Measuring Broadband New Zealand

Winter Report, September 2023

The Measuring Broadband New Zealand programme measures the quality of New Zealand's fixed line internet. The aim of the programme is to independently measure and report on the actual in-home broadband performance so consumers can assess 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.

Please refer to page 20 for speed test results. The report also includes summary tables at the back that show the results for easy reference.

This report provides an overview of the findings from data collected between 1st July and 31st July 2023.

Contents

Overview

This report presents the key indicators of consumer internet performance in New Zealand from testing during July 2023.

Highlights include:

1. Reporting application performance by plan, including an updated view of Netflix and YouTube performance.

2. Continued benchmarking of LEO satellite performance against ADSL, VDSL, 4G Fixed Wireless, Fibre 300, Fibre Max and HFC Max plans, including gaming, video conferencing, video streaming and social media.

3. Improvements to average download speeds for MyRepublic's Fibre Max plan, especially during peak hours. This is the last time MyRepublic will be included in a report, as they are no longer providing broadband services in New Zealand following the sale of their broadband customer base to 2degrees.

This is the third report in the next phase of the Measuring Broadband New Zealand (MBNZ) programme, which will cover more providers and technologies, and expands analysis into rural areas that do not have access to Fibre broadband services. Previous reports released by the MBNZ programme can be found [here](1)[1].

This report draws on testing from a wider range of providers including Contact Energy, Farmside, Inspire Net, Lightwire, Netspeed, Sky New Zealand, Starlink, UniFone, Wireless Nation and WIZWireless. There are a range of other RSPs to choose from who are not currently included in the testing, and we encourage Kiwis to shop around.

The MBNZ programme has a code of conduct to ensure that the parties involved 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 the signatories is included in the code, including the Commission and SamKnows. The updated code of conduct was circulated to parties for signing on 15 September 2023, and will be published online in due course. All tested RSPs complied with the current code of conduct, including validation of the data used in this report. You can see the current code of conduct on our website [here](2)[2].

---

[1] https://comcom.govt.nz/regulated-industries/telecommunications/monitoring-the-telecommunications-market/monitoring-new-zealands-broadband/Reports-from-Measuring-Broadband-New-Zealand
[2] https://comcom.govt.nz/regulated-industries/telecommunications/regulated-services/consumer-protections-for-copper-withdrawal

Executive Summary

Application Performance

1. Results for LEO satellite application performance (online gaming, Netflix etc) are included in this report for the second time, allowing us to benchmark results against the previous report.

2. Over 99% of Fibre 300, Fibre Max and HFC Max plans were able to support 4 simultaneous UHD Netflix streams. LEO satellite is close behind with 98% able to support 4 streams, significantly more than VDSL and 4G Fixed Wireless (29% and 22% respectively). Only 27% of ADSL plans were able to support 1 UHD stream. Results for simultaneous HD streams are included in this report for the first time for ADSL and VDSL plans.

3. Online gaming shows consistent results for the games included in the previous report, with LEO satellite results sitting between VDSL and 4G Fixed Wireless. The three games testing to servers in North America showed much higher latencies across all technologies compared to games with gaming servers located in Australia, at a level which would impact user experience.

Benchmarking

1. MyRepublic have seen average download speeds increase compared to the previous report, especially during peak hours after making network improvements. This is the last time MyRepublic will be included in an MBNZ report, as they are no longer providing broadband services in New Zealand following the sale of their broadband customer base to 2degrees.

2. ADSL, VDSL, LEO satellite and Fibre plans see stable upload and download results compared to the previous reporting month.

Broadband Plan Comparison

This report includes broadband plans across a range of technologies and areas. The report shows performance comparison split across areas where Fibre broadband is available (urban areas), and where Fibre is not an option (rural areas). This comparison refines and expands our previous urban and rural view to better allow consumers to see how different technologies such as 4G Fixed Wireless perform in different areas. Areas with access to Fibre plans (Specified Fibre Areas) are the locations where Chorus will eventually be able to stop providing copper-based internet services (ADSL & VDSL plans), because Fibre is available. These are typically in more urban areas of New Zealand. More information on the withdrawal of copper-based internet services is available on the Commerce Commission website here[1].

ADSL - Remains suitable for traditional services like web browsing, email, and basic video streaming, particularly when there is 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 similar download/upload speeds to 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 simultaneous users or video conferences with a large number of participants. Fibre 300 will cover most users' requirements.

Fibre Max[2] - 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 plan. Performance can vary depending on RSP, and as Fibre 300 will support all modern

---

[1] https://comcom.govt.nz/regulated-industries/telecommunications/regulated-services/consumer-protections-for-copper-withdrawal
[2] All references to Fibre Max in this report encompass broadband plans 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, Mercury's Fibre Max, and One New Zealand's Fibre Max plans.

internet applications and multi-user households, Fibre Max is only recommended in cases where there is a genuine need for more bandwidth e.g. frequently uploading or downloading large files.

HFC (Cable) - Available in some areas (Wellington, Upper & Lower Hutt, the Kapiti Coast, and parts of Christchurch). HFC is also referred to as Cable and DOCSIS. One New Zealand is the only provider operating an HFC network in New Zealand. Two plans are available: UltraFast HFC Max and UltraFast HFC 200. HFC Max lines achieve similar download/upload performance to Fibre Max, however latency can be higher due to the difference between Cable and Fibre technologies. Due to the limited coverage of the Cable network, MBNZ does not collect enough data to report on the performance of the UltraFast HFC 200 plan.

4G Fixed Wireless - Can offer higher download speeds than ADSL, and on average similar speeds to VDSL. Users will experience higher latencies due to the cellular technology underlying these plans. 4G Fixed Wireless has the highest latency of all technologies, and also delivers lower download/upload speeds and more frequent dropouts than Fibre. This range of performance factors means 4G Fixed Wireless should not necessarily be preferred to Fibre on performance grounds, however in some areas 4G Fixed Wireless is the only option for consumers, and even in areas where Fibre is available there are other reasons consumers might choose this option (ease of installation for example).

LEO Satellite - Available in both rural and urban areas and is transmitted wirelessly using a satellite and ground based satellite dish. Typically higher download speeds than a Fibre 100 plan, but this can vary with location. While speeds can be expected to handle most applications, including video conferencing and streaming, it is not as consistent as fixed line broadband due to factors such as congestion and bad weather.

Other Broadband Plans - There are other plans available that are not currently reported on by MBNZ. Fibre 30, 50, 100 and 200 plans should be broadly consistent with results measured for Fibre 300 and Fibre Max for latency and reliability metrics. HFC 200 results should also be broadly consistent with HFC Max results for latency and reliability metrics. The main differences for these lower speed Fibre and HFC (Cable) plans would be lower download and upload speeds, meaning it would take longer to download and upload larger files, and they would be able to support fewer users at the same time when using video streaming services. For WISP and 5G Fixed Wireless plans it is not possible to give any firm advice around their suitability for different applications at this stage.

Application Performance

In this section we report on the performance of a number of common applications that consumers in New Zealand use on a regular basis.

Some results in this section are shown with error bars representing the 95% confidence interval for each plan. This means that if we had repeated our measurements 100 times, we would expect the result to have fallen within the black bands in at least 95 cases.

The transparent bars show plans with a sample size lower than we would typically include within reporting. These plans have larger error bars due to the smaller sample size and care should be taken when comparing these plans against others. We recommend consumers factor in the error bars when comparing plan averages, especially those with smaller sample sizes.

Netflix

Video streaming is a good example of an application where the quality of a user's experience is more affected by bandwidth (capacity) than by latency (lag). The Netflix measurement streams real video from the live Netflix service. Traffic for this service is often delivered from within broadband provider's network to improve performance.

Since higher quality video takes up more data than lower resolution video, higher bandwidth plans such as Fibre 300, HFC Max and Fibre Max can reliably stream from Netflix in Ultra High Definition (4K) more of the time.

Figure 1:

Plan	% that can Reliably Stream HD & UHD Videos from Netflix				
4G Fixed Wireless All Areas, n = 87	UHD 77%	UHD 60%	NETFLIX 39%	NETFLIX 30%	**1-2** simultaneous UHD video streams
	HD 100%	HD 97%	HD 93%	HD 84%	**4+** simultaneous HD video streams
ADSL Non-Fibre Areas, n = 44	NETFLIX 27%	NETFLIX 0%	NETFLIX 0%	NETFLIX 0%	**0** simultaneous UHD video streams
	HD 93%	HD 66%	HD 55%	NETFLIX 41%	**2-3** simultaneous HD video streams
VDSL Non-Fibre Areas, n = 37	UHD 92%	UHD 54%	NETFLIX 32%	NETFLIX 22%	**1-2** simultaneous UHD video streams
	HD 100%	HD 100%	HD 97%	HD 92%	**4+** simultaneous HD video streams
4G Fixed Wireless Non-Fibre Areas, n = 66	UHD 74%	UHD 55%	NETFLIX 38%	NETFLIX 30%	**1-2** simultaneous UHD video streams
	HD 100%	HD 97%	HD 92%	HD 83%	**4+** simultaneous HD video streams
LEO Satellite Non-Fibre Areas, n = 80	UHD 100%	UHD 100%	UHD 99%	UHD 98%	**4+** simultaneous UHD video streams
Fibre 300 Fibre Areas, n = 305	UHD 100%	UHD 100%	UHD 100%	UHD 100%	**4+** simultaneous UHD video streams
Fibre Max Fibre Areas, n = 336	UHD 100%	UHD 100%	UHD 100%	UHD 99%	**4+** simultaneous UHD video streams
HFC Max Fibre Areas, n = 22	UHD 100%	UHD 100%	UHD 100%	UHD 100%	**4+** simultaneous UHD video streams

MBNZ Winter Report, 2023

Key Observations

- 99% of households on Fibre 300, Fibre Max or HFC Max plans were able to support 4 simultaneous UHD Netflix streams.

