Measuring Broadband

New Zealand

Summer Report, March 2022

In 2018, the Commerce Commission appointed SamKnows to measure New Zealand's internet performance. The programme, called Measuring Broadband New Zealand, gives internet users in New Zealand access to the SamKnows platform to measure the quality of their fixed-line internet. The aim of the programme is to increase transparency about actual in-home broadband performance and provide consumers with independent information about internet performance across different providers, plans, and technologies, to help them choose the best broadband for their homes. It will also encourage providers to improve and compete on their performance.

This report provides an overview of the findings from data collected between 1st December and 31st December 2021.

Contents

Overview

This report presents the most recent key indicators of consumer internet performance in New Zealand from testing during December 2021.

Highlights include:

1. Continued monitoring of the largest providers and plans, including Fibre 300 for the first time.

2. Monitoring of latency under load as well as 16 popular video game latencies.

The last report (https://comcom.govt.nz/__data/assets/pdf_file/0026/271961/MBNZ-Spring-Report-2021-01-December-2021.pdf), published on 1st December 2021, presented an analysis of latency under load on top of continuing to benchmark performance for all the main RSPs and Fibre plans.

Previous reports in this series have examined topics including internet performance during online broadcasts of the Rugby World Cup 2020, internet performance following New Zealand's Level 4 Alert in response to COVID-19, and how many people in a household can watch Netflix at the same time.

Other reports released by the Measuring Broadband New Zealand (MBNZ) programme can be found here: https://comcom.govt.nz/regulated-industries/telecommunications/monitoring-the-telecommunications-market/monitoring-new-zealands-broadband/Reports-from-Measuring-Broadband-New-Zealand

The MBNZ project has a code of conduct, the purpose of which is to ensure that parties involved in the MBNZ programme act in good faith and in accordance with principles relating to data validation, 'gaming' of results, and appropriate public usage of the MBNZ results. A list of signatories is included in the code, including the Commission and SamKnows. All tested RSPs complied with the code of conduct, including validation of data for this report. You can see the code of conduct on our website: https://comcom.govt.nz/regulated-industries/telecommunications/monitoring-the-telecommunications-market/monitoring-new-zealands-broadband

The MBNZ programme currently tests eight RSPs (Trustpower, Orcon, Slingshot, MyRepublic, Skinny, 2degrees, Vodafone and Spark) who between them provide broadband services for 95% of the market and pay the Telecommunications Development Levy (TDL). There are a range of other RSPs who are not included in the testing for consumers to choose from and we encourage Kiwis to shop around.

Executive Summary

Benchmarking

1. All main download/upload results are stable against the previous reporting period, with the exception of Hybrid Fibre-Coaxial (HFC) Max. During December, the majority of Fibre 100 plans have been upgraded to Fibre 300 for customers on Chorus, Tuatahi Fibre and Enable networks[1]. This report includes the Fibre 300 plan for the first time and the results will be used as a benchmark for the next report.

2. Hybrid Fibre-Coaxial (HFC) Max has seen a large increase in download speeds compared to the previous reporting period. The previous drop in performance in September was raised with Vodafone who have made network changes and average download speeds are now higher than the levels seen in the Winter 2021 report for HFC Max plans. Since these changes were made, idle latency for HFC Max has doubled compared to the previous reporting period.[2]

3. Latency under load testing continues to show that ADSL and Fixed Wireless plans both see a large increase latency when the line is in use, especially under upstream load. Fibre plans are less impacted, with Fibre Max showing only a very small increase in latency compared to idle latency values.

Application Performance

1. Over 99% of Fibre 300, Fibre Max and HFC Max plans were all able to stream 4 simultaneous UHD Netflix streams. Only VDSL plans were unable to stream 1 UHD Netflix stream for over 90% of households.

2. Snapchat Image latencies have decreased from the previous report. All other social media latencies remain consistent with those measured in September.

3. Online Gaming results are broadly consistent for all of the 16 games included in the previous report.

4. Video Conferencing results were consistent with those seen in previous reports, with the Fibre 300 plan seeing average latency results similar to the Fibre 100 plan in the previous quarter. Video Conferencing performance charts have been omitted from this report.

[1] https://company.chorus.co.nz/600000-kiwi-homes-and-businesses-able-benefit-chorus-300mbps-fibre-upgrade

[2] The increase in latency for HFC Max panelists seen in this report is due to Vodafone implementing some temporary network changes as part of ongoing efforts to improve throughput performance. Once this work is complete traffic will be routed back through Wellington, which will likely see a reduction in latency. It should be noted that the increase in latency is unlikely to have any discernible impact on end user's experience.

Package Comparison

ADSL

Remains suitable for traditional services like web browsing, email, and basic video streaming, particularly when there's only one person using the connection. Due to physical limitations, the highest-performing ADSL lines will never achieve download speeds higher than ~25 Mbps. The distance from house to exchange has a big effect on attainable speeds, with most ADSL lines in New Zealand averaging under 8 Mbps download. The higher latency, more frequent dropouts, and lower upload speeds make ADSL less suitable for video calls and multi-user households.

VDSL

There is a range in performance: some lines will achieve download/upload speeds indistinguishable from ADSL, whereas a small proportion of lines will achieve speeds comparable with Fibre 100, and certainly with lower speed Fibre plans. Lower speed lines will be less suitable for applications that use a lot of data, such as video conferencing and Ultra High Definition streaming, whereas higher speed lines will generally support more data-heavy applications.

Fibre 300

Supports latency-sensitive applications such as online gaming. Fibre 300 will also support data-heavy applications such as Ultra High Definition streaming with multiple concurrent users or video conferences with a large number of participants. Fibre 300 will cover most users' requirements.

Fibre Max[3]

Higher download and upload speeds than Fibre 300. The latency to internet applications, such as online games, through a Fibre Max line is the same as through any other Fibre package. Performance varies depending on RSP. Fibre 300 will support all modern internet applications and multi-user households, so Fibre Max is still only recommended in cases where there is a genuine need for more bandwidth e.g. frequently uploading or downloading large files.

Cable

Available in some areas (Wellington, Upper & Lower Hutt, the Kapiti Coast, and parts of Christchurch). Cable is also referred to as HFC and DOCSIS. Vodafone is the only provider operating a Cable network in New Zealand. Two plans are available: UltraFast HFC Max and UltraFast HFC 200. Due to the limited coverage of the Cable network, MBNZ doesn't collect enough data to formally report on the performance of the UltraFast HFC 200 plan.

[3] All references to Fibre Max in this report encompass packages derived from 'gigabit' wholesale products, in particular: 2degrees' Ultimate, MyRepublic's Fibre Pro/Gamer Pro, Orcon and Slingshot's Gigantic Fibre, Spark's Fibre Max, Trustpower's Fibre Max, and Vodafone's Fibre Max packages.

Fixed Wireless (4G)

Can offer higher download speeds than ADSL, but on average slower speeds than VDSL. Users also experience higher latencies due to the cellular technology underlying these plans. Fixed Wireless has the highest latency of all technologies apart from Satellite (not currently reported on by MBNZ). Fixed Wireless also delivers lower download/upload speeds and more frequent dropouts than Fibre. This range of performance factors means that Fixed Wireless should not be preferred to Fibre on performance grounds however often Fixed Wireless is the only option to consumers in remote areas. 5G Fixed Wireless plans (not currently reported on by MBNZ) are at present only available in limited areas, but would offer higher bandwidth than existing 4G plans.

Other packages

There are other packages available, such as Fibre 30, Fibre 50, Fibre 100, Fibre 200, HFC 200, and satellite packages. Since Measuring Broadband New Zealand collects less data on these packages it is not possible to give any firm advice around their suitability for different applications at this stage.

