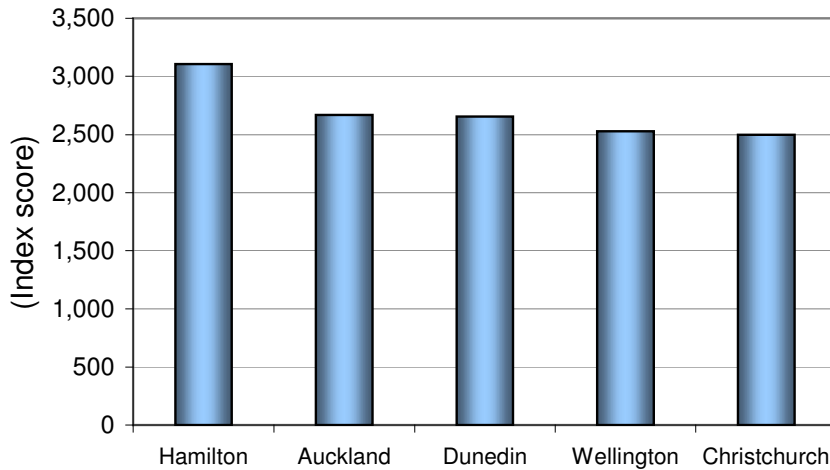
According to the UK regulator Ofcom, the number of unbundled lines in the UK was 3.7 million by December 2007 with almost all consumers having a choice of two to four broadband service providers. IDC data shows UK broadband penetration is 25.8 connections per 100 inhabitants, compared to New Zealand's 18.3, putting the UK in the mid-range of European countries. The market is highly competitive, with incumbent BT holding just over 25% retail market share compared to Telecom's 65% in New Zealand. UK Cable competition is well-established, with the largest cable provider, Virgin Broadband, holding an estimated 22% broadband market share comprising 3.3 million subscribers, compared to an estimated 8% for TelstraClear's cable network in NZ.

Industry Performance by City

Broadband performance between cities shows a considerable degree of variability. Hamilton recorded the highest average broadband score of 3107 across New Zealand's five main centres, based on the performance of seven ISPs. Hamilton's result was 16% ahead of Auckland's 2670 result and 24% higher than fifth-ranked Christchurch's, as shown in Figure 4.

FIGURE 3

Industry performance by city



Source: Epiro, March 2008

The outcome reflects Hamilton's growing broadband capability as a high-growth regional centre. Both Telecom and TelstraClear have metropolitan fibre loops, whilst the Hamilton Fibre Network (HFN) has been combined with independent local loop provider Velocity to create an open-access community network providing Metro Ethernet fibre connections across the city.

Auckland and Dunedin were neck and neck at second place in broadband performance, while Wellington and Christchurch were ranked fourth and fifth respectively with near equalized outcomes.

This results reflect, in part, the means of data collection. ISPs in Auckland, Wellington and Christchurch were assessed at three sites including suburbs, while Hamilton and Dunedin were evaluated from one central city site. This potentially boosted the scores for Hamilton and Dunedin, as the results could well reflect the shorter loop lengths, availability of fibre backhaul and the investment upgrades that go first to densely populated urban and city centres.

However, a comparison of just the central city sites of all five cities still leads to a very similar outcome. Hamilton continues to take leadership, followed by Dunedin, with Wellington and Christchurch neck and neck. Only Auckland shows a slight reduction in its comparative score.

None of the newly unbundled Auckland exchanges were measured in this March quarter. Epiro will be measuring and comparing unbundled and standard exchanges in the future.

New Zealand: the issue of relative performance and scale

The table below is a quarterly snapshot of the actual raw data generated from Epiro's testing infrastructure. The industry average, with range and variability scores, has been included to demonstrate the scale of performance variation between ISPs and the units of measurement for each performance test. As can be seen, there is a substantial degree of variability. Even where variances appear small, they may nevertheless have a marked effect on the user's experience. For

activities such as online gaming, for example, the smallest of ping time delays will impact gaming performance.

TABLE 1

NZ Industry raw data averages

	Synchroni- sation speed	Time to connect	Cached HTTP	Non- cached HTTP	Ping	DNS	Email	Packet Loss
	Kb/s	seconds	Kb/s	Kb/s	seconds	m/seconds	seconds	%
Industry average	6,403.82	1.940769	54.82629	42.51157	0.198653	103.1613	31.76	0.53%
Highest score	7,221.30	2.812	96.505	46.988	0.235571	200	48.1	0.77%
Lowest score	5,778.80	0.71	36.3	30.179	0.15	38.8	21.1	0.11%
% range	25%	296%	166%	56%	57%	415%	128%	604%