- 98% of LEO satellite plans were able to stream 4 simultaneous UHD Netflix streams.

- 77% of households on Fixed Wireless across all areas of New Zealand were able to support a single UHD stream, and 84% of households could support at least 4 simultaneous HD streams. In non-Fibre areas, 74% of households were able to support a single UHD stream, and 83% of households could support at least 4 simultaneous HD streams.

- 92% of households on VDSL plans in non-Fibre areas were able to support a single UHD stream, and 92% could support 4 simultaneous HD streams. For ADSL households in non-Fibre areas, only 27% were able to support a single UHD stream, while 55% could support 3 simultaneous HD streams.

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 factor of how responsive social media applications will be, however there are other factors that can also influence performance.

Figure 2: **The Latency to Servers of Different Social Media Platforms.**
Average of household average latency to content servers, lower is better.
Fibre plans only.
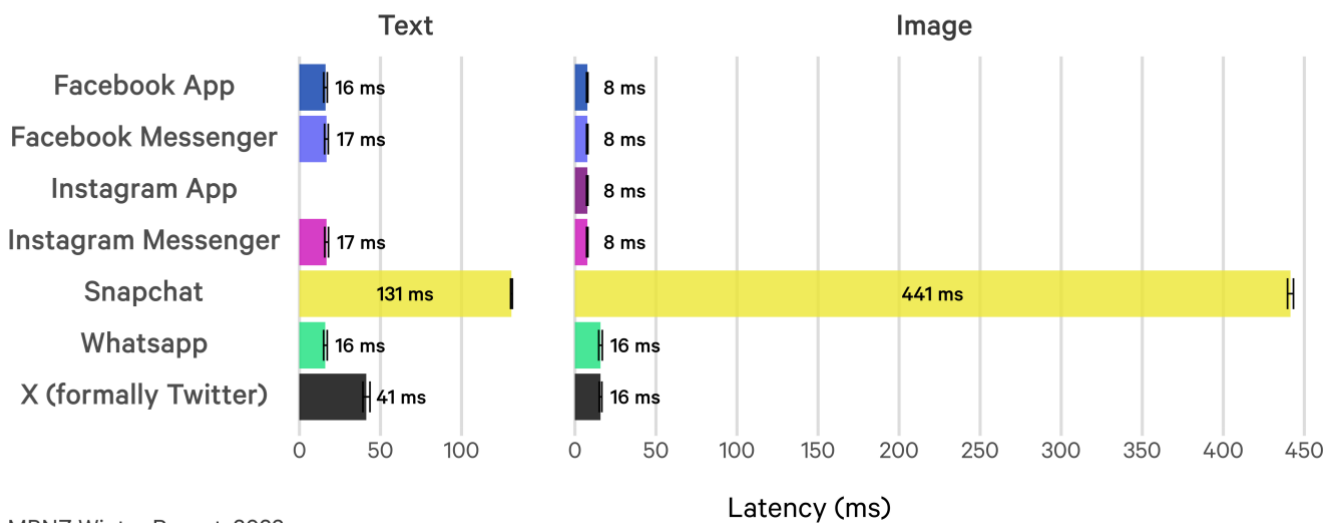
MBNZ Winter Report, 2023

Key Observations

- Latency values for all social media services remained consistent for Fibre plans compared to the previous report.

- Snapchat latencies remain higher than all other social media platforms tested for both Image and Text downlink. Consumers may notice a several second delay when using Snapchat, to download an image for example, compared to other social media platforms due to Snapchat's hosting location. This is outside the control of RSPs.

- Latency results are shown for Fibre plans only. Results for social media split by individual plans can be seen in the figure below, and results for all RSPs can be seen in table **3**.

Figure 3: The Latency to Servers of Different Social Media Platforms by Plan.

Average of household average latency to content servers, lower is better.

The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 45).

		Text	Image
ADSL n = 45	Facebook App	32 ms	23 ms
	Facebook Messenger	31 ms	23 ms
	Instagram App		23 ms
	Instagram Messenger	31 ms	23 ms
	Snapchat	149 ms	472 ms
	Whatsapp	31 ms	32 ms
	X (formally Twitter)	54 ms	33 ms
VDSL n = 46	Facebook App	27 ms	18 ms
	Facebook Messenger	27 ms	18 ms
	Instagram App		18 ms
	Instagram Messenger	27 ms	18 ms
	Snapchat	143 ms	460 ms
	Whatsapp	27 ms	26 ms
	X (formally Twitter)	60 ms	27 ms
4G Fixed Wireless n = 66	Facebook App	57 ms	46 ms
	Facebook Messenger	57 ms	46 ms
	Instagram App		46 ms
	Instagram Messenger	57 ms	46 ms
	Snapchat	167 ms	503 ms
	Whatsapp	56 ms	56 ms
	X (formally Twitter)	67 ms	53 ms
LEO Satellite n = 84	Facebook App	40 ms	33 ms
	Facebook Messenger	44 ms	33 ms
	Instagram App		33 ms
	Instagram Messenger	48 ms	33 ms
	Snapchat	158 ms	476 ms
	Whatsapp	38 ms	38 ms
	X (formally Twitter)	95 ms	46 ms
Fibre 300 n = 284	Facebook App	15 ms	8 ms
	Facebook Messenger	16 ms	8 ms
	Instagram App		8 ms
	Instagram Messenger	16 ms	8 ms
	Snapchat	131 ms	442 ms
	Whatsapp	15 ms	15 ms
	X (formally Twitter)	43 ms	17 ms
Fibre Max n = 316	Facebook App	17 ms	7 ms
	Facebook Messenger	18 ms	7 ms
	Instagram App		7 ms
	Instagram Messenger	18 ms	7 ms
	Snapchat	130 ms	441 ms
	Whatsapp	17 ms	16 ms
	X (formally Twitter)	41 ms	15 ms
HFC Max[1] n = 22	Facebook App	21 ms	12 ms
	Facebook Messenger	22 ms	12 ms
	Instagram App		12 ms
	Instagram Messenger	22 ms	12 ms
	Snapchat	141 ms	456 ms
	Whatsapp	21 ms	21 ms
	X (formally Twitter)	45 ms	20 ms

Latency (ms)

MBNZ Winter Report, 2023

[1]Results for HFC Max are based on a sample size of 22 Whiteboxes. The low sample size can be attributed to the relatively small coverage area of One New Zealand's Cable network and the competing influence of Copper, Fibre and Fixed Wireless in those areas.

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 the users' device and the server where the game is hosted, then disruptive stuttering or lag will result. This is usually 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.

Figure 4: The Latency to Various Online Gaming Servers.
Average of household average latency to gaming servers, lower is better.
Fibre Plans Only. Lower latency means that lag is less likely.
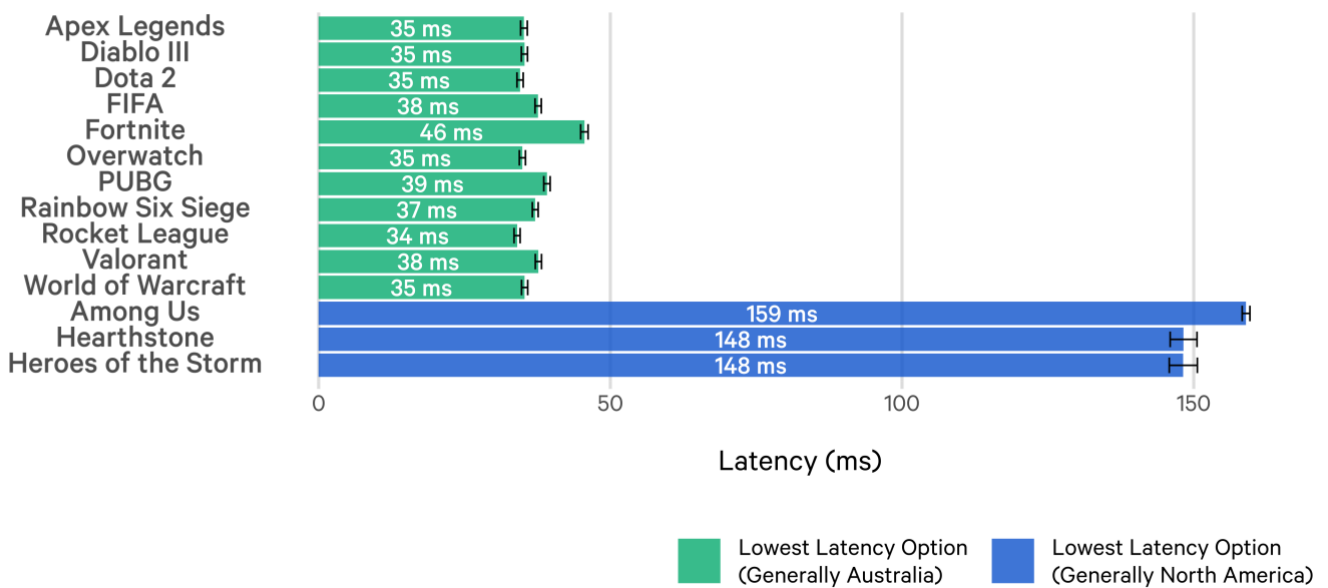
MBNZ Winter Report, 2023

Key Observations

- Among Us, Hearthstone and Heroes of the Storm all tested to servers in North America. These games show average latencies around 150 ms, much higher than the remaining games which tested to servers located in Australia.

- The impact of latency on consumers also depends on the type of game being played. For example, high latency would be noticed more by consumers playing first person shooter games than turn based strategy games, and could have a negative impact on game play experience if it was too high.

- The latency results above are shown for Fibre plans only. Results for latency split by individual plans can be seen in the figure below, and results for all RSPs can be seen in table **4**.