Speed Tests - Download

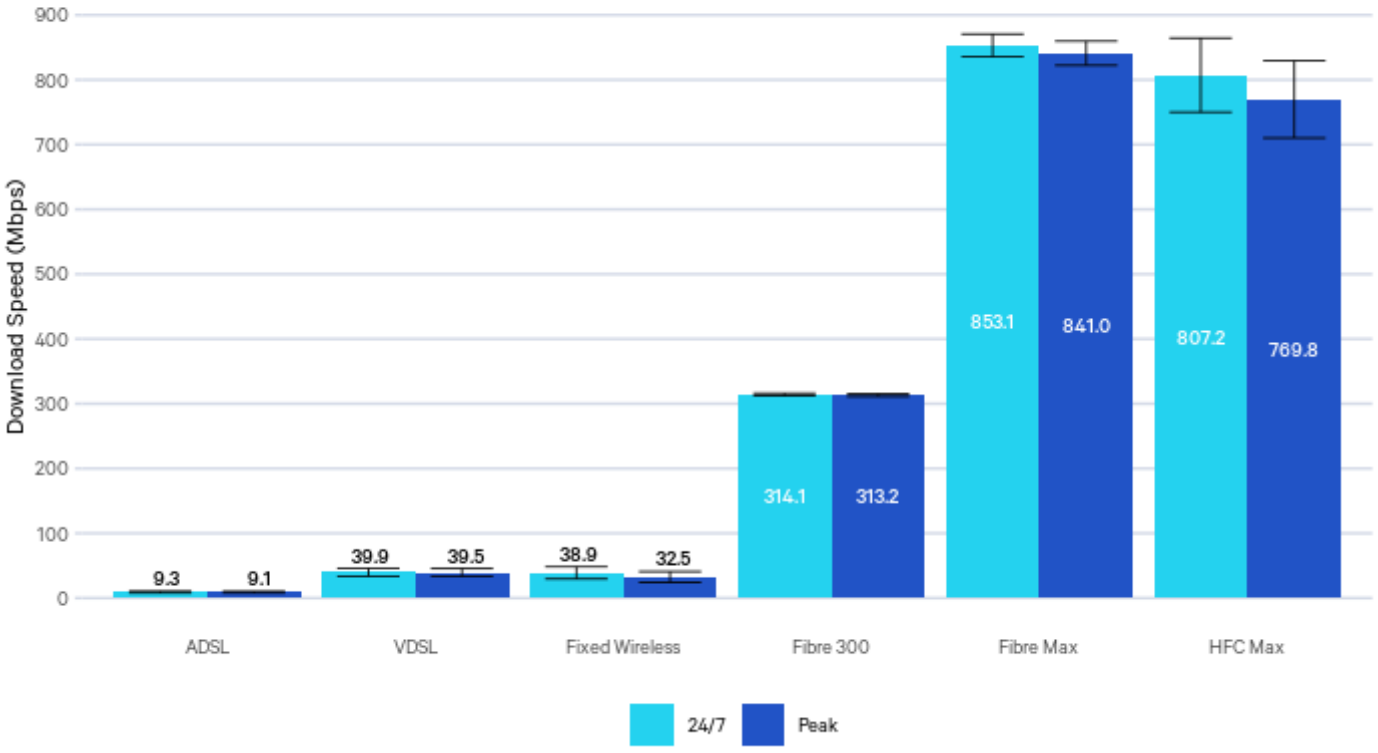
Figures 1 and 2 give an overview of download and upload speed across the country. These are included in every report in order to provide a benchmark that can be tracked over time.

Peak hours are the times when people typically use the internet; in New Zealand this is 7pm to 11pm on Monday-Friday.

Figure 1

Average Download Speeds by Plan

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm. Error bars show 95% confidence intervals of the mean.



These results are shown with error bars representing the 95% confidence interval for each plan's average speed. If we had repeated our measurements 100 times, we would expect average speeds to have fallen within the black bands in at least 95 cases. Other graphs throughout the report display similar confidence intervals, which carry the same interpretation.

Key Observations

- The majority of Fibre 100/20 plans have been upgraded to Fibre 300/100 during the month of December for most customers on Chorus, Tuatahi and Enable networks. Average download speeds for the Fibre 100 plan in September were 100.9 Mbps.
- The average download speeds of HFC Max saw an increase of over 120% in performance compared with that seen in the previous report, with average download speeds increasing from 354.7 Mbps in September to 807.2 Mbps Mbps in December.[4] The previous drop in performance in September was raised with Vodafone who have made network changes. Average download speeds are now higher than the levels seen in the Winter 2021 report for HFC Max plans.
- ADSL, VDSL and Fixed Wireless plans have seen small increases in download speed compared to the previous report. These changes are unlikely to be noticeable for the majority of consumers.
- Fibre Max plans have seen an increase in download speeds, especially during peak times compared to the previous report. Average peak download speeds have increased from 807.3 Mbps in September to 841 Mbps Mbps in December.
- During September, a number of areas of New Zealand were placed into high COVID-19 alert levels which likely resulted in a fall in download speeds for Fibre Max plans compared to the Winter 2021 report. As these restrictions have been lifted, average download speeds for Fibre Max plans in December have returned to those seen prior to restrictions being imposed, as seen in the Winter 2021 report.

[4] Results for HFC Max are based on a sample size of 25 Whiteboxes. This accounts for the wider confidence intervals for HFC Max results. Since 25 is lower than the usual minimum used in reporting, we should caveat that the results may not be representative of all HFC Max connections. The low sample size can be attributed to the relatively small coverage area of Vodafone's Cable network and the competing influence of Copper, Fibre and Fixed Wireless in those areas.

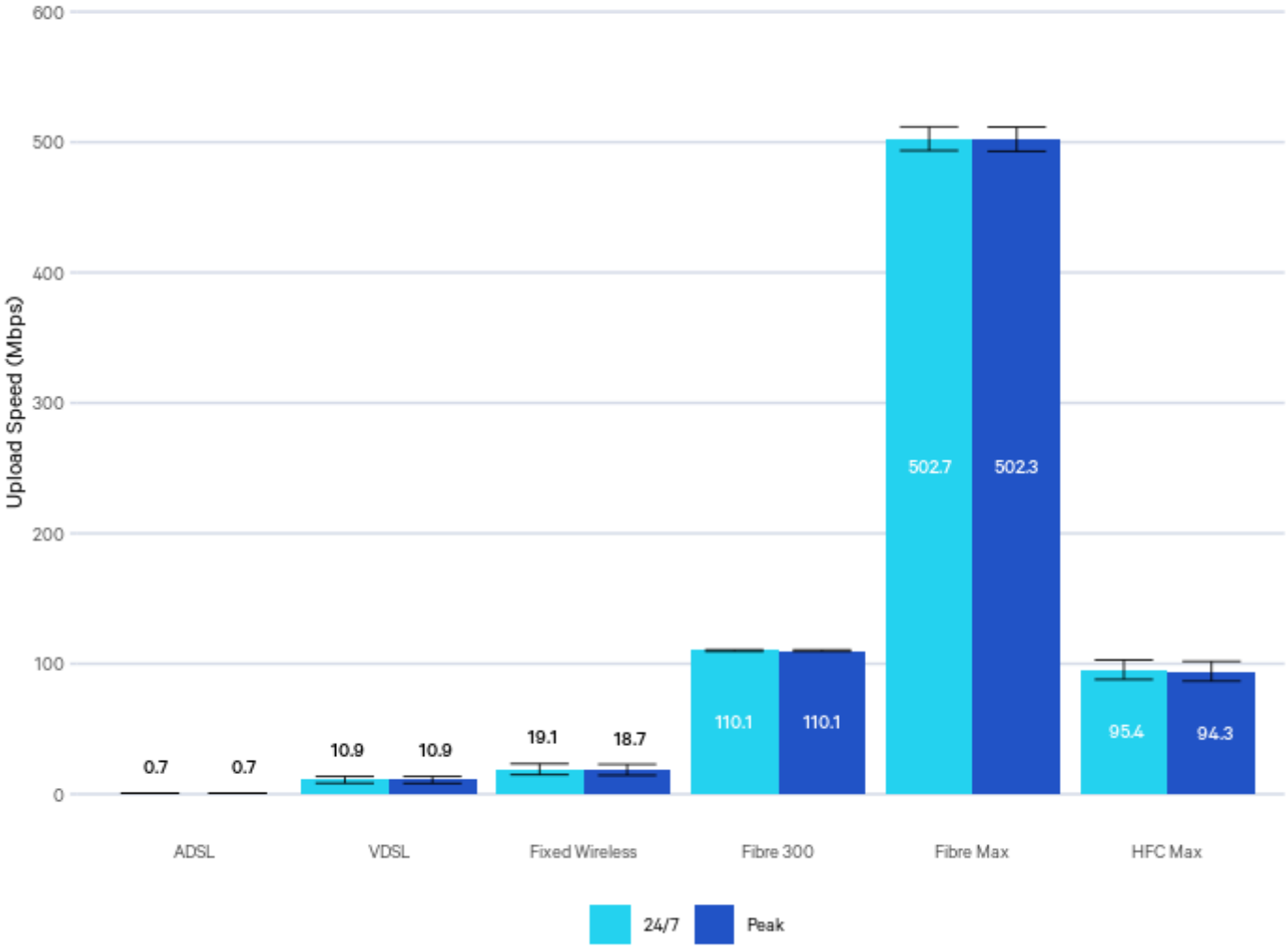
Speed Tests - Upload

Upload speeds should be considered alongside download speeds. The main applications where the impact of upload speed is apparent are file transfers and video conferencing. For example, a lower upload speed will mean that it takes longer for files to sync or email attachments to be applied.

Figure 2

Average Upload Speeds by Plan

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm.
Error bars show 95% confidence intervals of the mean.



Key Observations

- The average upload speeds for are consistent with those seen in the previous report for all plans.
- It is not possible to compare upload speeds for the Fibre 300/100 plan to the previous report as the majority of volunteers were upgraded from the Fibre 100/20 plan at the beginning of December. Average upload speeds for the Fibre 100/20 plan in September were 22.4 Mbps.

