



Measuring Broadband New Zealand

Autumn Report, June 2019

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 SamKnows Whiteboxes 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 the data collected during March and April 2019.



Executive summary

15th March - 14th April 2019

This report presents key indicators of consumer internet performance in New Zealand. Some of the highlights of this report include:

1. **The inclusion of Fixed Wireless packages along with other technologies for the first time.**
2. **High download speeds were achieved on fibre and VDSL packages.**
3. **Test results to specific services used by Kiwis like Netflix and YouTube.**
4. **Comparison between results at peak times (7pm to 11pm) and results over 24 hours.**

SamKnows and the Commerce Commission are keen to publish more detailed information about a range of topics in following reports. The next report is anticipated in September 2019, and we aim to include:

1. **More performance comparisons between providers.**
2. **Comparison between results in different regions of New Zealand.**
3. **Performance analysis of specific packages.**
4. **A breakdown of results by all technologies available.**

In order to make performance comparisons we need to make sure we have enough volunteers with Whiteboxes on our panel. We still have lots to send out and we're particularly interested in finding people on these packages:

RSP	2 Degrees	MyRepublic	Orcon	Skinny	Slingshot	Spark	Trustpower	Vodafone
Package	ADSL	Gigatown	ADSL	Wireless 4G	ADSL	Fibre Max	ADSL	Fibre Max
	VDSL	Gigatown Gamer	Fibre 100		Fibre 100	Wireless Broadband	Fibre 100/20	Rural Broadband
		Ultra-Fast Fibre Pro	Gigantic Fibre		Gigantic		Fibre Max	UltraFast HFC Max
			VDSL					

So if you want to help please sign up here: www.measuringbroadbandnewzealand.com to take part!

Speed tests

15th March - 14th April 2019

Figures 1 and 2 present a high-level view of download and upload speed across the nation. These are included in every report in order to provide a benchmark that can be tracked over time. Figure 1 shows download speeds by technology. Products based upon Fibre Max deliver an average of 550.3 Mbps, which is more than five times the speed of Fibre 100 based products. ADSL is lowest at 9.3 Mbps. For most common internet applications, the download speeds delivered by Fixed Wireless, VDSL, Fibre 100 and Fibre Max are all adequate. However, for households with multiple people streaming, downloading files, or gaming at the same time, Fibre 100 or Fibre Max packages are better. Fibre-to-the-home services, such as the Fibre 100 and Fibre Max products benchmarked here, use fibre-optic cables to deliver internet access to consumer's homes. This does not suffer degradation over long distances like the copper wiring used for ADSL or VDSL does. It should be noted that the Fibre Max speeds presented here were significantly impaired by an interconnection issue between one of the RSPs and the hosting provider of our New Zealand test servers, REANNZ. This impairment has now been rectified and we expect future Fibre Max results to be significantly higher as a result.