Figure 5: The Latency to Various Online Gaming Servers by Plan.

Average of household average latency to gaming servers, lower is better
The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 36).
Lower latency means that lag is less likely.

ADSL n = 36

Game	Latency
Apex Legends	54 ms
Diablo III	56 ms
Dota 2	
FIFA	57 ms
Fortnite	80 ms
Overwatch	55 ms
PUBG	62 ms
Rainbow Six Siege	57 ms
Rocket League	52 ms
Valorant	57 ms
World of Warcraft	52 ms
Among Us	174 ms
Hearthstone	165 ms
Heroes of the Storm	161 ms

VDSL n = 37

Game	Latency
Apex Legends	48 ms
Diablo III	48 ms
Dota 2	65 ms
FIFA	50 ms
Fortnite	60 ms
Overwatch	48 ms
PUBG	53 ms
Rainbow Six Siege	49 ms
Rocket League	46 ms
Valorant	50 ms
World of Warcraft	47 ms
Among Us	168 ms
Hearthstone	161 ms
Heroes of the Storm	159 ms

4G Fixed Wireless n = 58

Game	Latency
Apex Legends	75 ms
Diablo III	75 ms
Dota 2	88 ms
FIFA	80 ms
Fortnite	89 ms
Overwatch	76 ms
PUBG	80 ms
Rainbow Six Siege	75 ms
Rocket League	72 ms
Valorant	77 ms
World of Warcraft	73 ms
Among Us	202 ms
Hearthstone	195 ms
Heroes of the Storm	189 ms

LEO Satellite n = 78

Game	Latency
Apex Legends	66 ms
Diablo III	67 ms
Dota 2	71 ms
FIFA	71 ms
Fortnite	81 ms
Overwatch	66 ms
PUBG	73 ms
Rainbow Six Siege	68 ms
Rocket League	64 ms
Valorant	70 ms
World of Warcraft	65 ms
Among Us	190 ms
Hearthstone	175 ms
Heroes of the Storm	176 ms

Fibre 300 n = 233

Game	Latency
Apex Legends	36 ms
Diablo III	36 ms
Dota 2	35 ms
FIFA	38 ms
Fortnite	46 ms
Overwatch	36 ms
PUBG	40 ms
Rainbow Six Siege	38 ms
Rocket League	35 ms
Valorant	38 ms
World of Warcraft	36 ms
Among Us	159 ms
Hearthstone	153 ms
Heroes of the Storm	153 ms

Fibre Max n = 293

Game	Latency
Apex Legends	35 ms
Diablo III	35 ms
Dota 2	34 ms
FIFA	37 ms
Fortnite	45 ms
Overwatch	34 ms
PUBG	39 ms
Rainbow Six Siege	37 ms
Rocket League	34 ms
Valorant	37 ms
World of Warcraft	35 ms
Among Us	159 ms
Hearthstone	144 ms
Heroes of the Storm	144 ms

HFC Max[1] n = 20

Game	Latency
Apex Legends	
Diablo III	47 ms
Dota 2	46 ms
FIFA	48 ms
Fortnite	57 ms
Overwatch	46 ms
PUBG	49 ms
Rainbow Six Siege	47 ms
Rocket League	45 ms
Valorant	47 ms
World of Warcraft	46 ms
Among Us	163 ms
Hearthstone	174 ms
Heroes of the Storm	175 ms

Legend:
- Lowest Latency Option (Generally Australia)
- Lowest Latency Option (Generally North America)

Latency (ms)

MBNZ Winter Report, 2023

[1]Results for HFC Max are based on a sample size of 20 Whiteboxes. The low sample size can be attributed to the relatively small coverage area of One New Zealand's Cable network and the competing influence of Copper, Fibre and Fixed Wireless in those areas.

Video Conferencing

Latency is not the only factor impacting on the quality of a video call. Packet loss and jitter can result in stuttering and dropouts, and these are not captured in the round-trip times measured here. Application specific attributes such as audio/video encoding and proprietary communication protocols can lead to different performance characteristics for different services.

Figure 6: **The Latency to Servers of Different Video Conferencing Services using Free and Paid Accounts.**

Average of household average latency, lower is better. Fibre plans only.
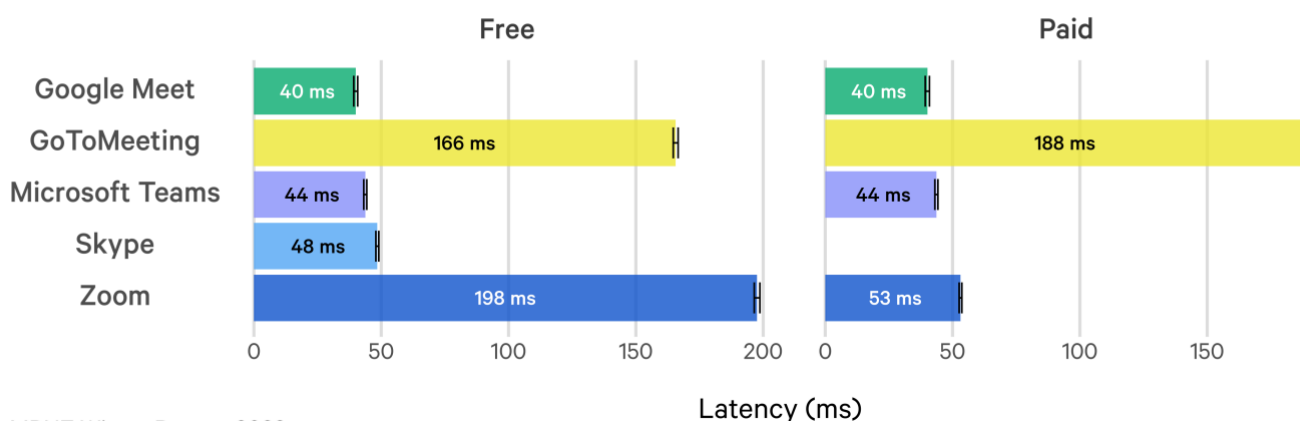
MBNZ Winter Report, 2023

Key Observations

- Zoom provides paid subscribers with geographically nearer servers than unpaid subscribers resulting in lower latency for paid subscribers. Video conferencing services that use international servers usually see similar performance, however as the traffic is travelling further and subject to international routing, this could account for small differences in consumer experience like users talking over one another more frequently when using these unpaid services.

- Latency is only one factor that affects video conferencing quality of experience. Other differences between free and paid accounts such as holding longer meetings or inviting more participants are not included here.

- The latency results above are shown for Fibre plans only. Results for all video conferencing split by individual plans can be seen in the figure below, and results for all RSPs can be seen in table **5**. Results for Webex are not included in this report as we make improvements to the test to make it more relevant for consumers.

Figure 7: The Latency to Servers of Different Video Conferencing Services using Free and Paid Accounts by Plan.

Average of household average latency, lower is better.

The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 23).

| Plan	Service	Free	Paid
ADSL n = 46	Google Meet	67 ms	67 ms
	GoToMeeting	181 ms	205 ms
	Microsoft Teams	63 ms	63 ms
	Skype	67 ms	
	Zoom	215 ms	71 ms
VDSL n = 48	Google Meet	51 ms	51 ms
	GoToMeeting	172 ms	200 ms
	Microsoft Teams	55 ms	55 ms
	Skype	60 ms	
	Zoom	209 ms	64 ms
4G Fixed Wireless n = 69	Google Meet	93 ms	94 ms
	GoToMeeting	206 ms	235 ms
	Microsoft Teams	77 ms	78 ms
	Skype	82 ms	
	Zoom	248 ms	88 ms
LEO Satellite n = 84	Google Meet	64 ms	63 ms
	GoToMeeting	167 ms	209 ms
	Microsoft Teams	67 ms	67 ms
	Skype	72 ms	
	Zoom	235 ms	80 ms
Fibre 300 n = 292	Google Meet	40 ms	40 ms
	GoToMeeting	165 ms	190 ms
	Microsoft Teams	44 ms	44 ms
	Skype	49 ms	
	Zoom	200 ms	54 ms
Fibre Max n = 324	Google Meet	40 ms	40 ms
	GoToMeeting	166 ms	187 ms
	Microsoft Teams	44 ms	44 ms
	Skype	48 ms	
	Zoom	196 ms	53 ms
HFC Max[1] n = 23	Google Meet	51 ms	51 ms
	GoToMeeting	169 ms	203 ms
	Microsoft Teams	52 ms	52 ms
	Skype	57 ms	
	Zoom	210 ms	61 ms

Latency (ms)

MBNZ Winter Report, 2023

[1]Results for HFC Max are based on a sample size of 23 Whiteboxes. The low sample size can be attributed to the relatively small coverage area of One New Zealand's Cable network and the competing influence of Copper, Fibre and Fixed Wireless in those areas.

YouTube

The YouTube measurement streams a real video from the live YouTube service. Traffic for this service is often delivered from within the broadband provider's networks, through the use of Google Global Caches (GGCs). These are servers installed by the broadband provider inside their network to cache YouTube and other Google content to improve performance.