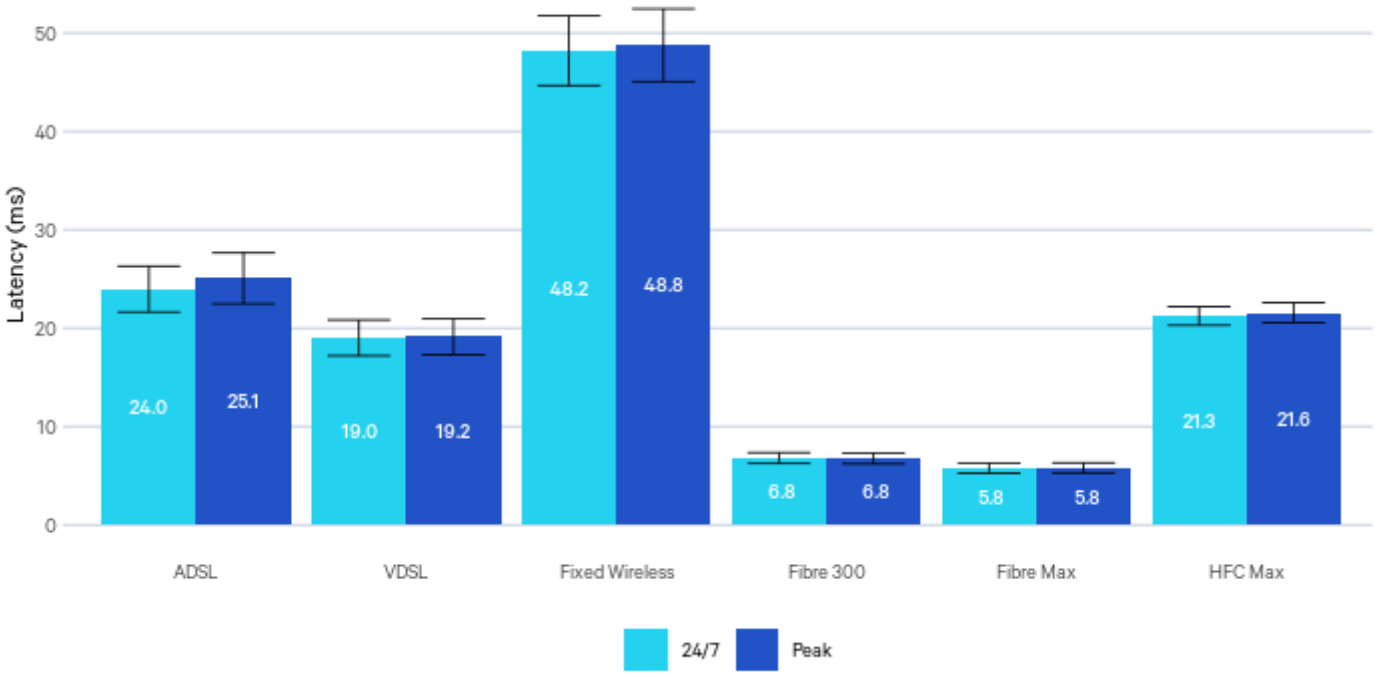
Latency

Latency is another key factor that should be considered when assessing broadband performance (this chart only includes results to servers hosted in New Zealand). The time it takes to transmit and receive messages between household and server limits the responsiveness of realtime applications such as interactive webpages or video calls. Higher baseline latency makes realtime applications more vulnerable to jitter (also known as packet delay variation) and dropouts.

Figure 3

Average Latency to Test Servers by Plan. Lower is better.

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm.
Error bars show 95% confidence intervals of the mean.



Some plans show a wider variation of latency than others: latency across a Fixed Wireless connection will generally be more variable than over a Fibre line. These ranges have been reported explicitly in previous reports.

Key Observations

- Latency over Fixed Wireless is higher than over Copper (ADSL VDSL), Cable, or Fibre. Fibre is faster due to both the lower latency over fibre optics and to the more recent infrastructure that underpins the Fibre network.
- Cable connections have a higher latency than Fibre on average, but the difference is not so great as to have an effect on most realtime applications.
- There is no material difference in latency across different Fibre plans, since latency is independent of bandwidth. A Fibre Max plan will not necessarily result in more responsive performance of interactive applications than a Fibre 300 plan.
- The average latency values across plans are consistent with those seen in the previous report with the exception of HFC Max. Latency values for HFC Max have increased by around 66% compared to September.[5]

[5] The increase in latency for HFC Max panelists seen in this report is due to Vodafone implementing some temporary network changes as part of ongoing efforts to improve throughput performance. Once this work is complete traffic will be routed back through Wellington, which will likely see a reduction in latency. It should be noted that the increase in latency is unlikely to have any discernible impact on end user's experience.

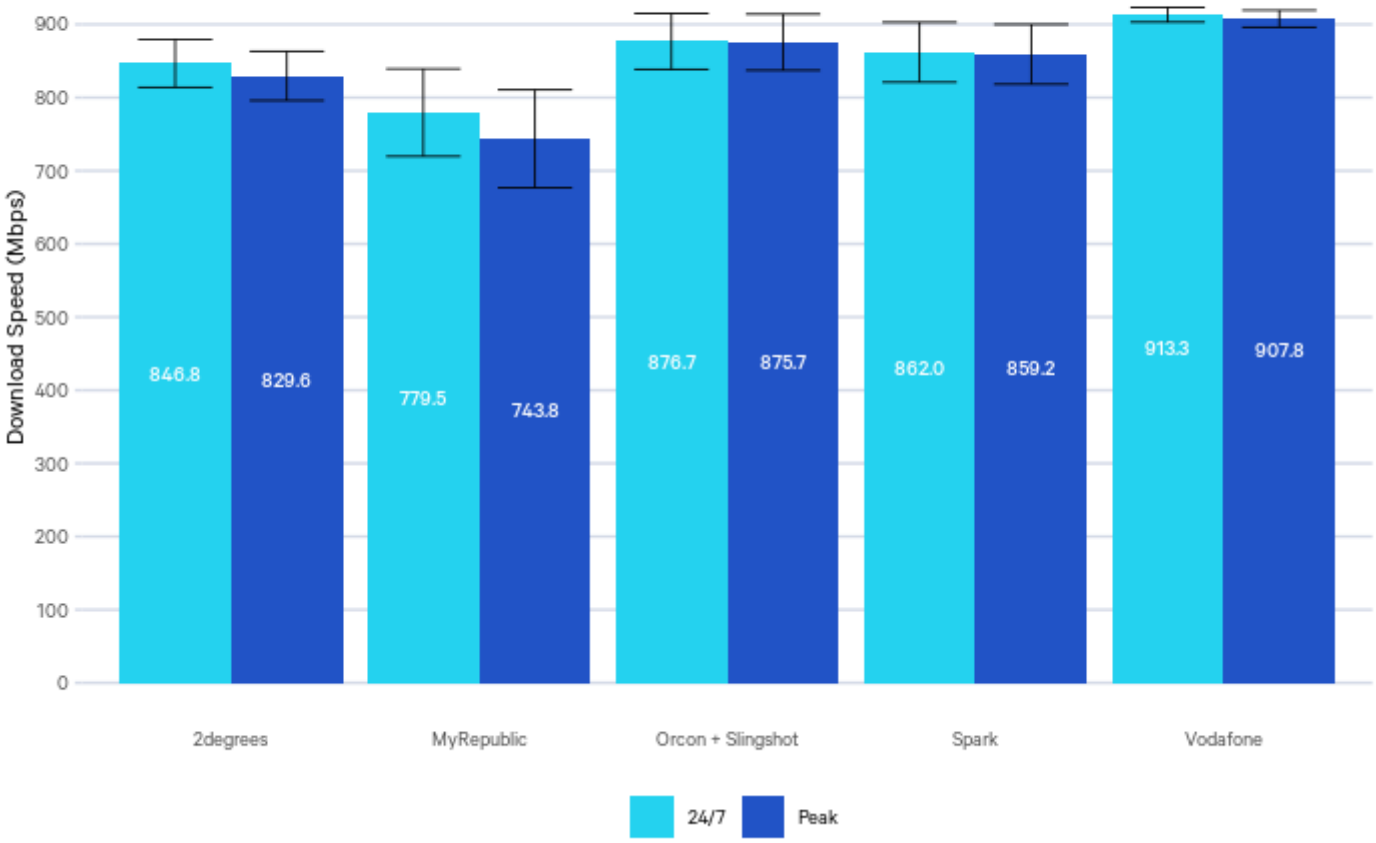
Fibre Max Breakdown by RSP

Fibre Max plans are derived from 'gigabit' wholesale products but, since around 6% of the data in HTTP traffic is given over to protocol overhead (IP packet headers etc.), the highest speed test result that can theoretically be achieved by a Fibre Max line is around 940 Mbps.