Source: EpiTiro-IDC NZ BBI Q1 08

ISP PERFORMANCE BY CITY

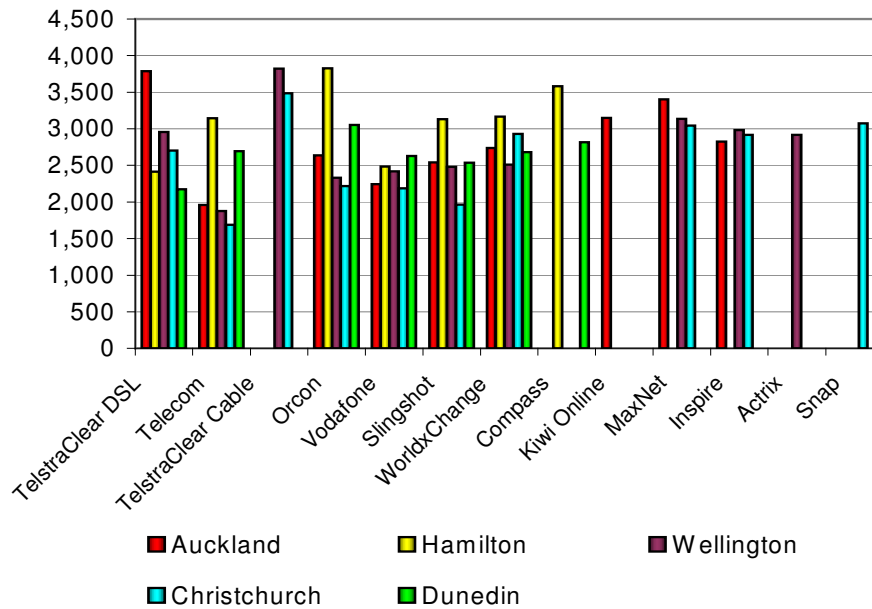
Overview of ISP performance across all city centres

The ISP performance in New Zealand's five main centres for the March Quarter provides a valuable database from which to assess the impact of network investment upgrades, cabinetisation and unbundled local loop going forward. This work had only just begun in the March quarter and was not included in the EpiTiro data.

Figure 4 aggregates all ISP results across New Zealand's five city centres. It shows that in the March quarter, TelstraClear Cable, TelstraClear DSL and Orcon recorded the top outcomes. TelstraClear took leadership in Auckland, Wellington and Christchurch where it has its own cable and DSL network, while Orcon was the top performing ISP in Hamilton and Dunedin. However both service providers had mid to below-average outcomes outside of these cities.

FIGURE 4

ISP performance between cities



Source: Epitiro 2008

Other leading ISPs achieved only average or below average results, and reported a wide variation between their highest and lowest city scores ranging from 20% (Vodafone) to 86% (Telecom).

In Auckland, Wellington and Christchurch, Telecom's results were between 26% and 32% below each city's average. However Telecom had slightly above average in Dunedin and Hamilton. Vodafone and Slingshot both achieved similar outcomes that were consistently mid-range to below average across all cities.

By contrast, the second-tier ISPs consistently outperformed the city average, occupying between two and four of the top five places in each centre. MaxNet took second place in Auckland and Wellington, Snap was number two in Christchurch and Compass was second-ranked in Hamilton and Dunedin.

These outcomes must be seen in context. Epitiro-IDC believes a key factor is that small Tier 2 ISPs have relatively uncontended networks with few users at any one time. Many have a dedicated focus on smaller higher-value audiences. By comparison, Vodafone, Telecom, Slingshot and Orcon have much larger and rapidly growing subscriber bases, leading to heavier network loading and contention. This has a particular impact on Telecom, given that it has over 60% retail broadband market share.

Another factor is that in the three main centres a number of Tier 2 ISPs were only measured at one central city site, whereas the top five ISPs were measured at three sites including suburbs.

Auckland performance

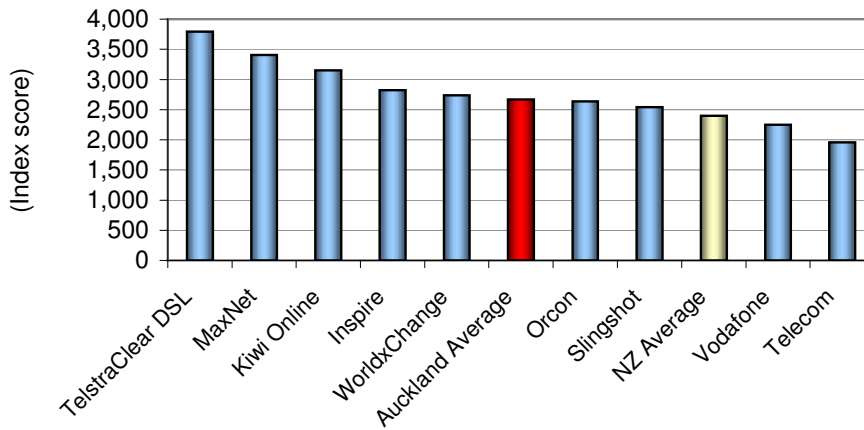
A standout feature of Auckland's broadband performance is that four of the top five ISPs were smaller, 2nd tier service providers.