Figure 8: Highest Quality that can be streamed over YouTube by Plan
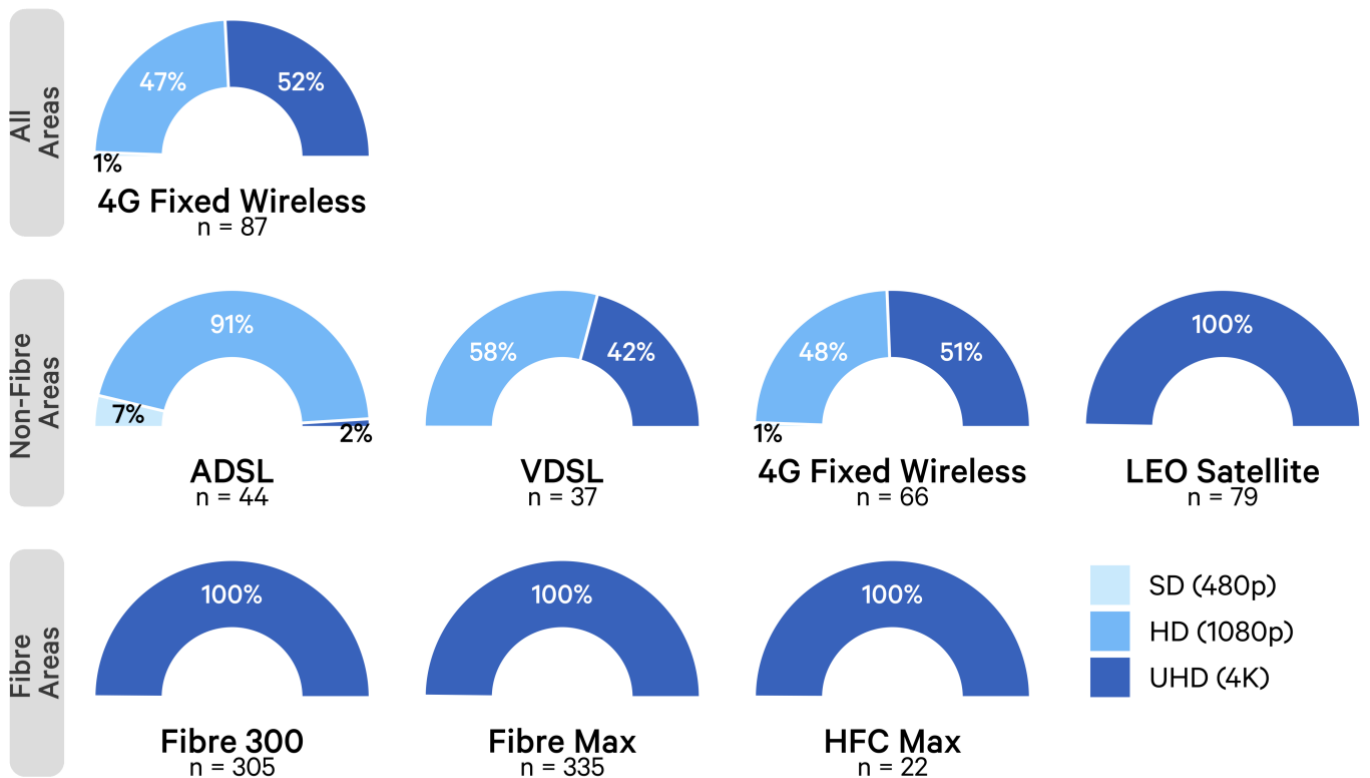
MBNZ Winter Report, 2023

Key Observations

- 52% of Fixed Wireless units across New Zealand were able to stream an UHD YouTube video.

- 42% of VDSL units in non-Fibre areas were able to stream an UHD video, compared to only 2% of ADSL units.

- 100% of LEO satellite units in non-Fibre areas, and Fibre 300, Fibre Max and HFC Max units in Fibre areas were able to stream an UHD YouTube video.
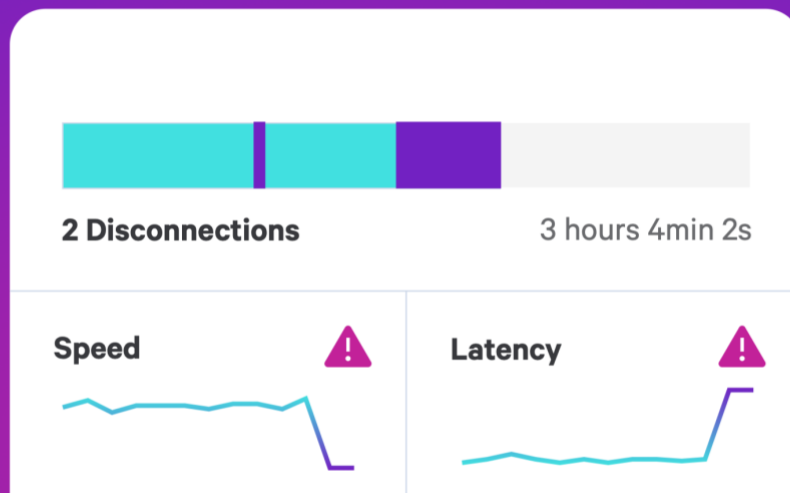
Quality of Service & Reliability

Disconnections

Realtime applications like video calls rely on a consistent 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. Instead, the main reasons for network dropouts relate to congestion and the configuration of network equipment. The following graph compares *daily* disconnection rates across plans. This is an updated metric from the previous report, which showed *hourly* disconnection rates. If consumers wanted to compare disconnection rates to the previous report, they should divide the disconnection rates shown below by 24.

This graph shows medians across households. Taking Fixed Wireless as an example 50% of households will experience no more than 2 disconnections per day 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 disconnection rates far above the median, whereas Fixed Wireless plans are more likely to have results close to the median.

Figure 9: Median Daily Disconnection Rates. Lower is Better.

Medians of household daily 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.
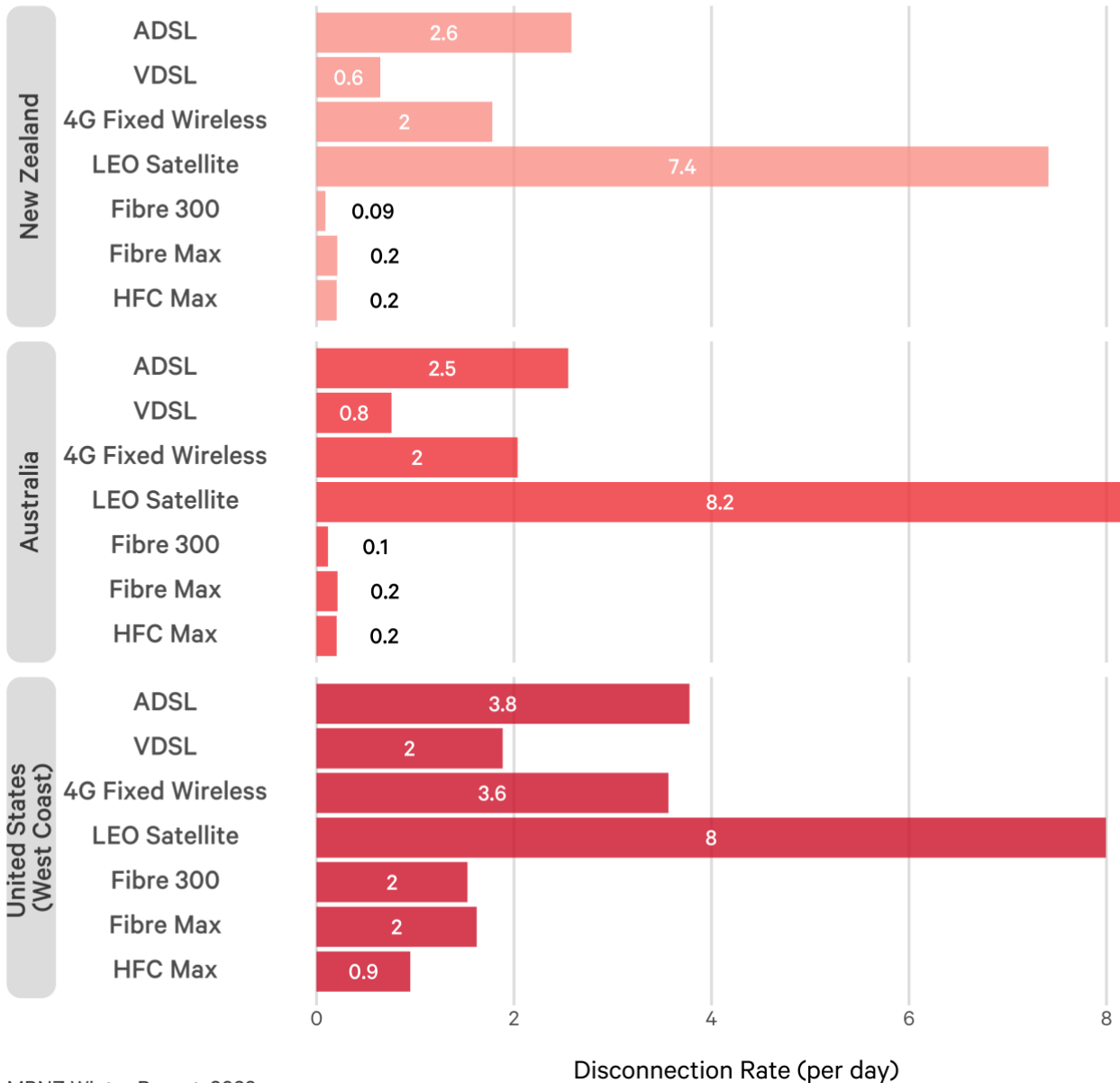
MBNZ Winter Report, 2023

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 four undersea cable networks which carry traffic to and from New Zealand across the Tasman Sea and the Pacific.

The results for disconnections remain broadly consistent when compared to the previous report, and the level of disconnections is 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.

- Satellite experiences a considerably higher rate of disconnections than most VDSL, Fixed Wireless, Fibre, and Cable connections. Satellite customers will often see a small increase in packet loss when connecting to moving satellites however this is not at a level that would unduly affect user experience for LEO satellite customers. Disconnections for Fibre plans remain low.

- Traffic going overseas is more likely to be lost than traffic remaining within New Zealand.