Figure 4

Average Fibre Max Download Speed by RSP

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm. Error bars show 95% confidence intervals of the mean.



Key Observations

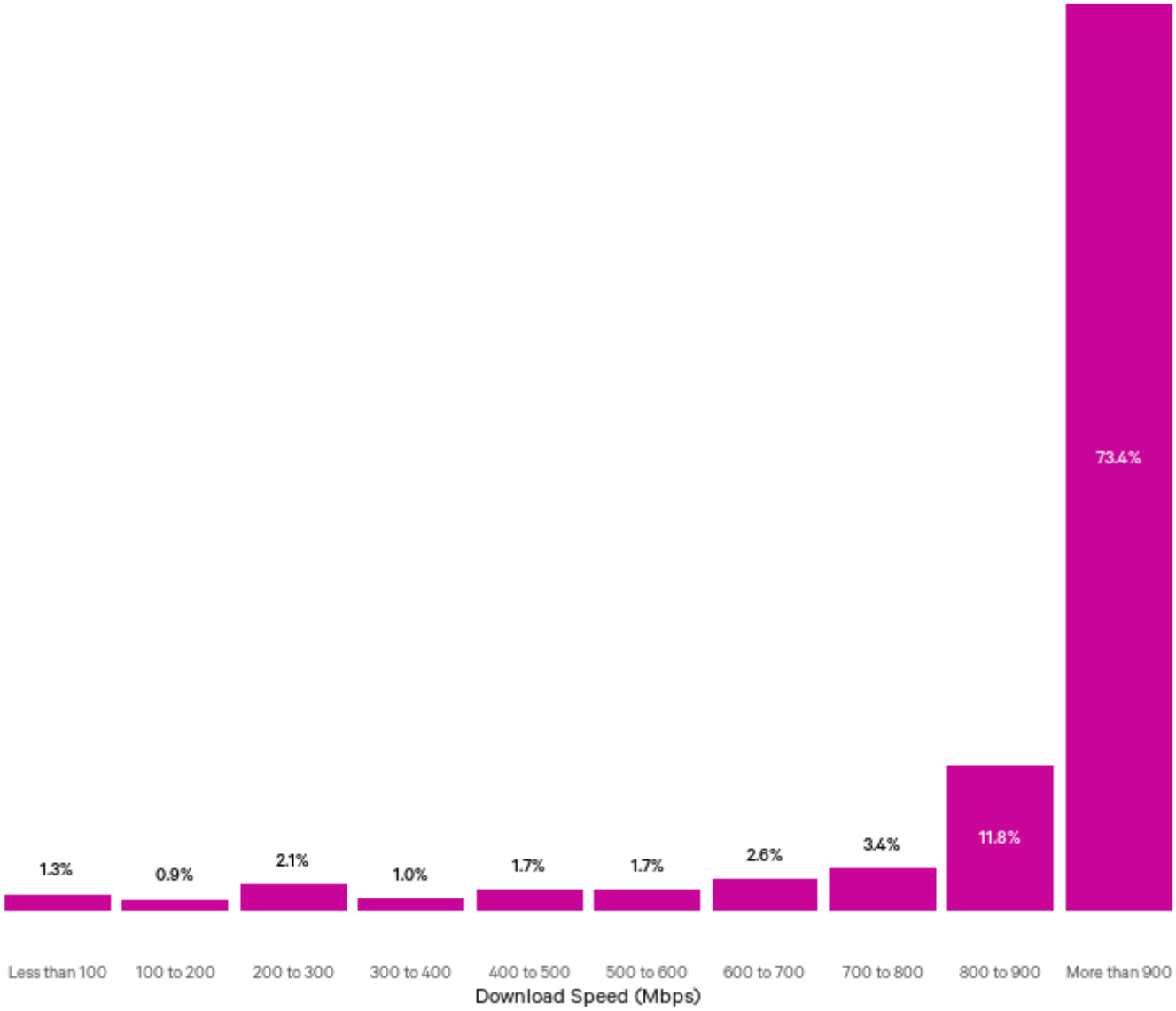
- All RSPs results are broadly in line with those seen in the previous report, with the majority of RSPs seeing a small increase in average download speeds.
- There were not enough Fibre Max volunteers connected to Trustpower during the measurement period to report results for that RSP. All RSPs are included in the overall Fibre Max results shown in Figures 1—3. Results for Vodafone are based on a sample size of 39 Whiteboxes.

Distribution of Fibre Max Results

Figure 5

Download speeds on Fibre Max plans.

Distribution of test results. Advertised average download speeds for Fibre Max plans range between 700Mbps and 950Mbps; this varies by RSP and over time.



Key Observations

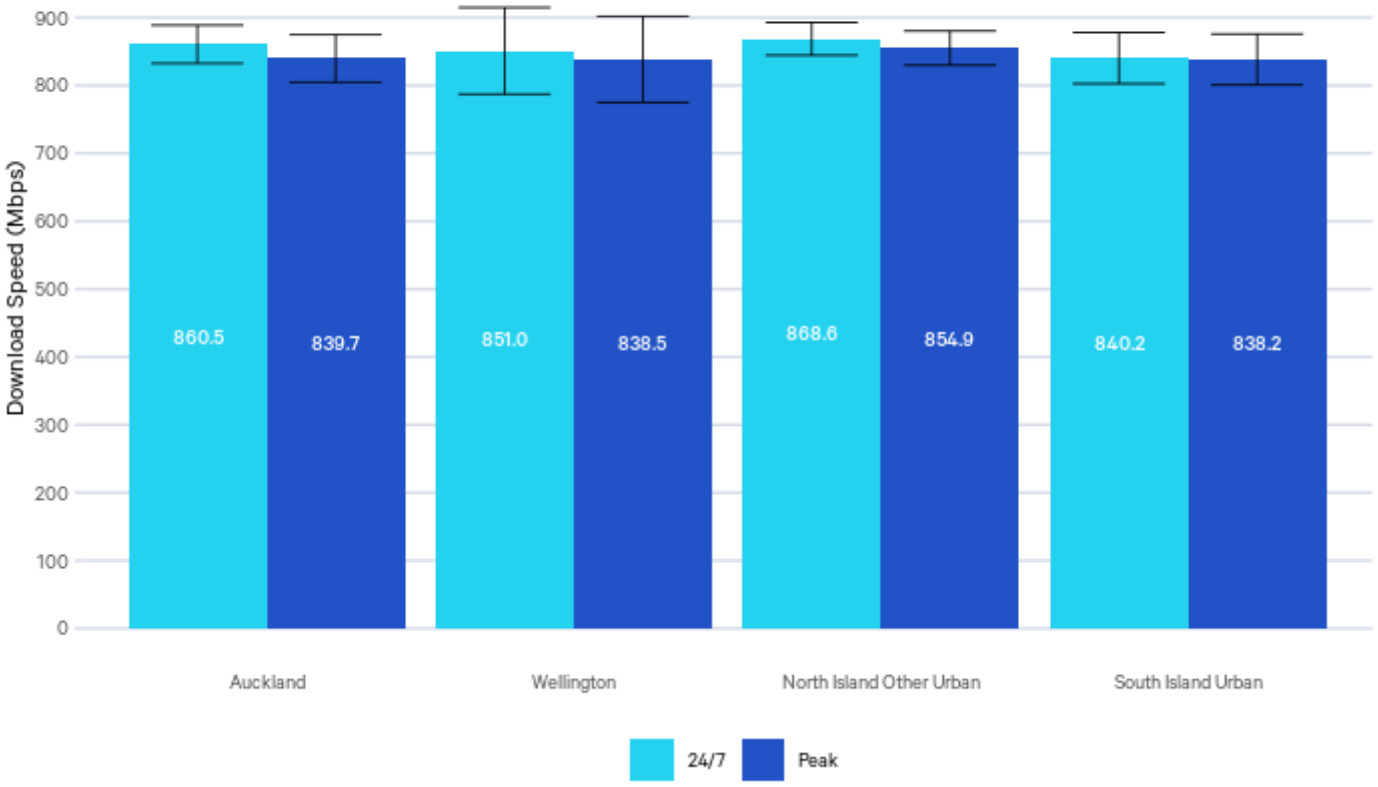
- 73% of speed tests run over Fibre Max lines now achieve download speeds above 900 Mbps, an increase on the 63% seen in the previous report. This brings the percentage of lines achieving download speeds above 900 Mbps back in line with results seen in the Winter 2021 report. The fall in results seen in September is likely due to a number of areas of New Zealand that were placed into high COVID-19 alert levels.
- Within the range of test results, 85% of tested Fibre Max households had an average download speed higher than 800 Mbps, a small increase on the 80% seen in the previous report.

Fibre Max Breakdown by Region

Figure 6

Average Fibre Max Download Speed by Region

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm. Error bars show 95% confidence intervals of the mean.