Figure 1: Download Speeds Peak vs. 24/7

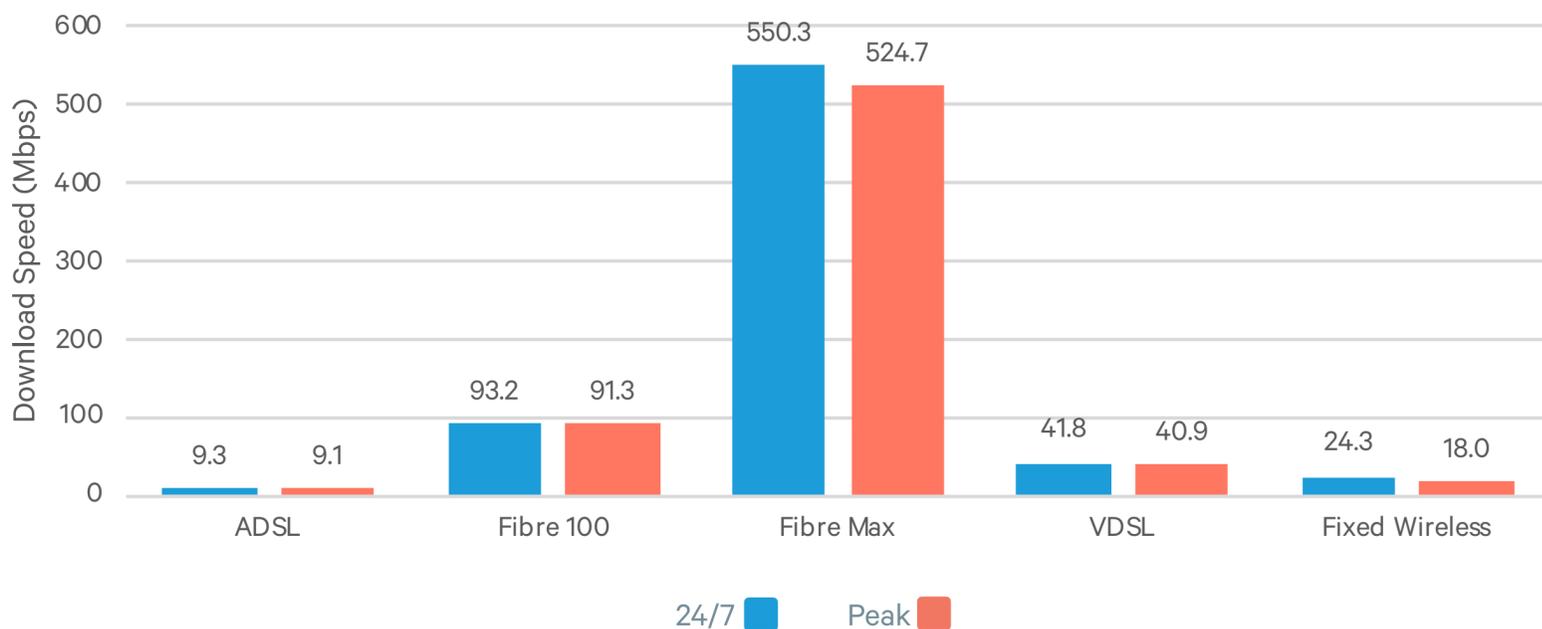
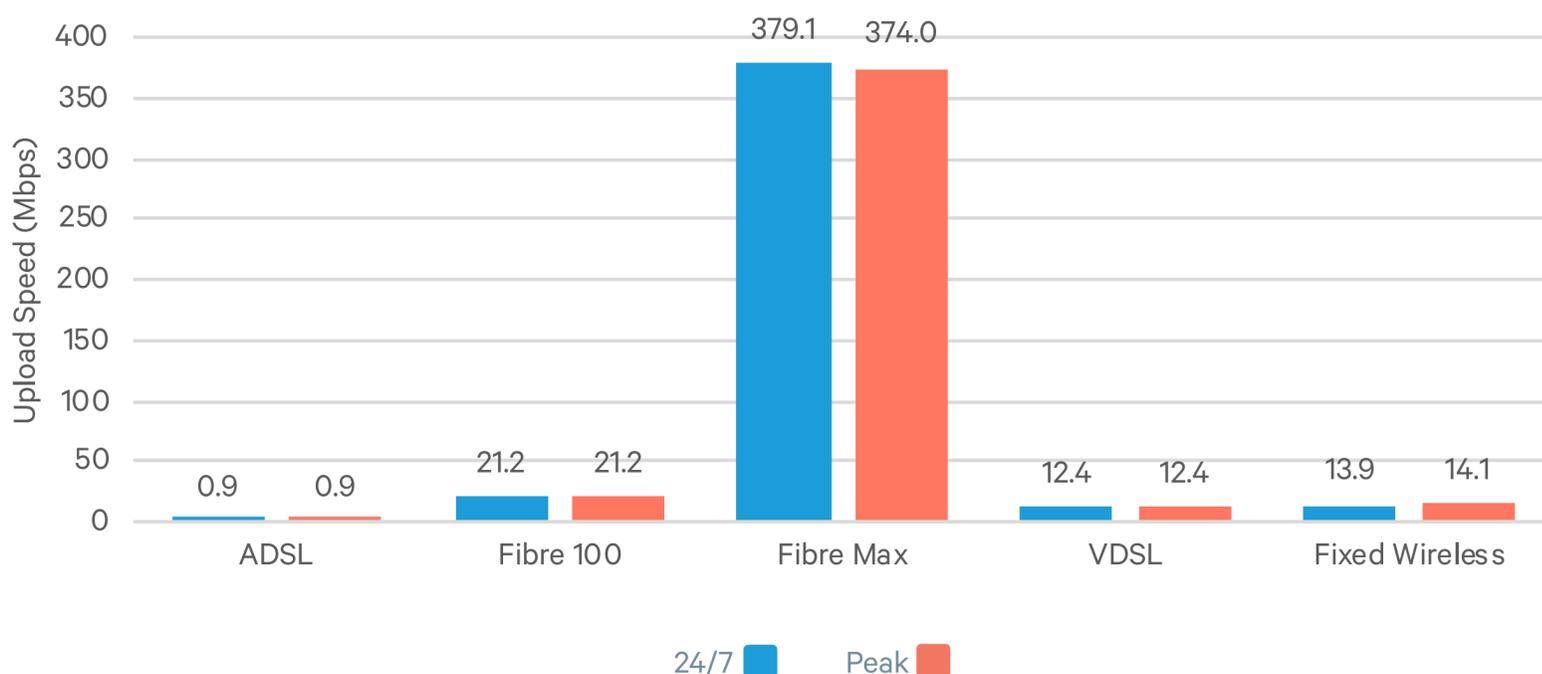


Figure 2 presents upload speeds by technology. Like download speeds, performance is highest on Fibre Max. Each of the other technologies ranges from 12.4 - 21.2 Mbps, except for ADSL which is significantly lower at 0.9Mbps. There is no significant drop-off in either download speed or upload speed at peak times, which means that most users can expect their experience to remain consistent despite more people using the network.