Speed Tests - Download

Figures **10** and **14** give an overview of download and upload speed across the country. These are included in every report to provide a benchmark that can be tracked over time. These results are split across Fibre areas, where Fibre is available to consumers and non-Fibre areas where Fibre is not available. There were not enough Whiteboxes to report ADSL and VDSL results in Fibre areas.

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

Figure 10: Average Download Speeds by Plan

Average of monthly household weighted averages. Peak hours are Monday - Friday, 7pm - 11pm. The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 87). Error bars show 95% confidence intervals of the mean.
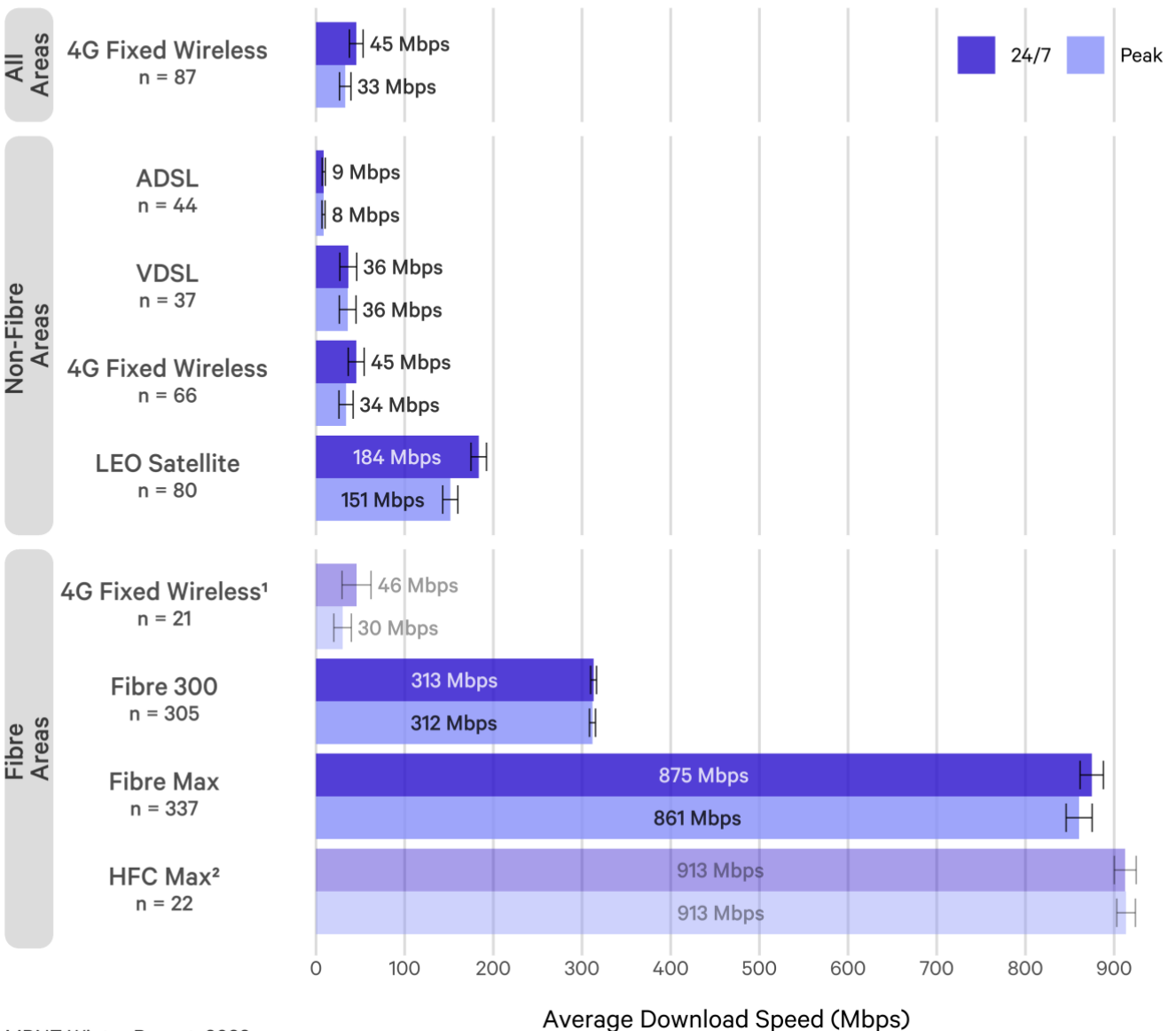
MBNZ Winter Report, 2023

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.

The transparent bars (e.g HFC Max and 4G Fixed Wireless in Fibre areas) show plans with a sample size lower than we would typically include within reporting. These plans have larger error bars due to the smaller sample size and care should be taken when comparing these plans against others. We recommend consumers factor in the error bars when comparing plan averages, especially those with smaller sample sizes.

Key Observations

- 4G Fixed Wireless results in Fibre areas[1] and HFC Max[2] results are based on a smaller sample size than we would typically include within reporting, but are sufficient to indicate performance while we add more Whiteboxes to enable more definite reporting.

- ADSL and VDSL results are consistent with those seen in the previous report, showing similar results during peak hours. Fixed Wireless average download speeds are similar to VDSL, but show a larger decrease in speeds during peak hours.

- Fibre 300 and Fibre Max results are also broadly similar to the previous report, with Fibre 300 seeing average speeds above 300 Mbps, including during peak hours. Fibre Max average download speeds are consistent with previous results. RSP specific results for Fibre Max can be found in Figure **17**.

---

[1] Results for 4G Fixed Wireless are based on a sample size of 21 Whiteboxes in Fibre areas. The lower sample size can be attributed to Fixed Wireless being a new area of focus for the MBNZ programme and we hope to increase this number for the Spring Report
[2] Results for HFC Max are based on a sample size of 22 Whiteboxes. The low sample size can be attributed to the relatively small coverage area of One New Zealand's Cable network and the competing influence of Copper, Fibre and Fixed Wireless in those areas.

Distribution of Fibre Max Results

Figure 11: Download Speeds on Fibre Max Plans.

Distribution of test results across 337 Fibre Max units.

Average (24/7) download speeds for Fibre Max plans is 875 Mbps; this varies by RSP and over time.
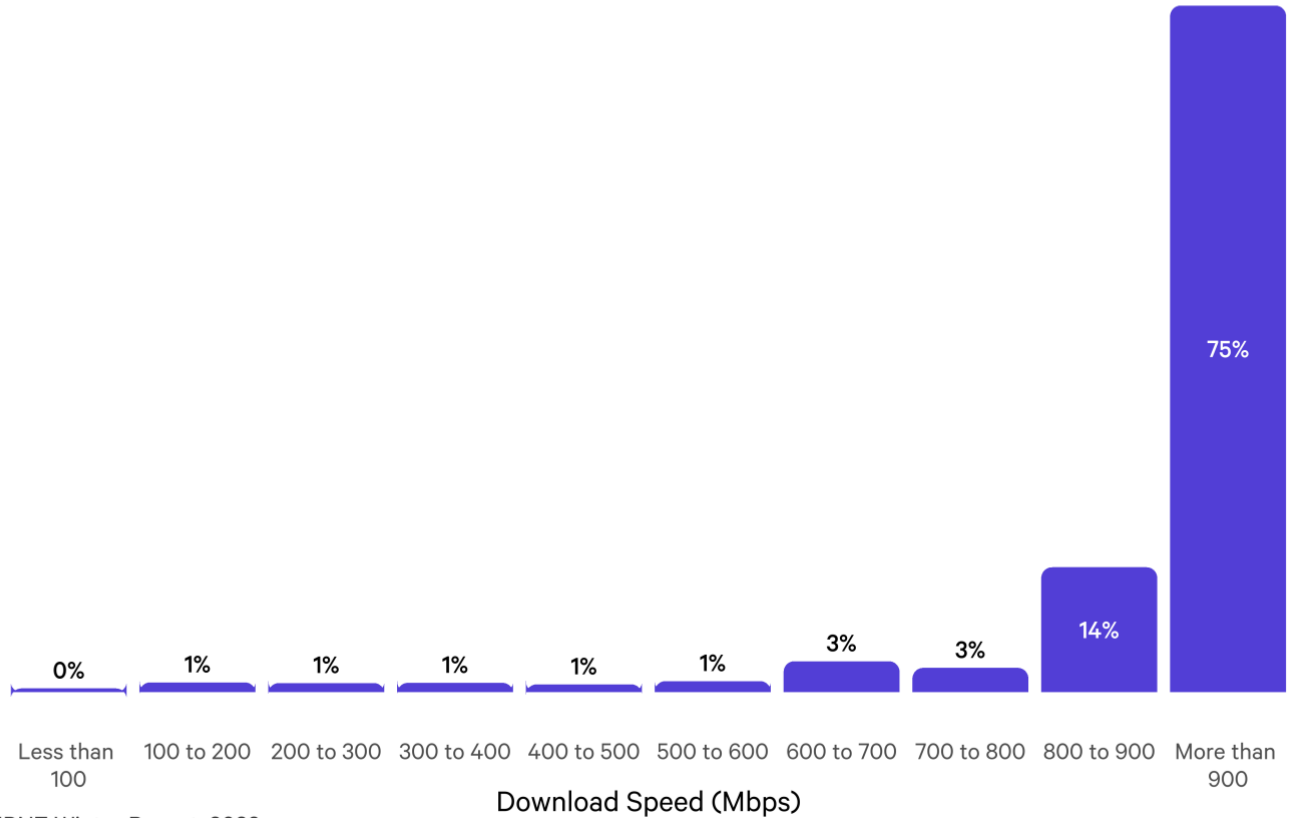
MBNZ Winter Report, 2023

Key Observations

- 75% of speed tests run over Fibre Max lines achieved download speeds above 900 Mbps, consistent with the previous report.