Key Observations

- There remains a small difference in performance between the two main islands, as has been noted in previous reports, but the difference is at a level which is unlikely to be noticed by end users. All regions have seen average download speeds increase compared to the previous report.

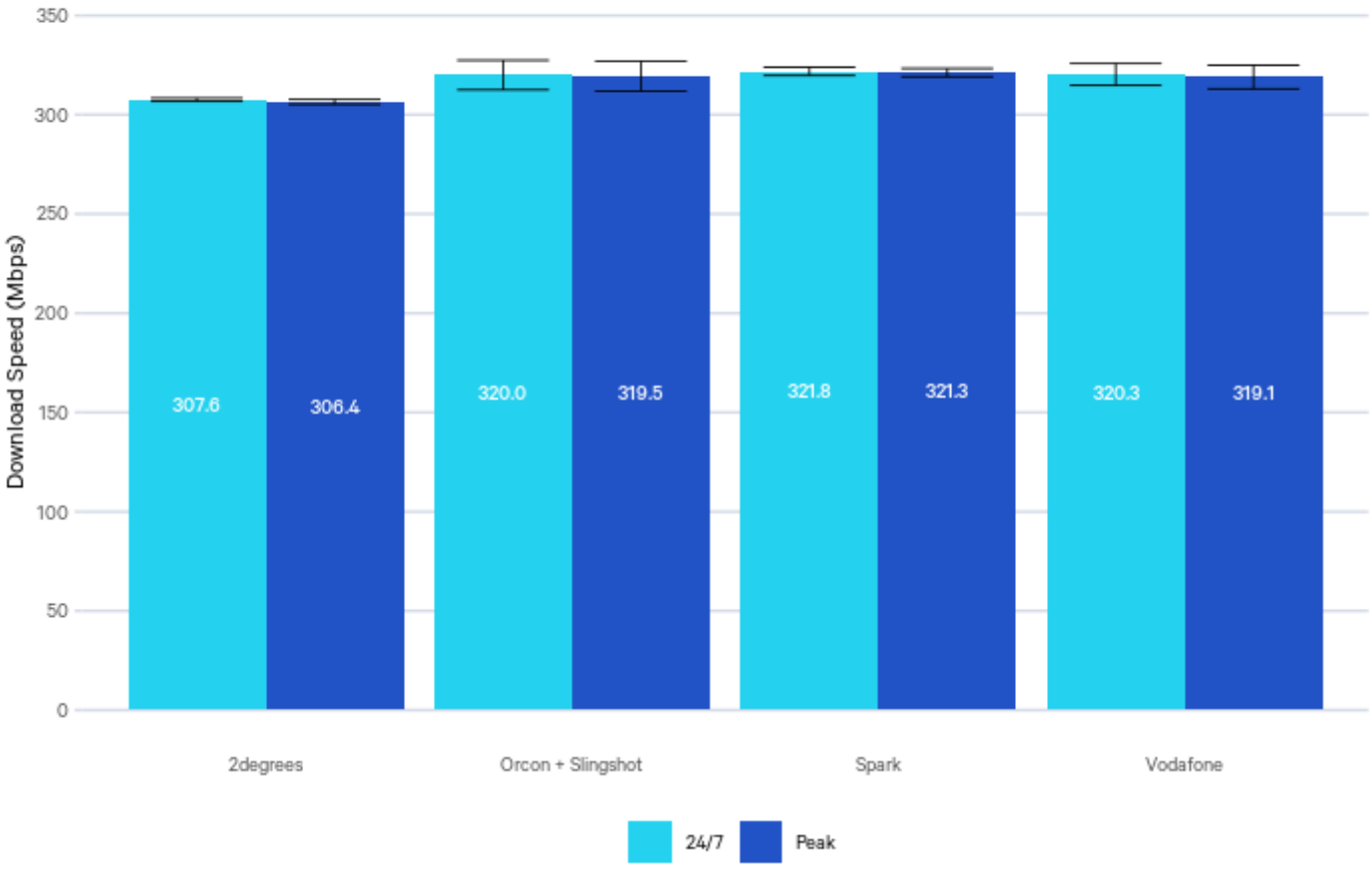
Fibre 300 Breakdown by RSP

The speeds under which Fibre 300 is advertised to consumers are 300 Mbps download and 100 Mbps upload. In practice, since the provisioned speed is set slightly higher to allow for extra bandwidth used up by network protocol overhead, it's quite common to see measured speeds close to or slightly above 300 Mbps.

Figure 7

Comparison of average Fibre 300 download speeds across RSPs.

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm. Error bars show 95% confidence intervals of the mean.



Key Observations

- It is not possible to compare download speeds for the Fibre 300 plan to the previous report as the majority of volunteers were upgraded from the Fibre 100 plan at the beginning of December.
- There were not enough volunteers connected to My Republic or Trustpower to report results. Orcon + Slingshot results are based on a sample of 32 units.[6] All RSPs are included in the overall Fibre 300 results shown in Figures 1—3.

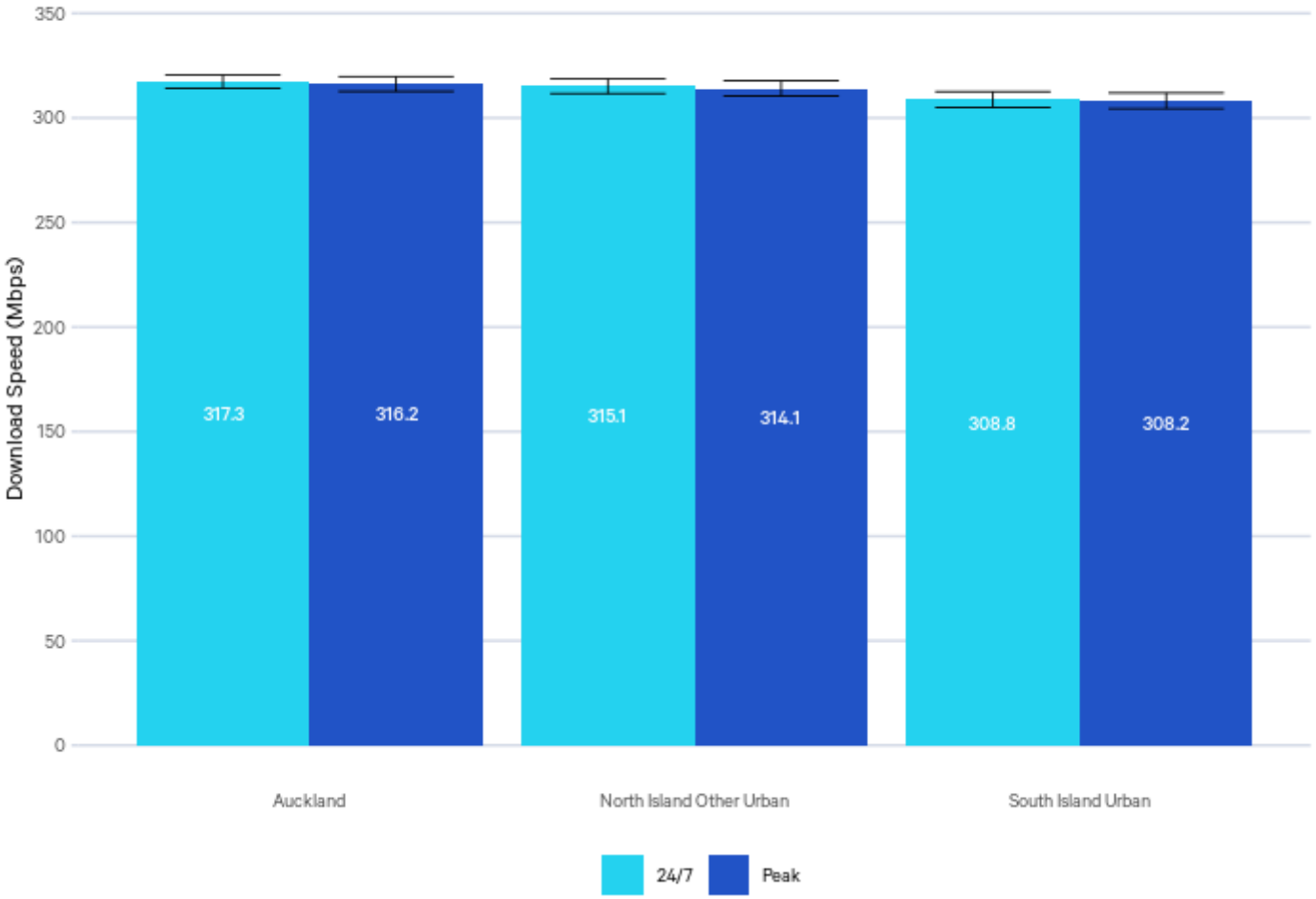
[6] Results for Slingshot are based on a sample size of 32 Whiteboxes. This accounts for the wider confidence intervals for Orcon + Slingshot Fibre 300 results.