Figure 2: Upload Speeds Peak vs. 24/7

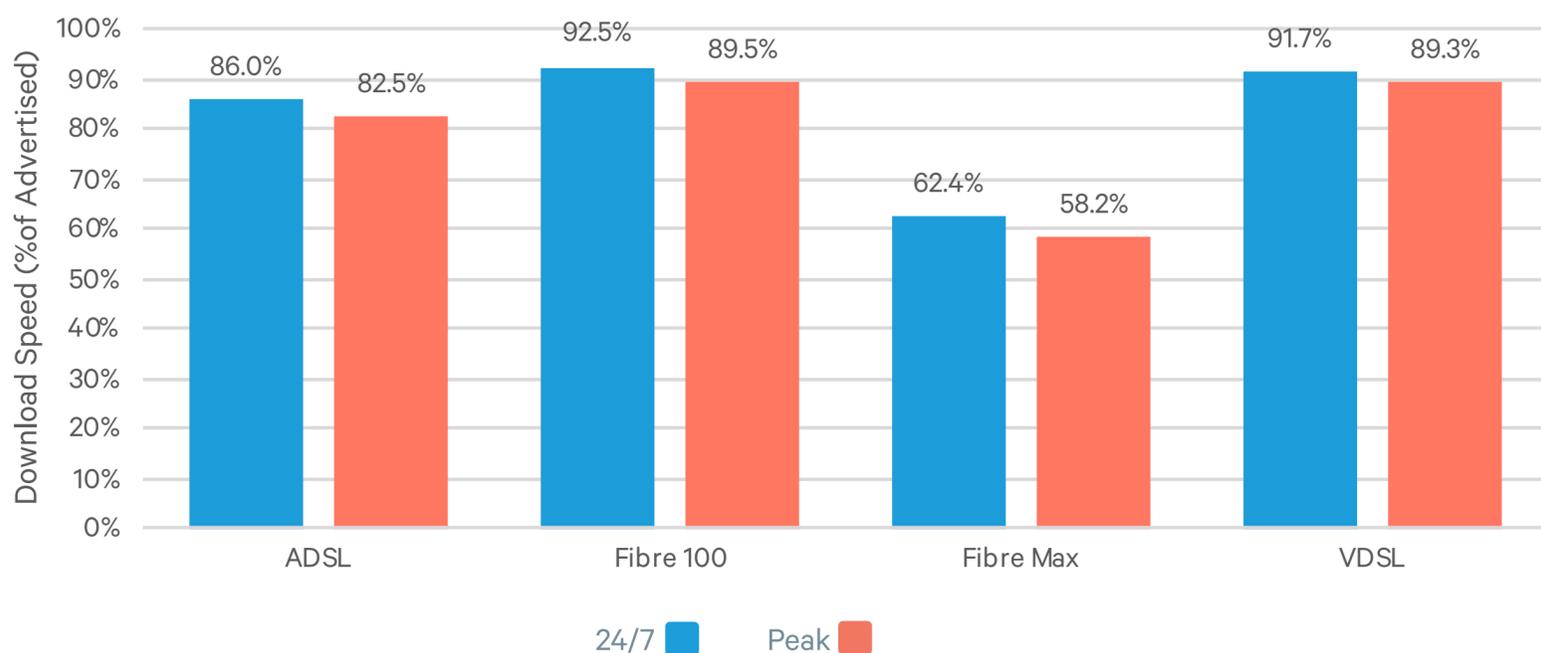


% of advertised speed

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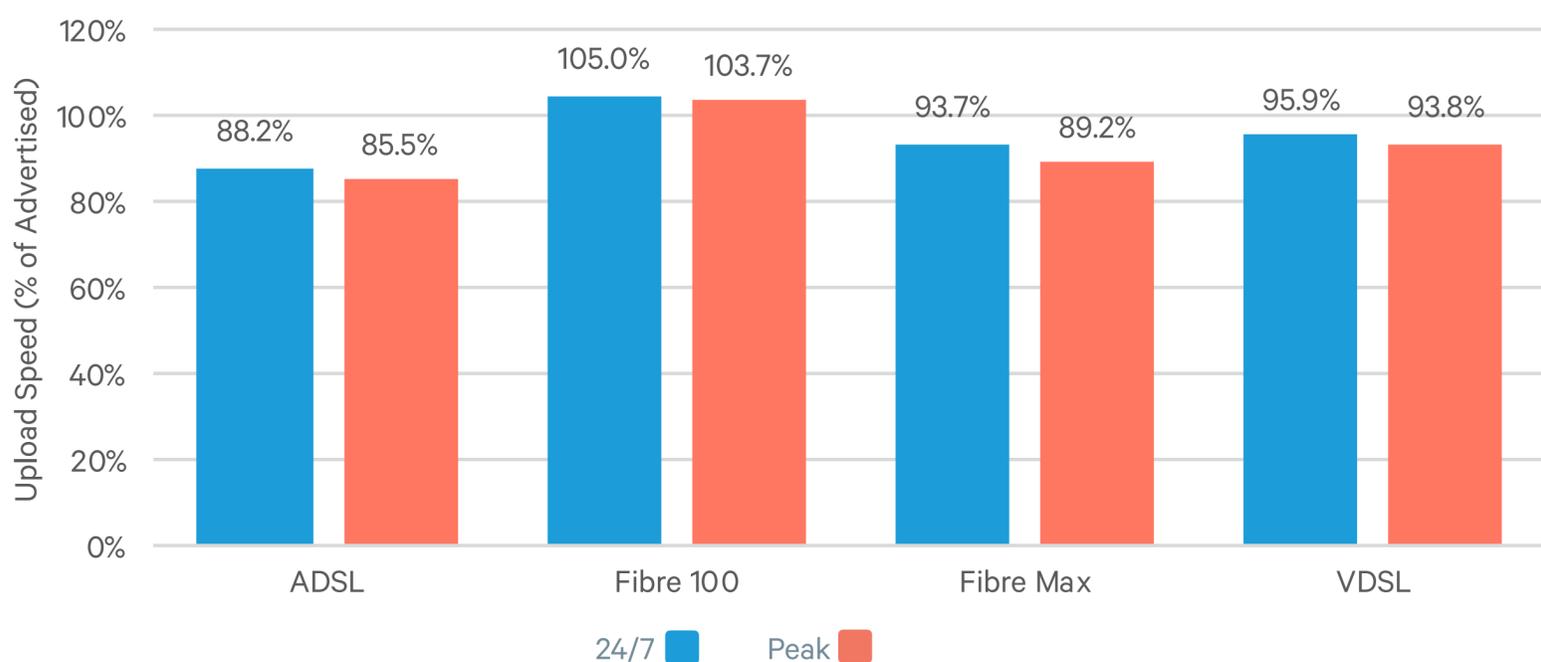
Figures 3 and 4 present download speed and upload speed as a percentage of the product's advertised speed, as presented on the RSP websites. In the case of ADSL and VDSL, RSPs do not advertise a single speed on their websites, as the achievable speed will vary according to the conditions of the copper wiring. Due to this, the ADSL and VDSL figures here are taken as a percentage of the "synchronised speed" (the speed the modem connected at). Seven percent is deducted from this synchronised speed to allow for network overheads. Such deductions are already accounted for in the advertising of fibre services. Fixed wireless is not advertised based on speed and has been excluded from this chart. All technologies show performance at or exceeding 82.5% of advertised, apart from Fibre Max which only reaches 58.2% during peak hours. A major contributor to the relative underperformance of the Fibre Max services during peak hours is the interconnection issue discussed in the previous section. Excluding the results of the one RSP with the interconnection issue, would only see Fibre Max reach 72.3% peak hours. However, given the high speeds of these connections their performance still far exceeds those of other access technologies, as seen in the previous section.