Distribution of 4G Fixed Wireless Results

Figure 12: Download Speeds on 4G Fixed Wireless Plans.

Distribution of test results. Average (24/7) download speeds for 4G Fixed Wireless plans is 45 Mbps in non-Fibre areas and 46 Mbps in Fibre areas; this varies by RSP and over time.
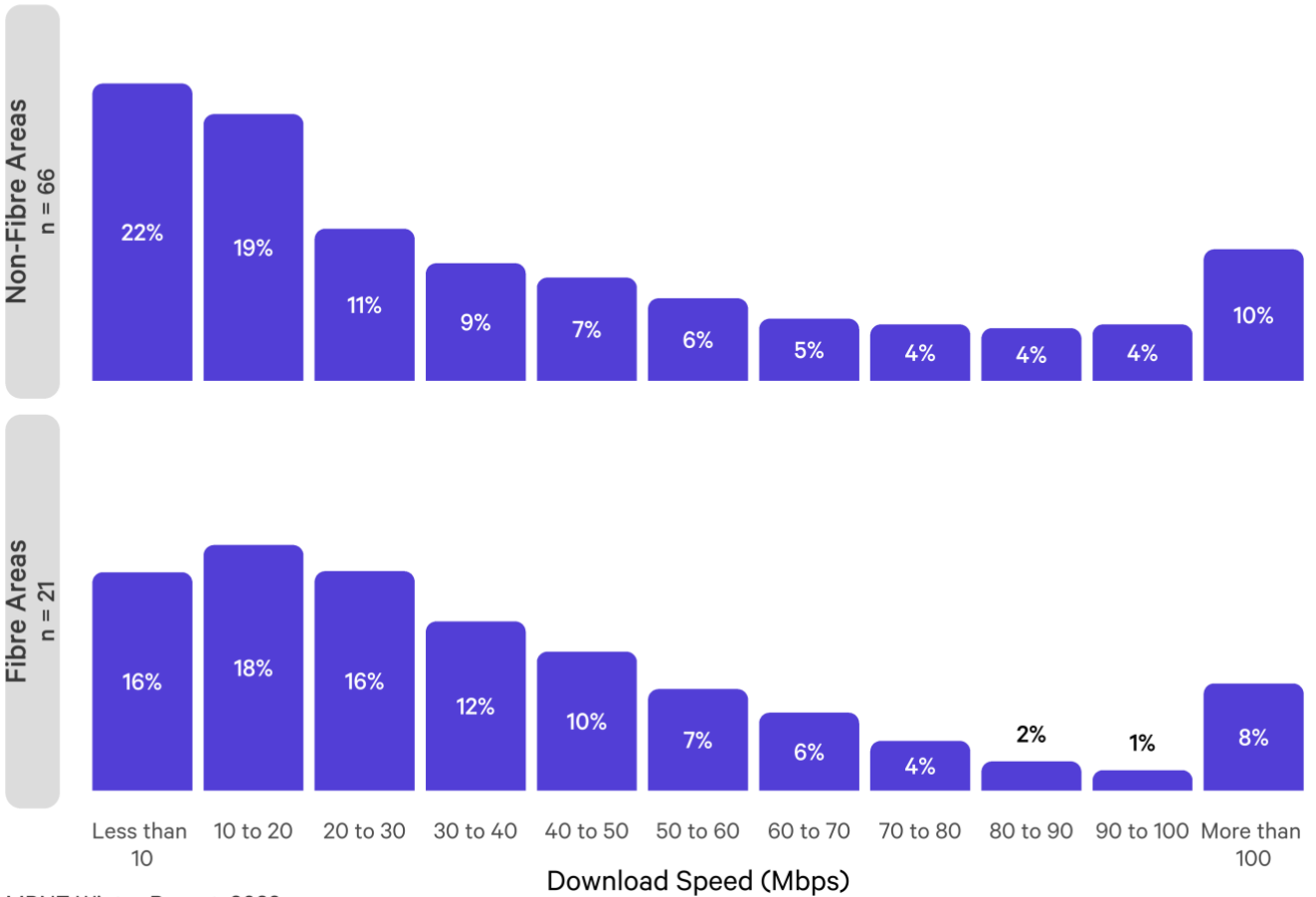
MBNZ Winter Report, 2023

Key Observations

- Overall average speeds for 4G Fixed Wireless are 45 Mbps in non-Fibre areas and 46 Mbps in Fibre areas.

- 41% of speed tests run over Fixed Wireless lines achieve download speeds of less than 20 Mbps in non-Fibre areas, compared to 34% in Fibre areas.

- 8% of download speed tests in Fibre areas achieved speeds of 100 Mbps or higher.

Distribution of LEO Satellite Results

Figure 13: Download Speeds on LEO Satellite Plans.

Distribution of test results across 80 Satellite units.

Average (24/7) download speeds for LEO Satellite plans is 184 Mbps in non-Fibre areas; this varies over time
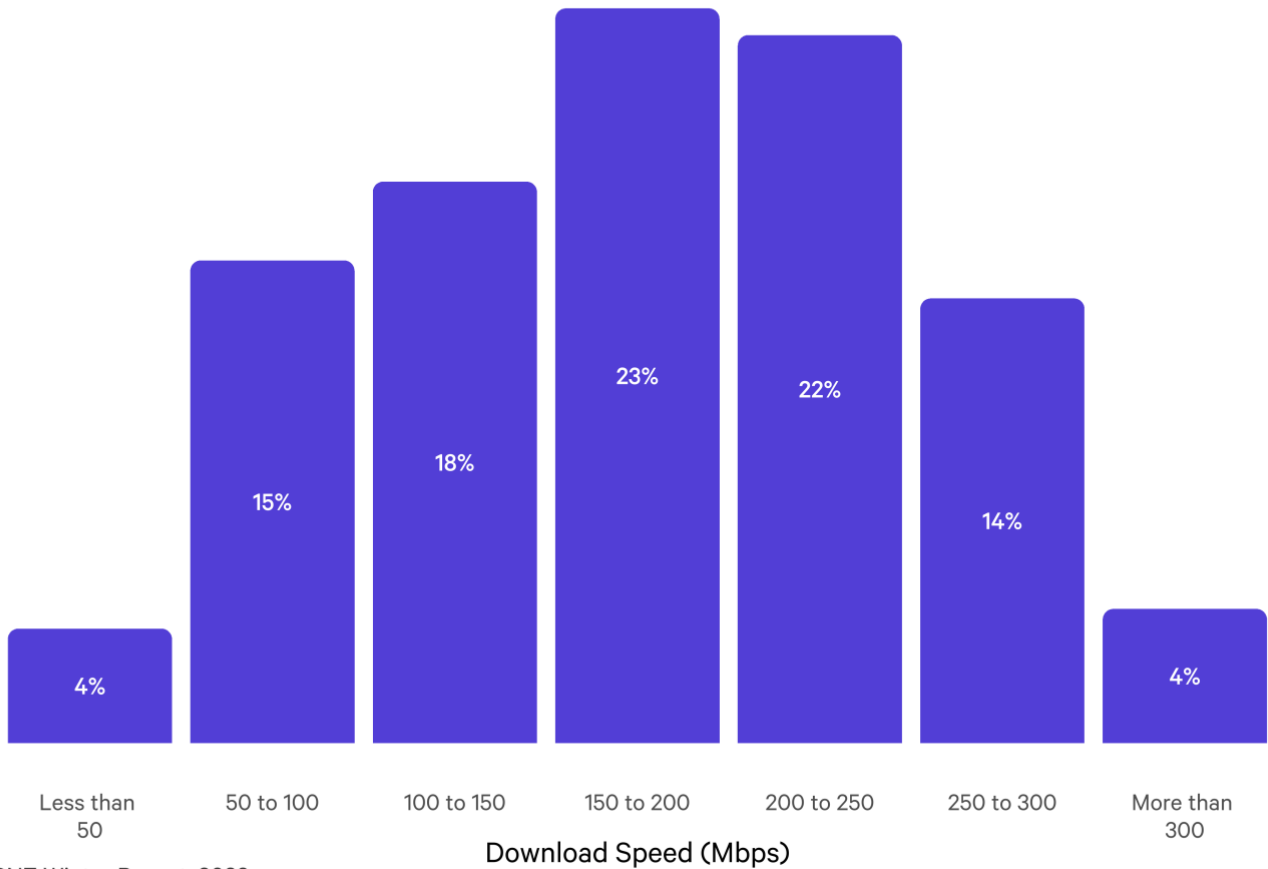
MBNZ Winter Report, 2023

Key Observations

- Only 4% of speed tests run over LEO satellite achieve download speeds of less than 50 Mbps in non-Fibre areas, compared to 7% in the previous report.

- Over 80% of download tests in non-Fibre areas achieved speeds of 100 Mbps or higher.

- 40% of download speed tests in non-Fibre areas achieved speeds of 200 Mbps or higher, an improvement on 34% previously.