Fibre 300 Breakdown by Region

Figure 8

Comparison of average Fibre 300 download speeds across different parts of New Zealand.

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm.
Error bars show 95% confidence intervals of the mean.



Key Observations

- All urban areas of New Zealand that we can provide results for see comparable download speeds through Fibre 300 plans, which are in line with the 300 Mbps headline download speed.[7]

[7] Testing is carried out across the country but results can only be provided for regions with a sufficient sample of Whiteboxes.

Disconnections

Realtime applications like video calls rely on a persistent connection between the home router and the target server. If the connection drops, even for a few seconds, the application will exhibit some form of stuttering. In the worst instance, a user might be disconnected and have to reconnect or wait for their broadband connection to come back online.

A brief disconnection very rarely means that, for example a physical cable has been cut; the main reasons for network dropouts relate to congestion and the configuration of network equipment.

Many common applications, such as video conferencing applications or online gaming used by New Zealanders are served from overseas, mainly Australia, East Asia, and the USA. All New Zealand RSPs share capacity through the limited set of undersea cables which carry traffic across the Tasman Sea and the Pacific.

The following graph compares outage rates across plans.

Figure 9

Median hourly disconnection rates. Lower is better.

Medians of household hourly rates. A disconnection means that two or more packets in a row don't complete a full round trip. Testing only covers periods where the line is idle.

This graph shows medians across households. Taking Fixed Wireless as an example 50% of households will experience no more than 0.06 outages per hour for traffic remaining within New Zealand. This obscures the extremes of performance for each plan: while the median ADSL and Fixed wireless results are comparable, ADSL connections are more likely than others to have outage rates far above the median, whereas Fixed Wireless plans are more likely to

have results close to the median. Disconnections vary by hour of the day, so the likelihood of 0.06 disconnection per hour when connected to a New Zealand server will not be consistent throughout all hours of the day.

The results for disconnections have increased for some technologies when compared to the previous report, specifically ADSL and VDSL. Fixed Wireless connections have seen the median disconnections fall compared to the previous report. In spite of these changes, the level of outages is still at a level whereby user experience will not be unduly affected.

Key Observations

- Most households see a very low rate of disconnections, at least while the line is idle.
- Most ADSL connections experience a higher rate of disconnections than most VDSL, Fixed Wireless, Fibre, and Cable connections. Disconnections for Fibre plans remain low.
- Traffic going overseas is more likely to be lost than traffic remaining within New Zealand. Disconnections have increased this report for all technologies for traffic testing to the United States.

Latency Under Load

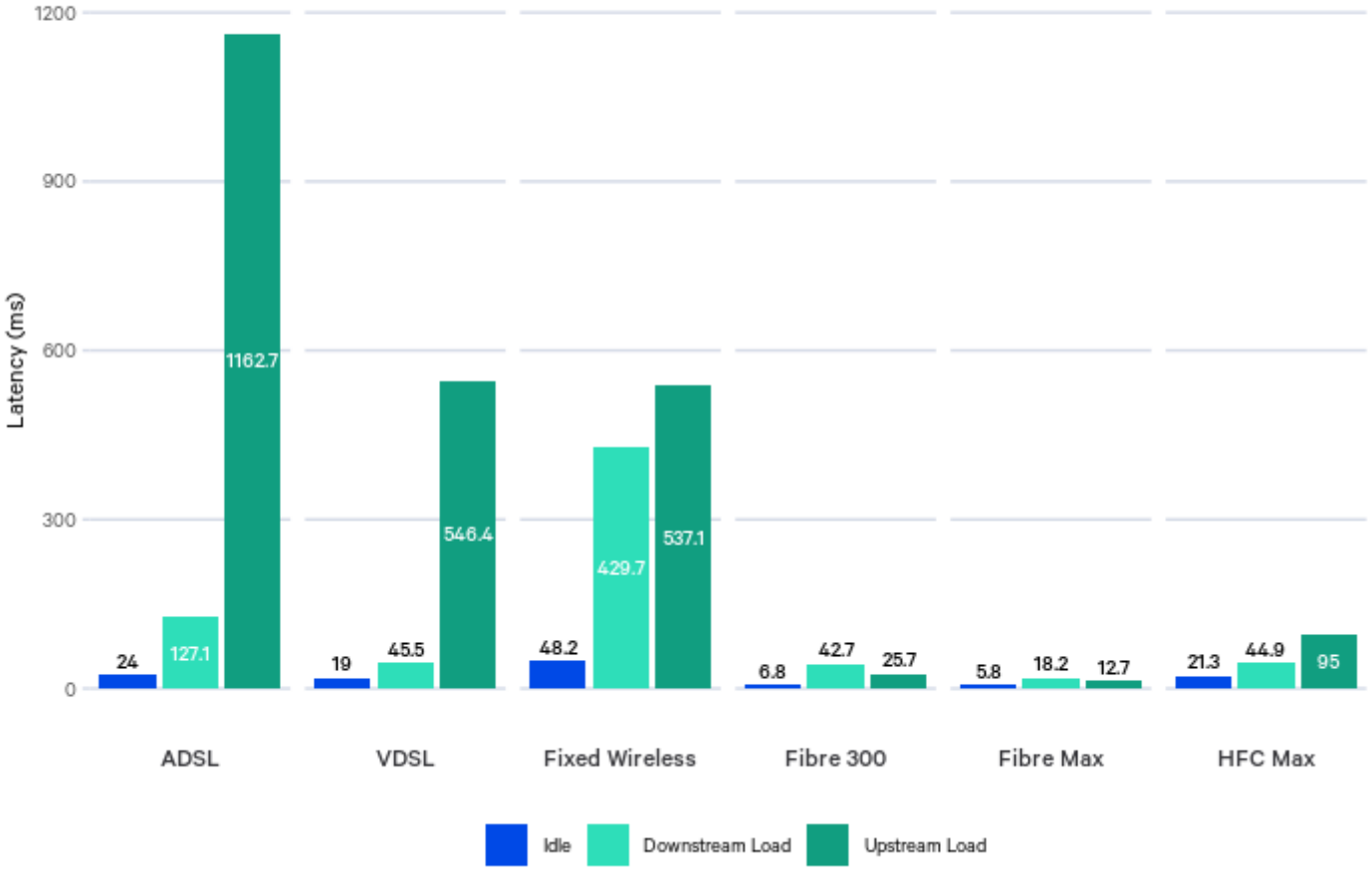
The Latency Under Load test measures the latency whilst the broadband connection is heavily utilised (by the way of a speed test run in parallel). This is more representative of user experience than idle latency as it shows the impact of downloading or uploading data to the internet (e.g. watching Netflix or uploading a file) on latency (e.g. how long a webpage takes to load). The results are particularly illustrative of real-world experience for people who are using latency sensitive applications like video conferencing.

The graph shows latency values while the connection is idle, compared with latency values while the connection under either downstream or upstream load. The latency under load test is performed while the download (or upload) speed tests are running, and this is compared to the idle latency measurement which is calculated when the line is idle. Differences in access technology and router models will result in different results for the user.

Figure 10

Average Latency Under Load to Test Servers by Plan. Lower is better.

Averages of monthly household averages



Key Observations

- All plans see latency increase when the line is running upload or download tests compared to when the line is idle.
- ADSL and Fixed Wireless plans see a large increase in latency under load while both download and upload tests are running. VDSL shows a high latency when upload tests are running. These latency values are high enough to be noticeable to the user if multiple devices are used simultaneously, with one device heavily using the connection.
- Latency under downstream and upstream load is higher for the Fibre 300 package compared to Fibre Max results. Both Fibre packages have lower latency results for idle latency and latency under downstream and upstream load than HFC Max.
- It is expected that the router model will be a factor in any latency rise, as the test is measuring what is known as “bufferbloat”, which is where the router or other network devices on the path are buffering large amounts of data. As such, differences in technology and router models will result in different results for the user.