Figure 3: % of Advertised Download Speed



Upload speeds as a percentage of advertised speed meet or exceed 85.5% across technologies. With the exception of those on ADSL, the upload speeds measured here will be sufficient for reliable and efficient uploading of content on modern internet applications.

Figure 4: % of Advertised Upload Speed



Video streaming

15th March - 14th April 2019

As speeds improve, the way people use the internet has changed. Streaming video is now commonplace, and RSPs in New Zealand are trying to make sure users can access high quality content when they want to. Figure 5 contains results from a test developed in conjunction with Netflix, which shows the maximum video quality users are able to stream. The test streams content from Netflix and calculates the highest quality that can be streamed without buffering. The data shows that streaming Netflix on Fibre 100, Fibre Max, and VDSL allows for ultra-high definition (UHD) streaming at least 87.9% of the time, which is important for watching on UHD smart TVs and projectors. UHD streaming is still possible most of the time on Fixed Wireless. For ADSL connections most users can reliably stream Netflix in high definition (HD), but not UHD.

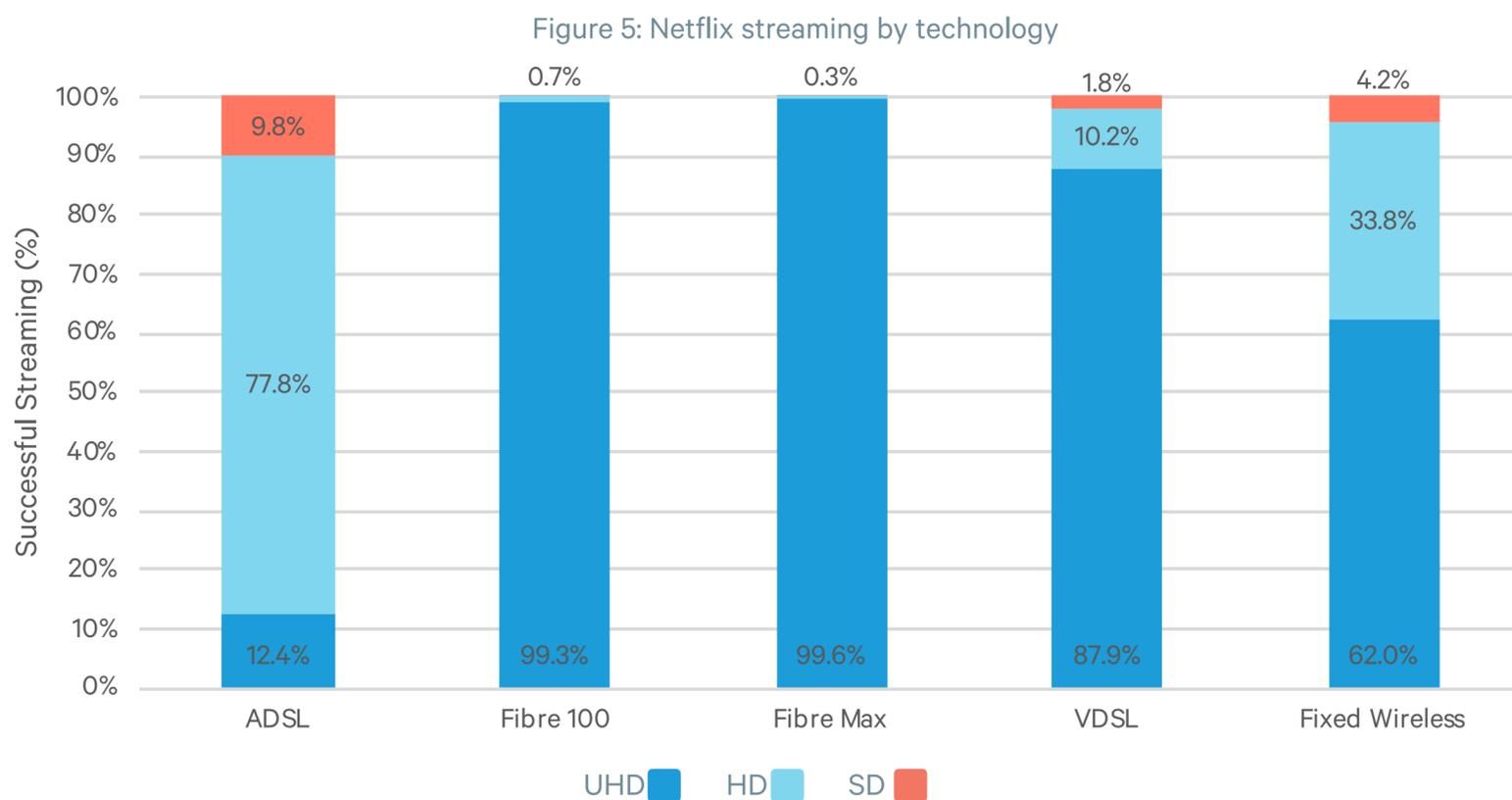
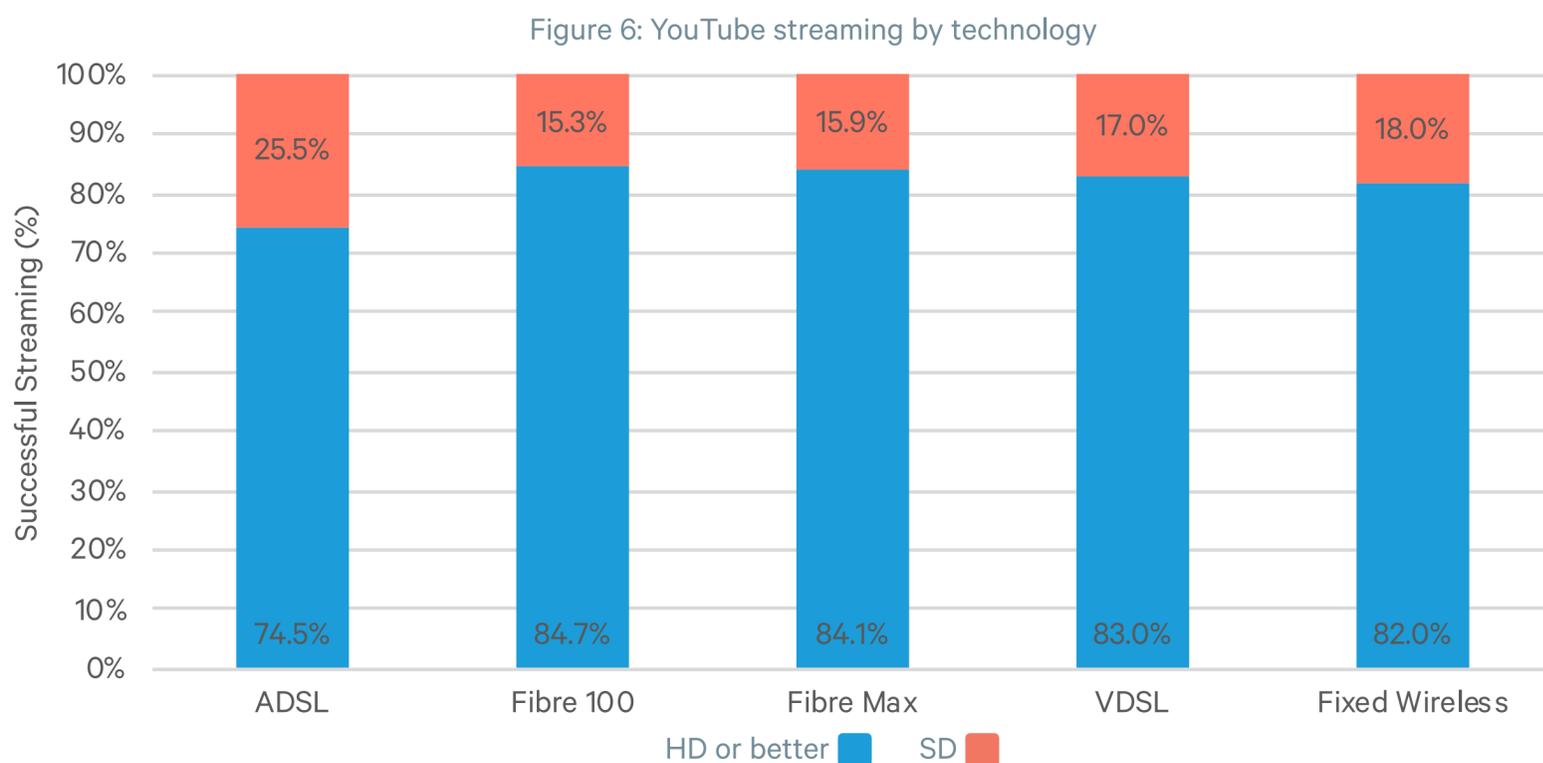