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 14: Average Upload Speeds by Plan

Average (24/7) of monthly household weighted averages. Peak hours are Monday - Friday, 7pm - 11pm. The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 87). Error bars show 95% confidence intervals of the mean.
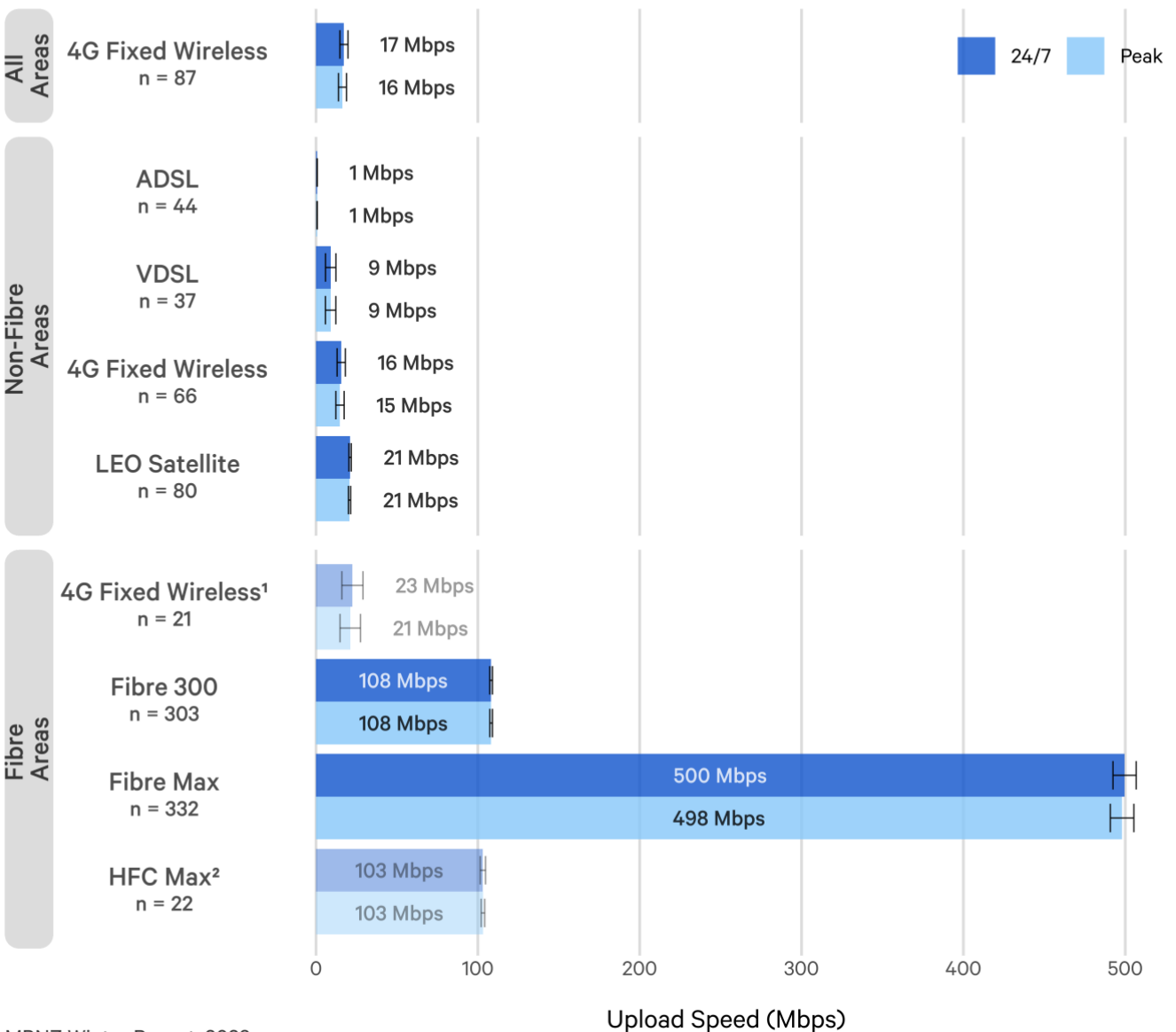
MBNZ Winter Report, 2023

Key Observations

- The average upload speeds are consistent with those seen in the previous report, with all technologies seeing very little decrease in average upload speeds during peak hours.

- 4G Fixed Wireless results in Fibre areas[1] and HFC Max[2] results are based on a smaller sample size than we would typically include within reporting, but are sufficient to indicate performance while we add more Whiteboxes to enable more definite reporting. This accounts for the larger confidence intervals for these plans. We should caveat that consumers should be careful about directly comparing these plans with others, as there is more uncertainty around the average speeds for these plans, and they should factor in the error bars into their comparison.

---

[1] Results for 4G Fixed Wireless are based on a sample size of 21 Whiteboxes in Fibre areas. The lower sample size can be attributed to Fixed Wireless being a new area of focus for the MBNZ programme and we hope to increase this number for the Spring Report

[2] Results for HFC Max are based on a sample size of 22 Whiteboxes. The low sample size can be attributed to the relatively small coverage area of One New Zealand's Cable network and the competing influence of Copper, Fibre and Fixed Wireless in those areas.

Latency

Latency is another key factor that should be considered when assessing broadband performance. The time it takes to transmit and receive messages between households and servers 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 **15** only includes results relating to servers hosted in New Zealand.

Figure 15: Average Latency to Test Servers by Plan. Lower is Better.

Average of monthly household weighted averages. Peak hours are Monday - Friday, 7pm - 11pm. The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 87). Error bars show 95% confidence intervals of the mean.
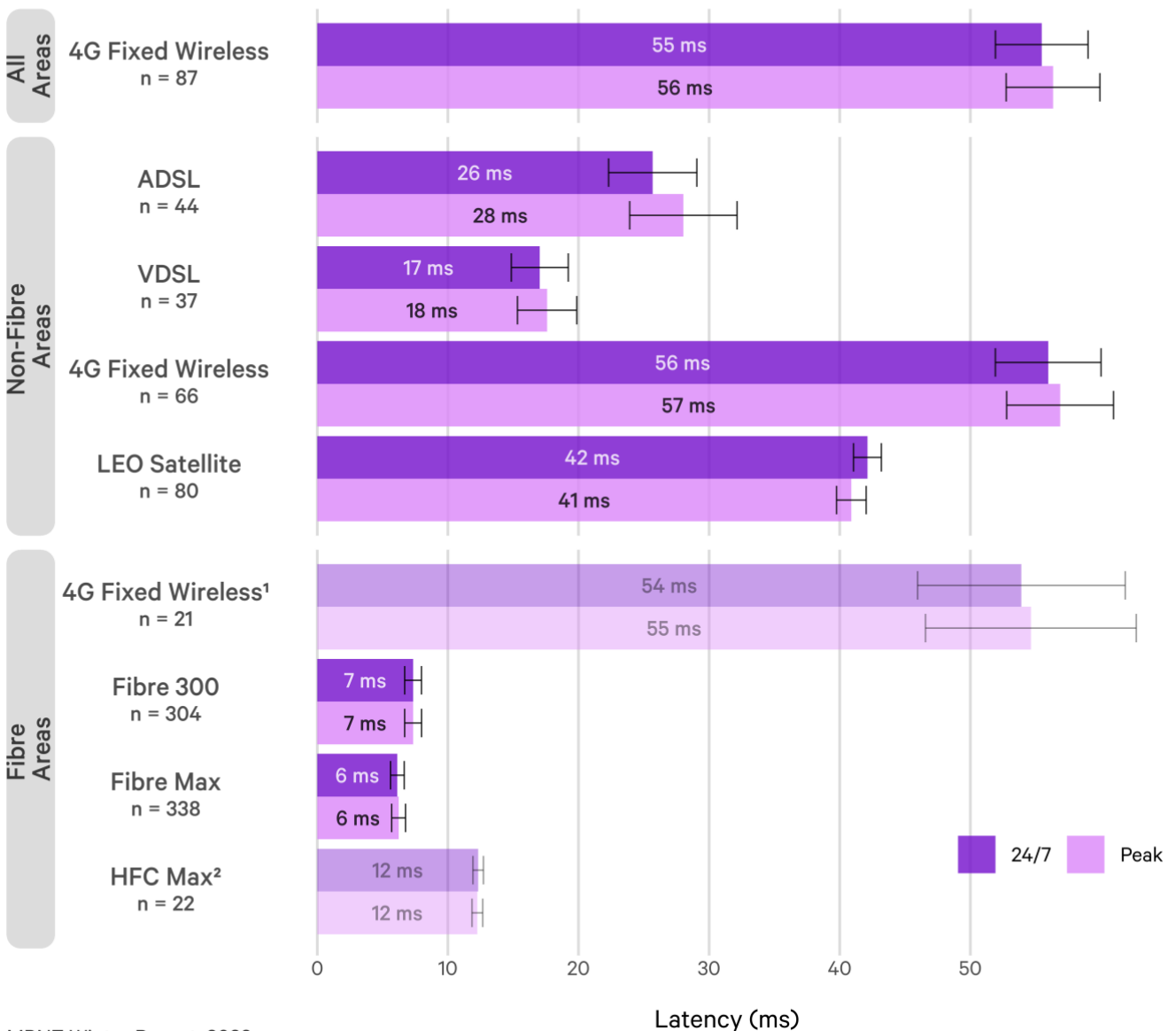
Some plans show a wider variation of latency than others: latency across a Fixed Wireless connection will generally be more variable than over a Fibre line. The impact of latency on user experience relating to specific applications is investigated earlier in the report.

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 the more recent infrastructure that underpins the Fibre network.

- LEO satellite connections have higher latencies than Copper (ADSL, VDSL) but lower latency than 4G Fixed Wireless plans in non-Fibre areas.

- Cable connections have a higher latency than Fibre on average.

- 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.

- 4G Fixed Wireless results in Fibre areas[1] and HFC Max[2] results are based on a smaller sample size than we would typically include within reporting, but are sufficient to indicate performance while we add more Whiteboxes to enable more definite reporting. This accounts for the larger confidence intervals for these plans. We should caveat that consumers should be careful about directly comparing these plans with others, as there is more uncertainty around the average speeds for these plans, and they should factor in the error bars into their comparison.

---

[1] Results for 4G Fixed Wireless are based on a sample size of 21 Whiteboxes in Fibre areas. The lower sample size can be attributed to Fixed Wireless being a new area of focus for the MBNZ programme and we hope to increase this number for the Spring Report
[2] Results for HFC Max are based on a sample size of 22 Whiteboxes. The low sample size can be attributed to the relatively small coverage area of One New Zealand's Cable network and the competing influence of Copper, Fibre and Fixed Wireless in those areas.