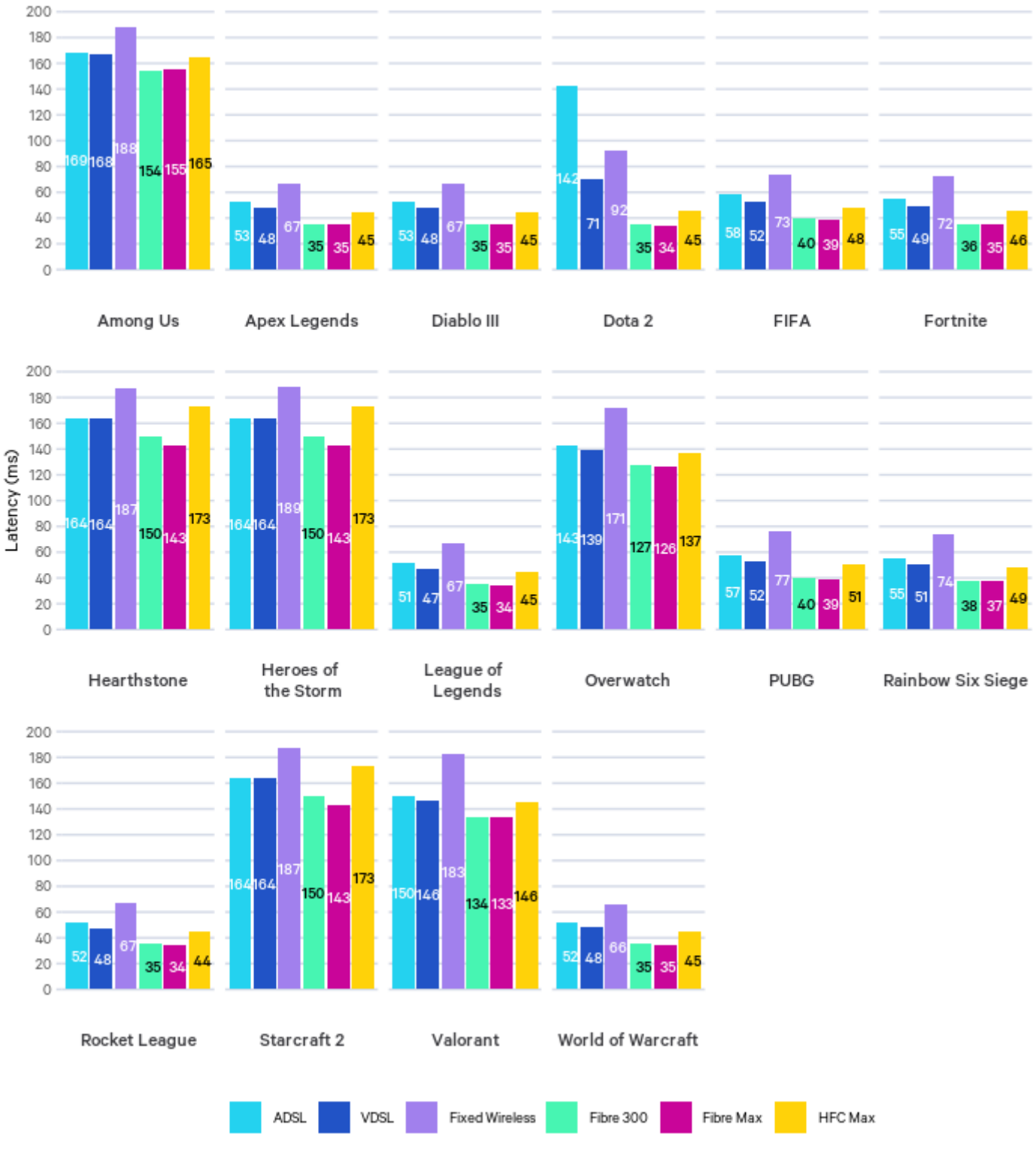
Online Gaming

Online gaming applications require low latency between users' machines and the central host server. If it takes a long time to pass messages between client and server then disruptive stuttering or lag will result.

Figure 11

The latency to various online gaming servers. Lower is better.

Average of household average latency to gaming servers.
Lower latency means that lag is less likely.



Key Observations

- All the games included in the previous report saw broadly consistent performance with the previous results.
- Among Us, Hearthstone, Heroes of the Storm and Starcraft all tested to servers in North America while Overwatch and Valorant tested to servers located in Asia. These games show higher average latencies across all technologies than the remaining games which tested to servers located in Australia.
- Fibre plans had the lowest latency to each game's servers on average. ADSL, VDSL, and Fixed Wireless plans are more likely to experience high latency and lag due to the variability of performance.
- Online gaming will start to stutter and lag when latency increases beyond 50 or 100ms – some game servers will simply refuse to admit players who have triple-figure latency because this will ruin the game for everyone else. Games with servers located in North America and Asia saw latency values above 100ms for all technologies.

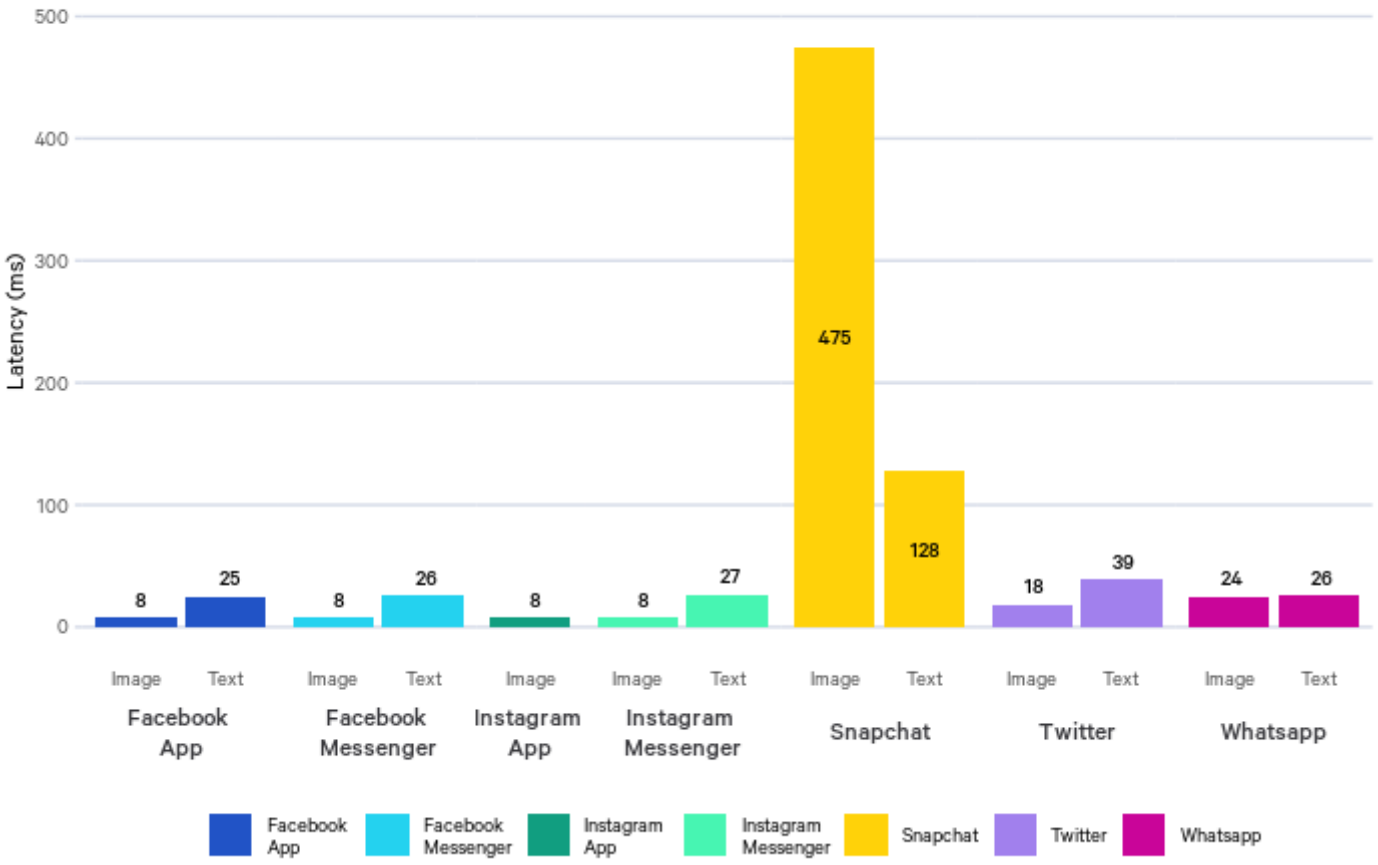
Social Media

Social media applications generally involve fetching a large number of relatively small pieces of information (single images, short pieces of text, and so on). Applications such as Facebook serve different types of content from different servers - for example an image will come from one server while its caption will come from a different server. Due to this, latency to the server will be a large determinant of how responsive social media applications will be, however there are other factors that can determine a user's performance.

Figure 12

The latency to servers of different social media platforms.

Average of household average latency to content servers. Fibre plans only.



Key Observations

- Latencies have fallen for Snapchat Downlink Image, from an average of 622 ms in September to 475 ms in December for Fibre plans. Snapchat latencies remain higher than all other social media platforms tested for both Image and Text downlink.