While TelstraClear DSL took the lead with a score of 3790, 42% above the Auckland average, MaxNet, KiwiOnline, Inspire and WorldExchange all achieved outcomes that were up to 28% above city average.

Epitiro-IDC believes this is a direct reflection of TelstraClear's on-net DSL performance and network capability in metropolitan areas, coupled with backhaul capacity.

FIGURE 5

ISP performance in Auckland



Source: Epitiro, March 2008

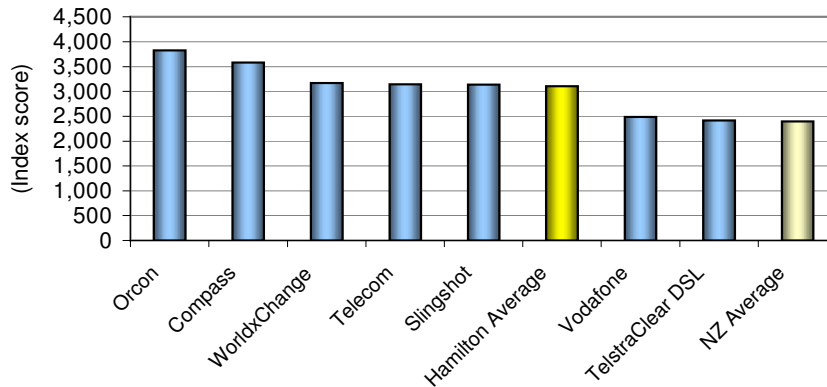
WorldxChange, Orcon and Slingshot all achieved similar mid-range outcomes, while Vodafone and Telecom achieved the lowest scores among the DSL providers. However Telecom, Vodafone, Slingshot and TelstraClear are all upgrading their networks to ADSL2+ technology, unbundling local loops, installing new fibre-fed cabinets and improving backhaul capability at key Auckland sites. This will begin to take effect over the balance of the year.

Hamilton performance

Hamilton's broadband leadership in the March quarter reflects a stronger ISP performance across the board, with the city average 30% above the NZ average.

FIGURE 6

ISP performance in Hamilton



Source: Epitiro, March 2008

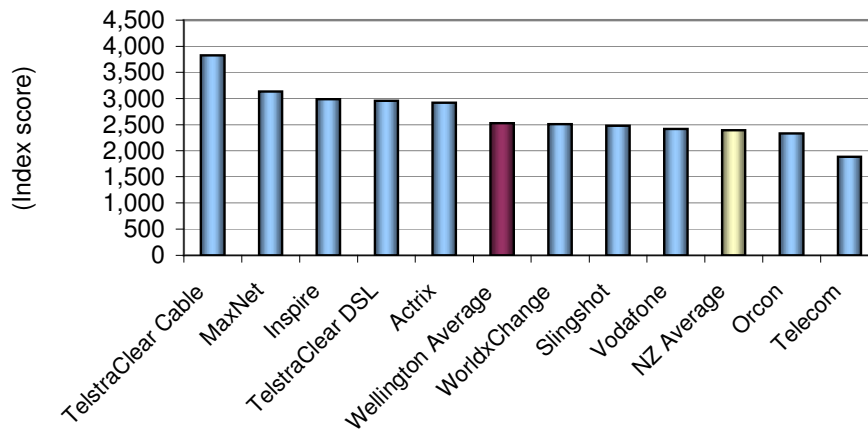
Orcon achieved the highest score at 3828, followed by Compass at 3580. WorldxChange, Telecom and Slingshot achieved near equalized scores, followed by Vodafone. However, in a reversal from its Auckland result, TelstraClear DSL achieved the lowest outcome, which was 22% below the city average.

Wellington performance

Wellington's broadband performance showed a similar pattern to Auckland: TelstraClear and the second tier ISPs, MaxNet, Inspire and Actrix, all occupied the top five places.

FIGURE 7

ISP performance in Wellington



Source: Epitiro, March 2008

TelstraClear's cable network achieved clear leadership with a score of 3827, 51% above the Wellington average. TelstraClear says it now has 56% broadband market share in Wellington, up from 35% two years ago, and is planning to upgrade its cable network from 10Mbps to 24Mbps mid year.

MaxNet took second place, followed closely by Inspire, TelstraClear DSL and Actrix with scores 15% to 24% above the city average.

There were relatively small variations in the performance outcomes for Slingshot, Vodafone and Orcon. However Telecom's result was 26% below the Wellington average making it the poorest performing of the Top 5 ISPs.