Figure 6 shows the same metric for another major video streaming service, YouTube. In this case we see that all technologies stream in High Definition the majority of the time. This metric measures the most popular content on YouTube in New Zealand, which may be a high-definition movie trailer, or it could be a low-quality video shot on a smartphone. By comparison, Netflix always makes UHD content available, so there are always more successful UHD tests than the YouTube test. For this reason, UHD and HD has been combined into "HD or better" in figure 6. This also explains the increased frequency of SD content in the chart, as sometimes SD content is the best availability quality for a video. The chart again demonstrates that fibre services deliver the best experience, and ADSL the poorest, although there is less difference than with Netflix.



Latency

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Round-trip latency represents the time taken to send a data packet to a server and receive it back. Lower latency is better as it means you are receiving the requested information back quickly. This makes web pages load faster and allows you to use online services, most notably gaming, without experiencing severe lags or delays. Fixed wireless is more sensitive to interference and congestion on mobile networks and this is demonstrated by significantly higher latency than other technologies. For a user who prioritises gaming or other responsive applications, fixed wireless products may cause noticeable issues. ADSL latency at 49ms or 50ms would also be unreliable, while Fibre 100 and Fibre Max deliver the lowest (best) latency results. Latency has less impact on video streaming and large downloads. Web pages would load noticeably slower on Fixed Wireless services with the levels of latency measured here. This is to be expected as typically Fixed Wireless is not the first choice for delivering high-performance broadband, rather it is a solution for getting networks to harder-to-reach or sparsely populated areas.