Netflix

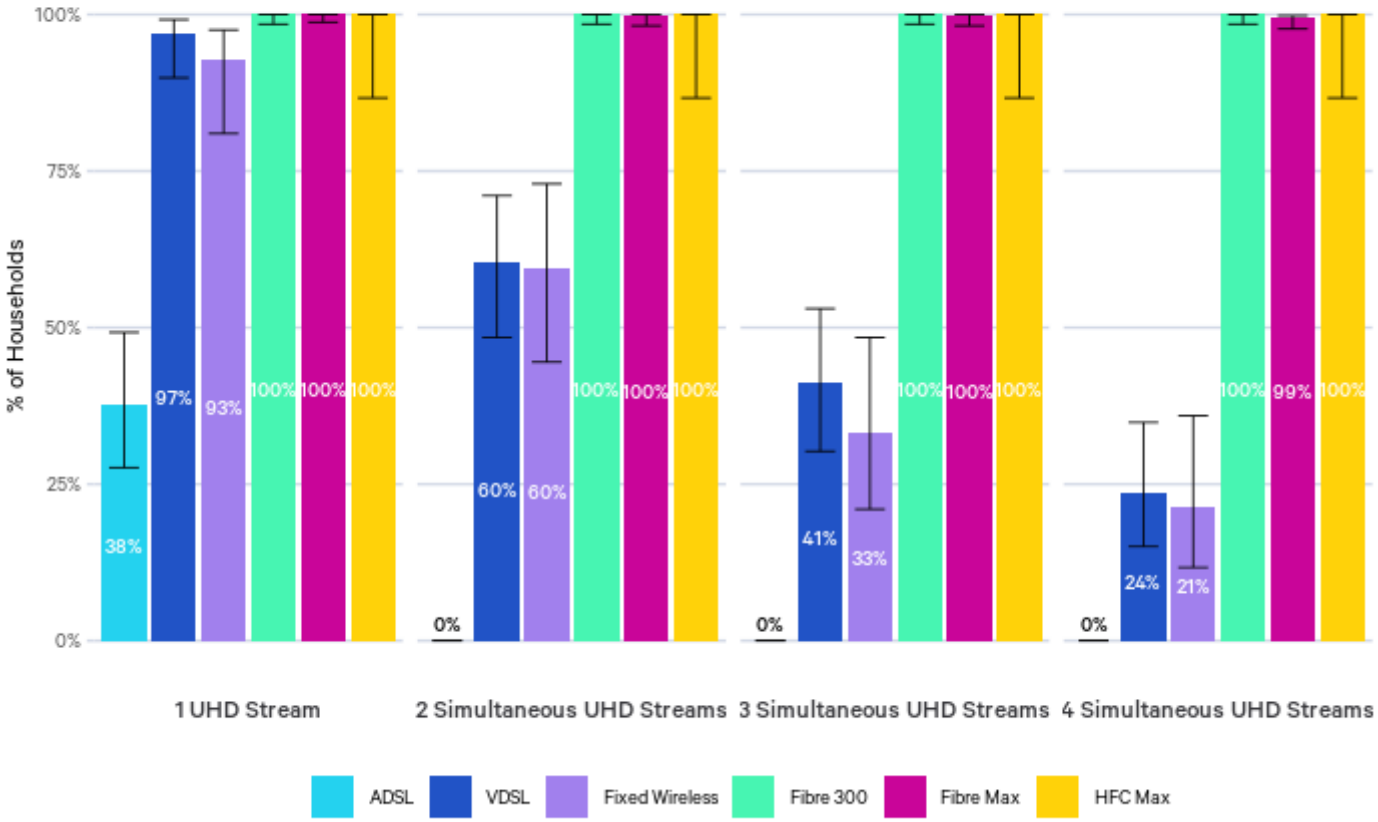
Video streaming is a good example of an application in which the quality of a user's experience is more affected by bandwidth than by latency. Since higher quality video takes up more data than lower resolution video, higher bandwidth plans such as Fibre 300, HFC Max and Fibre Max are able to reliably stream from Netflix in Ultra High Definition more of the time.

In 2021, Netflix introduced a change to the way its high definition and 4K video is encoded. Video is now delivered at a variable bitrate depending on the complexity of the video being transmitted. This means that a program with fewer colours and less movement, like a cartoon, will be encoded at a lower bitrate than a fast-paced action film. In practical terms, if 4K video was encoded at 15.6 Mbps previously, it would now be transmitted at no more than 12 Mbps as a worst case. This has little effect on higher speed Fibre plans, but does mean that a number of households on Copper and Fixed Wireless plans will be more likely to be able to watch an Ultra High Definition video, or even support multiple streams running simultaneously since the change was implemented.

Figure 13

The proportion of households able to stream 1, 2, 3 or 4 simultaneous Ultra High Definition videos from Netflix.

Based on the average download speed to Netflix servers for each household. Error bars show 95% confidence intervals.



Key Observations

- 99% of households on Fibre 300, Fibre Max or HFC Max plans were able to stream 4 simultaneous UHD Netflix streams.
- Over 90% of households on VDSL and Fixed Wireless plans were able to stream a single UHD stream. Only 38% of households on ADSL plans were able to stream UHD.

How we test

Measuring home broadband across New Zealand

- The SamKnows Whitebox is a purpose-built testing agent that connects to your router.
- Measures every aspect of the internet service delivered to your home.
- Runs at regular intervals while you're not using the internet.

SamKnows One Analytics

- View all your data in one place.
- Create customised charts and save the results that mean the most to you.
- Track changes in your connection over time.

Sign up

Please participate by volunteering to receive a Whitebox. The more volunteers we have, the more information we can provide to consumers in New Zealand in future reports. https://www.measuringbroadbandnewzealand.com/sign-up

Our tests

	Test	Definition
	Download	The speed at which data can be transferred from the SamKnows test server to your device, measured in megabits per second (Mbps).
	Upload	The speed at which information is transferred from your device to the SamKnows test server, measured in megabits per second (Mbps).
	Latency	How long it takes a data packet to go from your device to our test server and back to your device, measured in milliseconds (ms). The shorter the latency, the better.
	Latency Under Load	How long it takes a data packet to go from your device to our test server and back to your device while a download/upload test is running, measured in milliseconds (ms). The shorter the latency, the better.
	Jitter	The variation in the delay of received packets, measured in milliseconds (ms). Essentially it is a measure of the stability of latency.
	Packet Loss	Packet loss counts packets that are sent over a network and don't make it to their destination, measured as a percentage of packets lost out of all packets sent.
	Disconnection	A disconnection means that two or more latency measurement packets in a row were lost. Measured as the median of household hourly rates
	Video Conferencing	Measures round-trip latency and reachability of a selection of video conferencing services.
	Social Media	Measures round-trip latency and reachability of a selection of major social media services.
	Online Gaming	Measures performance for a number of major games and supporting services, such as game distribution platforms.
	Video Streaming	Measures the highest bitrate, and therefore quality level, you can reliably stream from real content servers.
	Webpage Loading Time	The time it takes for a specific webpage to fully load. This is a combination test that includes download, latency and DNS in one test that accurately mimics real-world usage.
	CDN Measurements	Measures download performance for the same (or very similar) object from a variety of popular Content Delivery Networks over HTTP.
	Voice over IP	Measures the suitability of a broadband connection for VoIP calls.

Glossary

Term	Definition
ADSL	Asymmetric digital subscriber line. A broadband connection that uses existing telephone lines to send data.
Advertised speed	The speed at which broadband services are typically advertised or marketed, usually described in Mbps (megabits per second). On some networks like ADSL or Fixed Wireless, these are not given as a general maximum but vary from line to line as they do not transmit data without depreciation across distance.
Broadband	A network service or connection which is defined as “always on”, as opposed to historical dial-up internet.
Broadband speed	The speed at which data is transmitted over a broadband connection, usually measured in megabits per second (Mbps).
Disconnection	A disconnection means that two or more latency measurement packets in a row were lost, resulting in stuttering broadband performance.
Download speed	The speed that data travels from our test server to your router. Measured in megabits per second (Mbps); higher is better.
Fibre	A broadband connection that uses fibre-optic cables to send data to and from a property directly. Sometimes referred to as FTTH (Fibre-to-the-home) or FTTP (Fibre-to-the- premises).
Fixed Wireless	A broadband connection that uses radio waves to provide internet access to a premises.
VDSL	Very high speed digital subscriber line. A broadband connection that allows higher speeds than ADSL technologies.
RSP	Retail Service Provider. A company that provides consumers with access to the internet.
Latency	The time it takes for a data packet to travel from your router to our test server and back. Measured in milliseconds (ms); lower is better.
Latency under load	The time it takes for a data packet to travel from your router to our test server and back while a download/upload speed test is running. Measured in milliseconds (ms); lower is better.
Mbps	Megabits per second. A unit measuring broadband speed. Mbps is the equivalent of 1,000 kilobits per second.
Packet loss	The percentage of packets that were lost somewhere between your router and our test server. Measured as a percentage of all packets sent; lower is better.

Term	Definition
Peak hours	The time of day when people are typically using their internet connection, defined in New Zealand as between 7pm and 11pm.
Upload speed	The speed that data travels from your router to our test server. Measured in Mbps (megabits per second); higher is better.