Christchurch performance

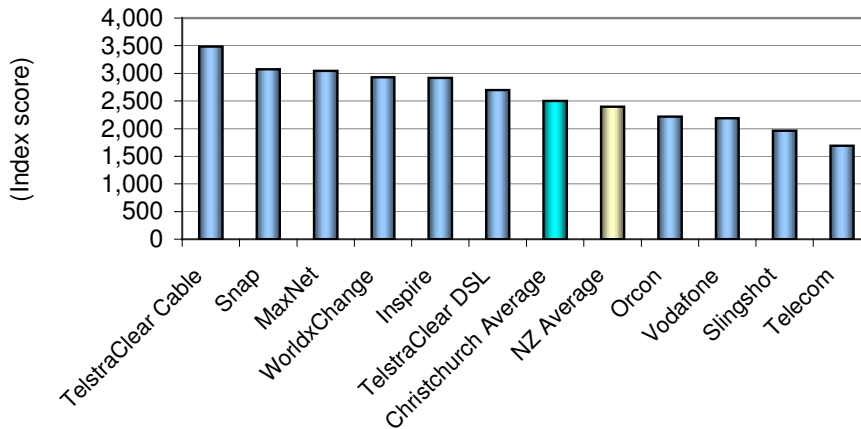
In Christchurch, TelstraClear Cable scored the top result of 3484, 13% ahead of the second-placed ISP Snap and 40% above the Christchurch average.

However, of the DSL players, it was the 2nd Tier ISPs that outperformed the market, with Snap, MaxNet, Inspire and WorldxChange consecutively achieving scores 17% to 23% above the city average, putting them ahead of TelstraClear DSL which took sixth place.

By contrast, the mainstream DSL ISPs scored below average outcomes, ranging in order from Orcon to Vodafone, Slingshot and Telecom.

FIGURE 8

ISP performance in Christchurch



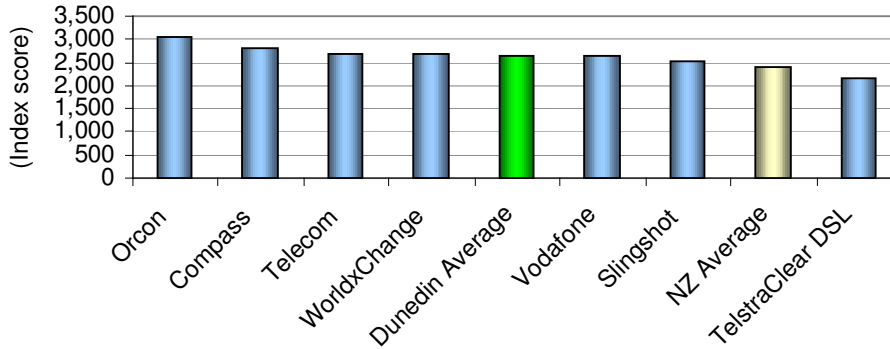
Source: Epitiro, March 2008

Dunedin performance

In Dunedin, the variation in performance outcomes across ISPs was relatively narrow in comparison to other cities.

FIGURE 9

ISP performance in Dunedin



Source: EpiTiro, March 2008

Orcon achieved the highest index score of 3053, 22% above the city average, followed by Compass at 2816.

Telecom, WorldxChange, and Vodafone were next in order with very close performance ratings, followed by Slingshot. However TelstraClear's DSL result in Dunedin was 13% below the city average.

ISP BROADBAND RATINGS BY KEY PERFORMANCE VARIABLES

Overview

Internet Service Providers have the capability to shape but not dictate the end user's broadband experience. Connection speed and throughput can depend as much on the customer's equipment and wiring, their distance from the exchange, and the number of users sharing the same bandwidth (known as 'contention'), as much as the broadband technology, quality and availability of backhaul and international capacity. Consequently ISP performance ratings on EpiTiro's key metrics will have been influenced by whether they control or wholesale all or a portion of the network, the availability of cost-effective backhaul, the size and geographic nature of their user base, and their ability to selectively invest to deliver targeted outcomes.

TelstraClear Cable consistently demonstrated the strongest performance across the four out of six key performance variables it was measured against, exceeding the industry average for time-to-connect by 39%, for cached HTTP by 41% and non-cached HTTP by 22%.

TelstraClear's cable modem service offers higher levels of bandwidth than currently available on DSL. Consumer services range from 2Mbps to 10Mbps, with plans to upgrade to 25Mbps. As with DSL, the level of contention affects cable performance, including the number of users online at any one time, the amount of traffic and usage patterns. Nevertheless TelstraClear's cable network, while experiencing strong subscriber base, remains a relatively uncontended network

that is further supported by TelstraClear's fibre backhaul and trunk networking capability.

TelstraClear was also the leading DSL performer, followed closely by Orcon. TelstraClear's DSL performance was between 6% and 14% better than the industry average across five measures - synchronisation speed, time-to-connect, cached HTTP and email round trip. However this varied between cities – stronger results in the three main centres were not matched in Hamilton and Dunedin, reflecting the poorer performance of its "Off-Net" services measured in those cities.

Orcon achieved a strong score across DNS, non-cached HTTP and ping, but this was offset by a lower email round trip score. Brief but frequent and very high spikes in Orcon's email delivery times negatively affected its score.