Figure 7: Latency by technology

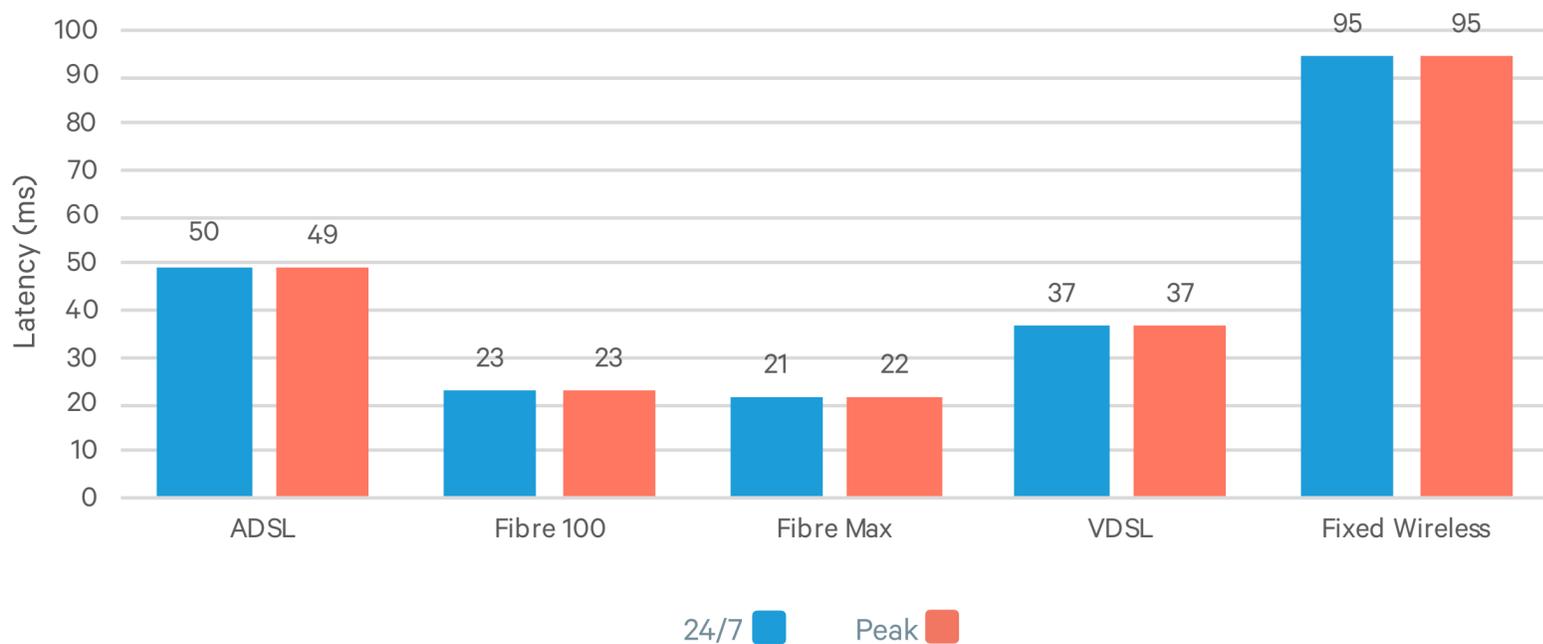
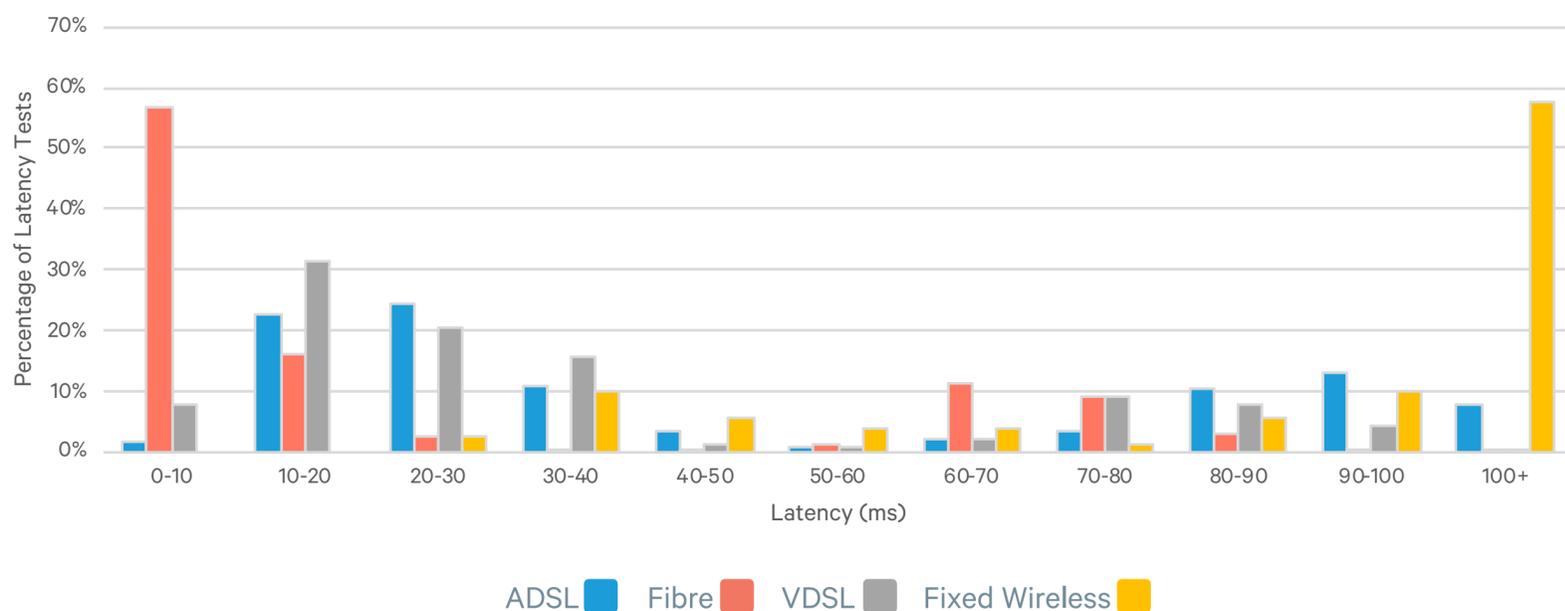


Figure 8 shows the distribution of latency results across technologies in New Zealand. It shows the latency results recorded along the Y axis, and the bars indicate the percentage of tests that fell into each 10ms bucket for each technology. Of all the latency tests performed on Fibre networks, 57% have latency below 10ms. At the other end of the chart, 57% of Fixed Wireless results were above 100ms. This means that, 57% of the time, Fixed Wireless networks will experience a delay of 100ms or more, significantly affecting services like gaming or web browsing.