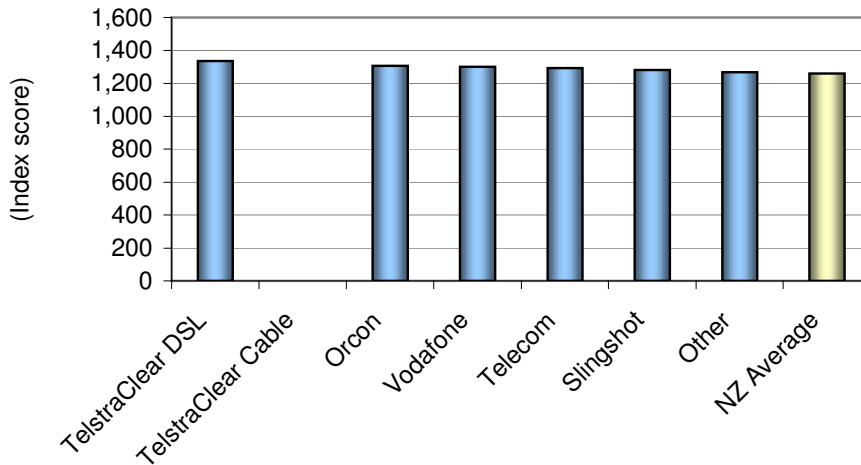
Telecom, Vodafone and Slingshot produced very similar results across most metrics. Telecom achieved a marginally better score on time-to-connect, while Slingshot was ahead on DNS and Vodafone on email round trip.

Synchronisation speed

Line synchronisation speed is the speed reported by the modem after connection to the ISP has been initiated. It represents an upper limit on the customer's experience of broadband speed, although sustained data rates are often slower than the synchronisation speed.

FIGURE 10

ISP performance: synchronisation speed



Note: 'Other' category includes ISPs Actrix, Compass, Inspire, MaxNet, Snap, WorldxChange, Woosh Wireless Broadband. Synchronisation speed is not captured with cable technologies or DSL PPPoE .

Source: Epitiro, March 2008

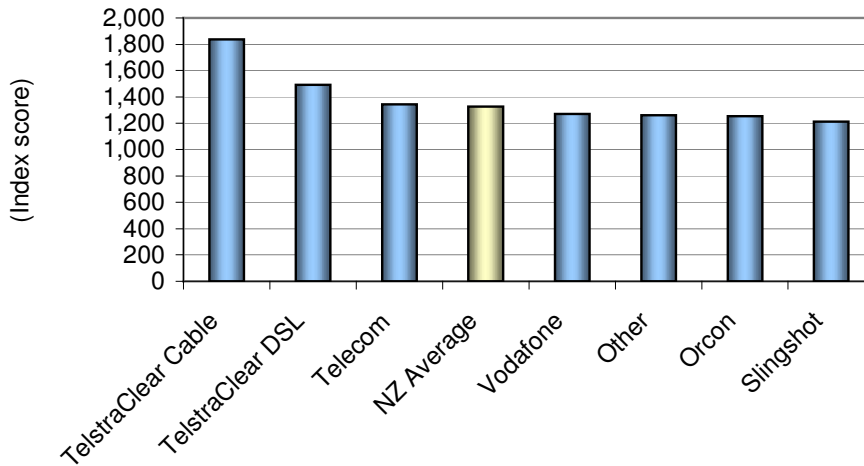
Most ISPs performed within a similar range on synchronization speed, with the variation in ISP scores a narrow 5%. TelstraClear DSL achieved the highest synchronisation speed score of 1335, 6% higher than the New Zealand average, closely followed by Orcon at 1306 and Vodafone at 1300. TelstraClear's DSL results potentially reflect its backhaul and fibre capability, and also the shorter on-net DSL copper loops.

Time-to-connect results

Time-to-connect is the time that a user waits for an ISP to recognize a log-in request and to set up a network connection. TelstraClear Cable achieved the highest time-to-connect score at 1839 - 39% higher than the industry average - followed by TelstraClear DSL at 1493 and Telecom at 1344. The slowest connection time results were recorded by Slingshot and the 'other' category, which aggregates second tier ISPs. However there was considerable variation among the other second tier ISPs. Snap would have been ranked third with a time-to-connect score of 1361, ahead of Telecom.