Figure 8: Frequency of latency results by technology

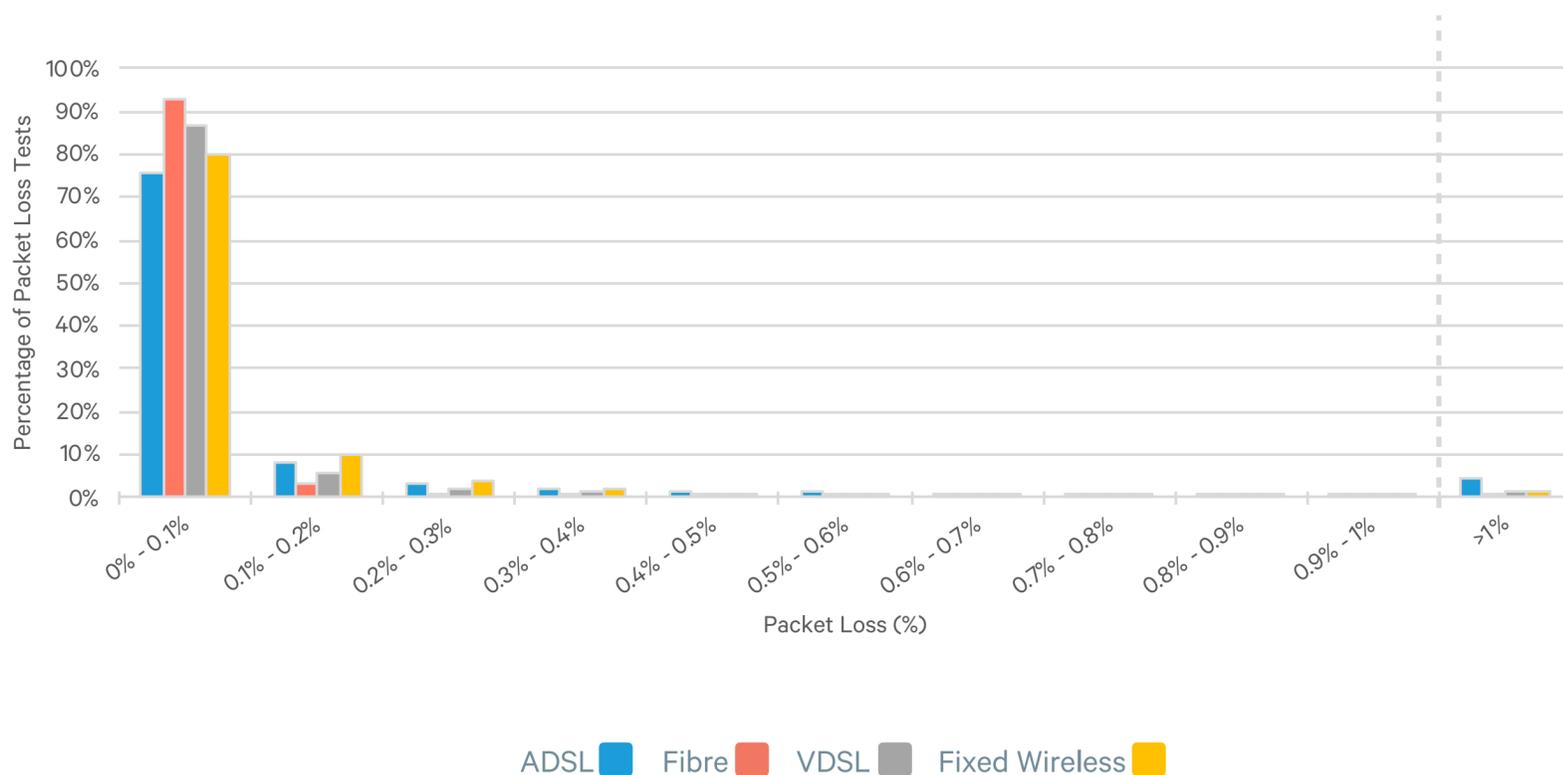


Packet loss

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Figure 9 shows the distribution of packet loss results by technology. Packet loss is the percentage of data packets lost during a measurement. This metric is important as any information lost will have to be retransmitted, causing delays when streaming, gaming, web browsing or any other online activity. We have included the distribution as it clearly shows that the vast majority of users do not experience significant packet loss and would not have their experience affected. In a small number of cases, however, packet loss reaches greater than 1% which will likely be noticeable in time-sensitive applications, such as web browsing, online gaming and voice calling. The dotted line in figure 9 shows this threshold.

Figure 9: Frequency of packet loss results by technology



What's next

This is the second of many reports which will be released quarterly by the MBNZ project and will track improvements in internet performance over time. In future reports, we will aim to include cable, and will aim to break results down by provider.

Sign up at

www.measuringbroadband.newzealand.com

Please participate by volunteering to receive a Whitebox. The more volunteers we have, the more information we can provide consumers in New Zealand in future reports.

How we test

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.



The SamKnows Whitebox!

Measuring homes across New Zealand

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

[Volunteer today!](#)

Our tests

	Download	The speed data travels from our test server to your device, measured in bits per second.
	Upload	The speed data travels from your device to our test server, measured in bits per second.
	Latency	How long it takes a data packet to go from your device to our test server and back to your device.
	Jitter	Measures the amount of difference between packet delays, or the stability of your latency.
	Packet Loss	When a packet of data becomes lost (does not arrive for two seconds) measured as a percentage of packets lost out of packets sent.
	You Tube	Measures the highest bitrate you can reliably stream of the most popular video in your country.
	Netflix	An application-specific test, supporting the streaming of binary data from Netflix's servers using the same CDN selection logic as their real client uses. The test has been developed with direct cooperation with Netflix.
	Web browsing	Measures how long it takes to fetch the HTML and referenced resources of a popular website.
	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

15th March - 14th April 2019

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”.
Broadband speed	The speed at which data are transmitted over a broadband connection, usually measured in megabits per second (Mbps).
Download speed	The speed that data travels from our test server to your router. Measured in Mbps (megabits per second), 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.
HD	High definition. Resolution of video streaming between 1280x720 pixels and 1920x1080pixels. Often referred to as 720p or 1080p.
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.
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.
Peak hours	The time of day when people are typically using their internet connection, defund in New Zealand as between 7pm and 11pm.
SD	Standard definition. Resolution of video streaming between 640x480 pixels and 858x480 pixels. Often referred to as 480p.
UHD	Ultra-high definition. The highest resolution for video streaming, this includes 4K UHD and 8K UHD. Minimum resolution of 3840x2160 pixels.
Upload speed	The speed that data travels from your router to our test server. Measured in Mbps (megabits per second), higher is better.
VDSL	Very high speed digital subscriber line. A broadband connection that allows higher speeds than ADSL technologies.