FIGURE 11

ISP performance: time to connect



Note: 'Other' category includes ISPs Actrix, Compass, Inspire, MaxNet, Snap, WorldxChange, Woosh Wireless Broadband

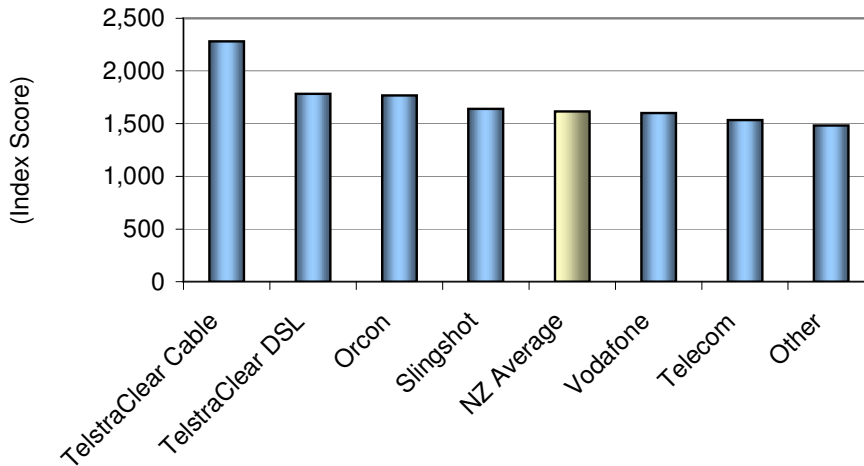
Source: Epitiro, March 2008

Cached HTTP performance

The speed test for cached HTTP replicates the user's experience in browsing content that is stored or 'cached' by ISPs on New Zealand-based servers. It measures how quickly an ISP can distribute content over the New Zealand portion of their network by testing how fast specific web pages are downloaded. Performance is affected by network contention, or the number of users and data-type sought at any one time.

FIGURE 12

ISP performance: cached HTTP



Note: 'Other' category includes ISPs Actrix, Compass, Inspire, MaxNet, Snap, WorldxChange, Woosh Wireless Broadband.

Source: Epitiro, March 2008

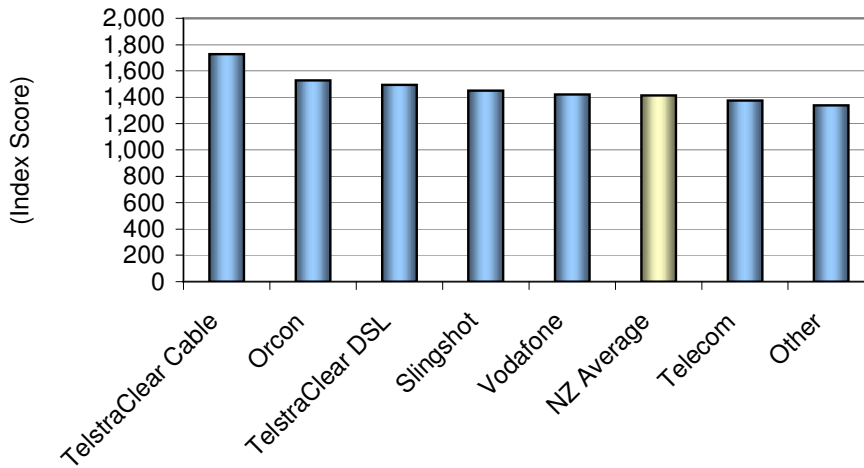
This test produced a relatively wider variety of results. TelstraClear Cable achieved the highest score of 2280, 28% ahead of TelstraClear DSL at 1785. Orcon took third position with 1768. At the other end of the Index, Telecom, Vodafone and the 'Others' category scored below average outcomes of between 1481 and 1601, up to 54% behind TelstraClear Cable's result.

Non-cached HTTP performance

Non-cached HTTP download speed is the best reflection of the speed of general web browsing of local and international sites experienced by consumers. TelstraClear Cable and Orcon reported the highest index outcomes, scoring 22% and 6% above the industry average respectively, followed by TelstraClear DSL and Slingshot. However Telecom and the 'other' ISP grouping scored 3% and 5% below average industry results. Within the 2nd tier carriers, Compass achieved the highest outcome at 1425, putting it on a par with Vodafone, but the aggregated result was reduced due to lower scores from a number of second tier ISPs.

FIGURE 13

ISP performance: non-Cached HTTP



Note: 'Other' category includes ISPs Actrix, Compass, Inspire, MaxNet, Snap, WorldxChange, Woosh Wireless Broadband

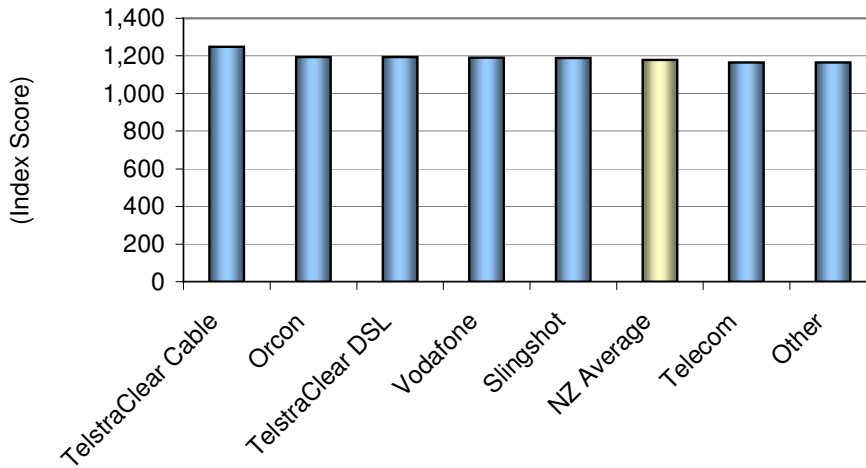
Source: Epitiro, March 2008

Ping time

The ping time average is a measure of how quickly the ISP's network can respond to a request. A 'ping' is the time taken for a terminal on the Internet to send a request to a remote server and for that server to respond with an acknowledgement, so it is also a measure of latency. In essence, shorter ping times are desirable for high-speed interactions such as gaming – the lower the ping time, the more enjoyable the gaming experience.

FIGURE 14

ISP performance: ping



Note: 'Other' category includes ISPs Actrix, Compass, Inspire, MaxNet, Snap, WorldxChange, Woosh Wireless Broadband

Source: Epitiro, March 2008

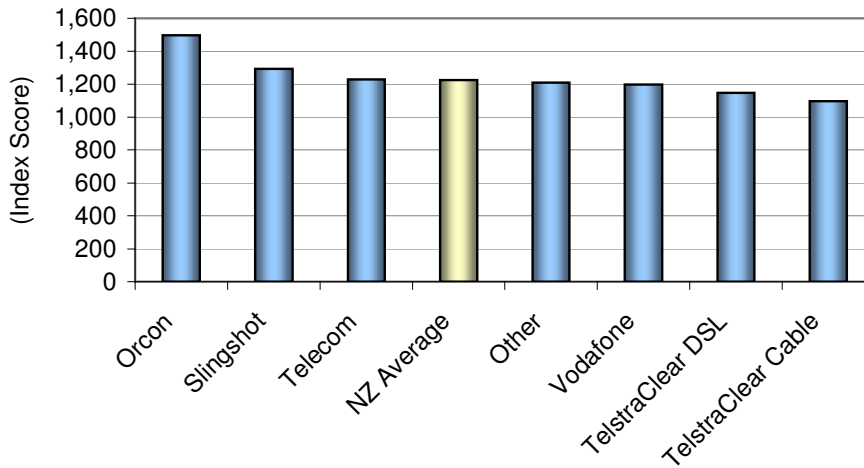
There was little ping variation across ISPs, with a 6% range from highest to lowest index score. TelstraClear Cable emerged with a marginally better outcome at 1248, 5% above the industry average, followed by Orcon and TelstraClear DSL at 1194 and 1193 respectively. Of the large ISPs, Telecom achieved the lowest outcome at 1193.

Domain Name Server (DNS) Response Times

A Domain Name Server (DNS) response time measure is a reflection of how quickly a domain name can be resolved into a corresponding IP address, making it a key measure of a user's experience in retrieving hyperlinked addresses or browsing websites. When an application makes a request requiring a DNS lookup, requests will generally be managed within the local ISP's network, with recently accessed or popular DNS results cached locally.

FIGURE 15

ISP performance: DNS



Note: 'Other' category includes ISPs Actrix, Compass, Inspire, MaxNet, Snap, WorldxChange, Woosh Wireless Broadband

Source: Epitiro, March 2008

On the DNS measure, Orcon achieved an indexed score 22% higher than the industry average and 16% higher than Slingshot, which achieved the second highest DNS outcome. Slingshot was followed by Telecom and Vodafone. By contrast, TelstraClear DSL and Cable scored 6% and 11% lower than the industry DNS average.

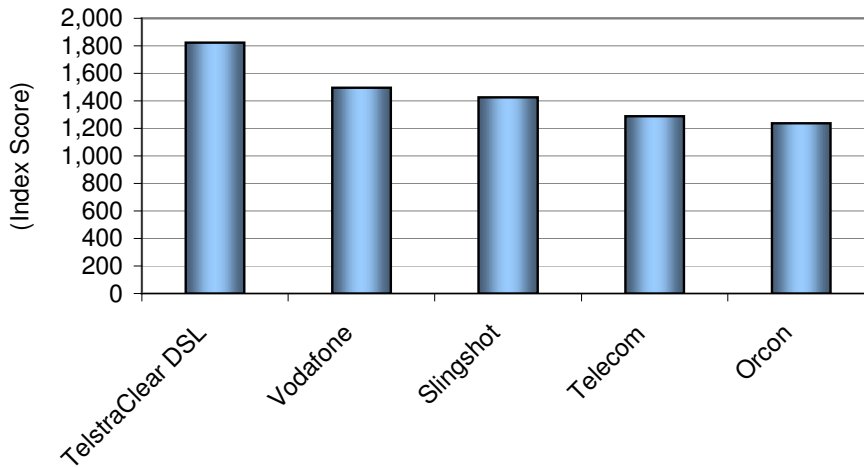
Email round trip

The Email roundtrip time test measures the time that it takes for an email to be sent over the Internet using the ISP's mail servers. If these servers are busy then they may take a longer time to send a message – consequently a shorter time provides a better experience.

In the March quarter, email round trip was measured over a shorter time period, due to technical difficulties with the Yahoo!Xtra bubble platform. While these have been resolved, the result was that email was only measured in the main centres, and did not include results for TelstraClear Cable or 2nd tier ISPs.

FIGURE 16

ISP performance: email round trip



Note, does not include TelstraClear Cable, or 'others'. Data is incomplete

Source: EpiTiro, March 2008

On the email round trip, TelstraClear DSL achieved the highest index outcome of 1823, 42% ahead of Telecom, followed by Vodafone and Slingshot at 1495 and 1425 respectively, then Telecom and Orcon.

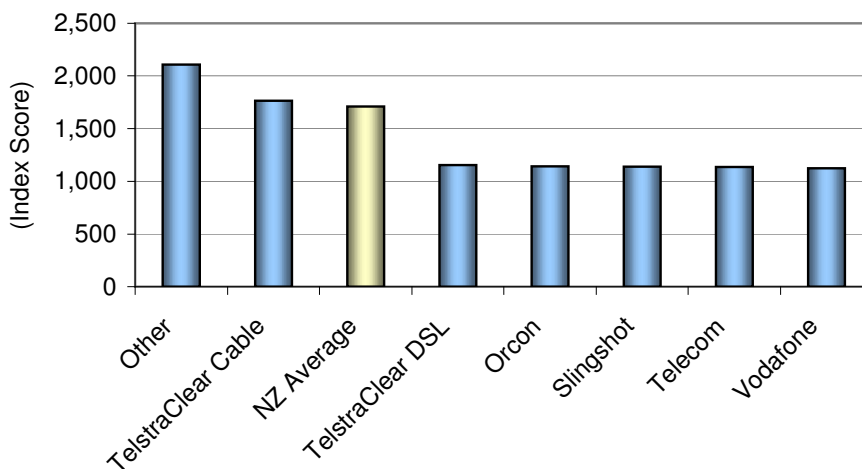
Orcon's email performance offset otherwise strong results on other key performance variables.

Packet loss performance

Packet loss is an important metric in evaluating the performance of streaming video and Internet telephony. The Internet transmits information as a string of packets, which are sent to a destination often via different paths. One of the hazards they face is that they may be lost, and if they are lost then they have to be resent, resulting in a delay in the transmitted material becoming visible to the user. Packets get lost if a network is busy; consequently a lower rate of lost packets is better. Significant packet loss results in substantial user irritation as it diminishes the voice quality of phone calls over the Internet and causes online video to stall and buffer.

FIGURE 17

ISP Performance: Packet Loss



Note: 'Other' category includes ISPs Actrix, Compass, Inspire, MaxNet, Snap, WorldxChange, Woosh Wireless Broadband

Source: Epitiro, March 2008

Second tier ISP's in the 'Others' group achieved the highest collective score on packet loss at 2110, 23% above the industry average and 20% ahead of TelstraClear Cable, which was ranked second on packet loss. This reflected particularly strong packet loss performances from business ISP MaxNet, Christchurch-based Snap, and Compass, which each scored between 33% and 78% above the industry average. Epitiro-IDC believes this reflects, in part, the focus by smaller residential ISPs on the early adopter and technically savvy market, including online gamers. These users, while highly demanding in terms of performance, can also grow an ISP's business via word of mouth and require less by way of initial set-up support.

Among the Tier 1 ADSL ISPs, performance was almost identical, with only a 1% variation in packet loss scores.

CONCLUSIONS

New Zealand's broadband environment is on the cusp of enormous transition, driven by new infrastructure investment, new technologies and new services. However this has yet to be fully reflected in the end user's experiences. The best-performing ISPs are not those with the greatest growth or market share – indeed three of the largest ISPs, Telecom, Vodafone and Slingshot, achieved only average to below average results on both geographic and key performance metrics, although all are currently implementing large scale investment programmes. TelstraClear's broadband continues to benefit from its cable technologies and relatively modern, underutilized fibre and DSL infrastructure.

Of the mainstream ISPs wholesaling Telecoms services, Orcon has achieved consistently high results this quarter, which was only offset by a weaker email outcome. And on a city and regional basis, it is smaller ISPs, namely MaxNet, Inspire, Snap, WorldxChange and Compass, that have produced some of the strongest results.

Going forward, we expect to see considerable change and some volatility in key performance, service and geographic outcomes. As a result the New Zealand Broadband Index will evolve to compare results on a rolling quarterly basis. EpiTiro and IDC will evaluate both bundled and unbundled local loop performance, and the customer's experience from their equipment in the home. The Index will also increasingly provide qualitative insight into ISP investment plans and outcomes, providing the picture behind the data.