Latency Under Load

The latency under load test measures the latency when 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.

Figure 16: Average Latency Under Load to Test Servers by Plan. Lower is Better.

Averages of monthly household averages.The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 21).

Legend: Idle | Downstream Load | Upstream Load

All Areas

4G Fixed Wireless (n = 87)
- 55 ms
- 400 ms
- 473 ms

Non-Fibre Areas

ADSL (n = 44)
- 25 ms
- 145 ms
- 1328 ms

VDSL (n = 37)
- 17 ms
- 69 ms
- 786 ms

4G Fixed Wireless (n = 66)
- 56 ms
- 393 ms
- 481 ms

LEO Satellite (n = 80)
- 42 ms
- 71 ms
- 41 ms

Fibre Areas

4G Fixed Wireless (n = 21)
- 54 ms
- 422 ms
- 446 ms

Fibre 300 (n = 303)
- 7 ms
- 44 ms
- 26 ms

Fibre Max (n = 330)
- 6 ms
- 20 ms
- 16 ms

HFC Max[1] (n = 22)
- 12 ms
- 60 ms
- 41 ms

Latency (ms)

MBNZ Winter Report, 2023

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.

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.

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 plan compared to Fibre Max results. Both Fibre plans have lower latency results for idle latency and latency under downstream and upstream load than HFC Max.

- LEO satellite plans see a small increase in latency under load when download tests are running. Latency under upload shows a smaller increase on idle latency for satellite plans.

- The impacts of latency on specific application performance are discussed earlier in the report (Social Media, Online Games, Netflix).

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 17: Average Fibre Max Download Speed by RSP

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm.
The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 121).
Error bars show 95% confidence intervals of the mean.
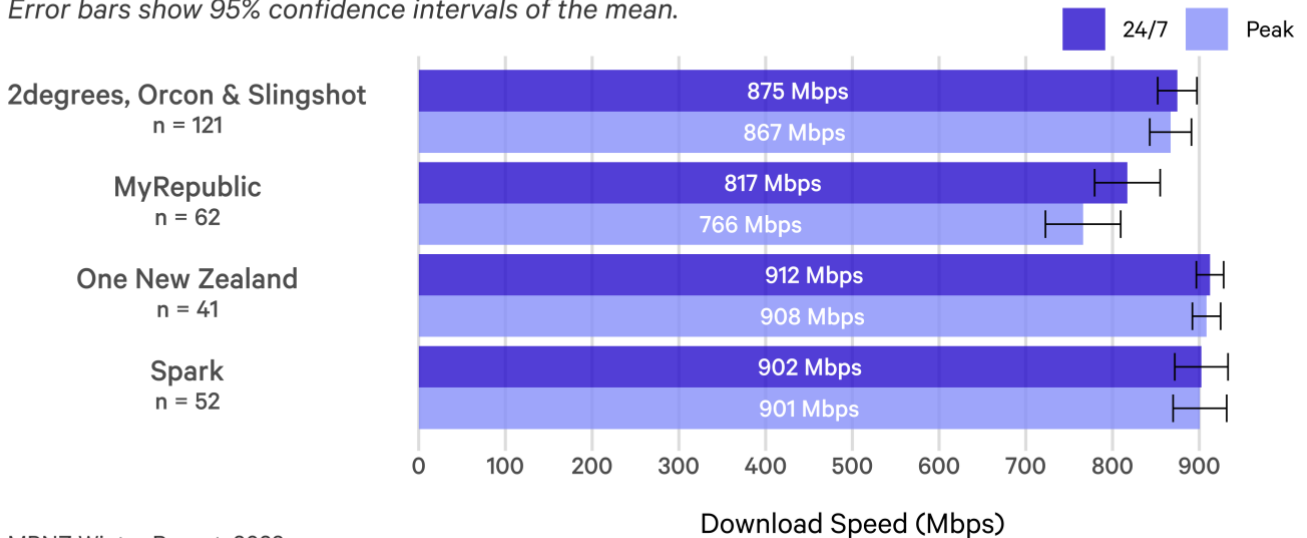
MBNZ Winter Report, 2023

Key Observations

- During July, MyRepublic made improvements to their network resulting in an increase in their average download speeds for Fibre Max plans of over 100 Mbps since the last report, especially during peak hours. Average download speeds for MyRepublic increased to 845 Mbps once the change was made during July, with speeds during peak hours increasing to 828 Mbps. This is the last time MyRepublic will be included in an MBNZ report, as they are no longer providing broadband services in New Zealand following the sale of their broadband customer base to 2degrees.

- For all other RSPs, the results are broadly in line with those seen in the previous report, showing similar average download speeds across all hours and peak hours.

- There were not enough Fibre Max volunteers connected to Contact Energy, Inspire Net, Sky NZ or Mercury during the measurement period to report results for these RSP. All tested RSPs are included in the overall Fibre Max results shown in Figures 1-3.

Fibre Max Breakdown by Region

Figure 18: Average Fibre Max Download Speed by Region

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm.
The number of Whiteboxes contributing to each result is shown under each geographical area (eg n = 337)
Error bars show 95% confidence intervals of the mean.
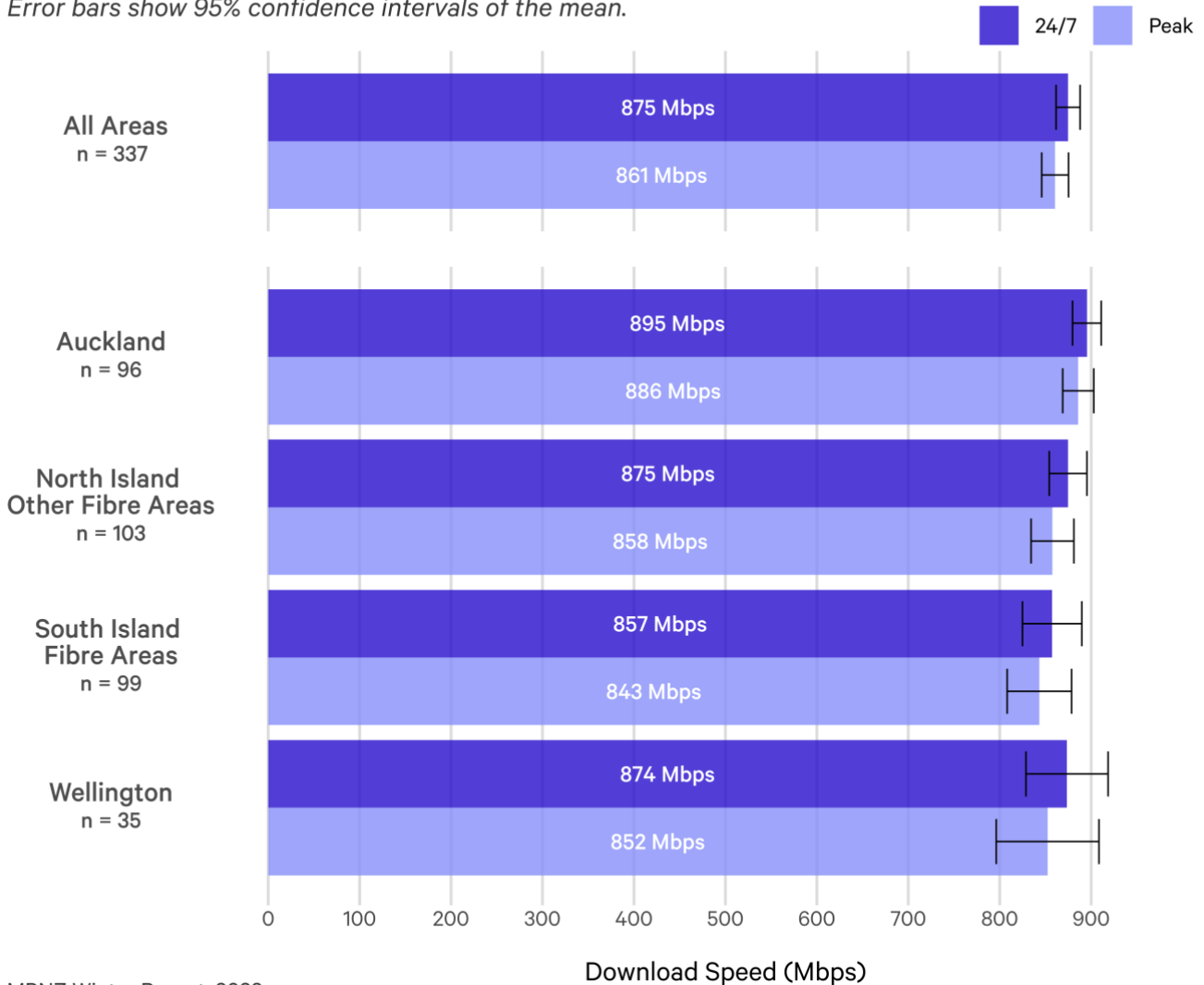
Key Observations

- 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.

MBNZ Winter Report, 2023

Fibre 300 Breakdown by RSP

The speeds Fibre 300 is typically 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 the network protocol overhead, it is quite common to see measured download speeds close to or slightly above 300 Mbps.

Figure 19: **Comparison of Average Fibre 300 Download Speeds across RSPs.**

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm.
The number of Whiteboxes contributing to each result is shown under each plan name (eg n = 101)
Error bars show 95% confidence intervals of the mean.

MBNZ Winter Report, 2023

Key Observations

- All RSPs continued to perform consistently in February. All RSPs shown in the chart achieved average download speeds above 300 Mbps.

- There were not enough volunteers connected to Contact Energy, MyRepublic, Sky NZ, Mercury, Unifone or Wireless Nation to report results. All tested RSPs are included in the overall Fibre 300 results shown in Figures 1-3.
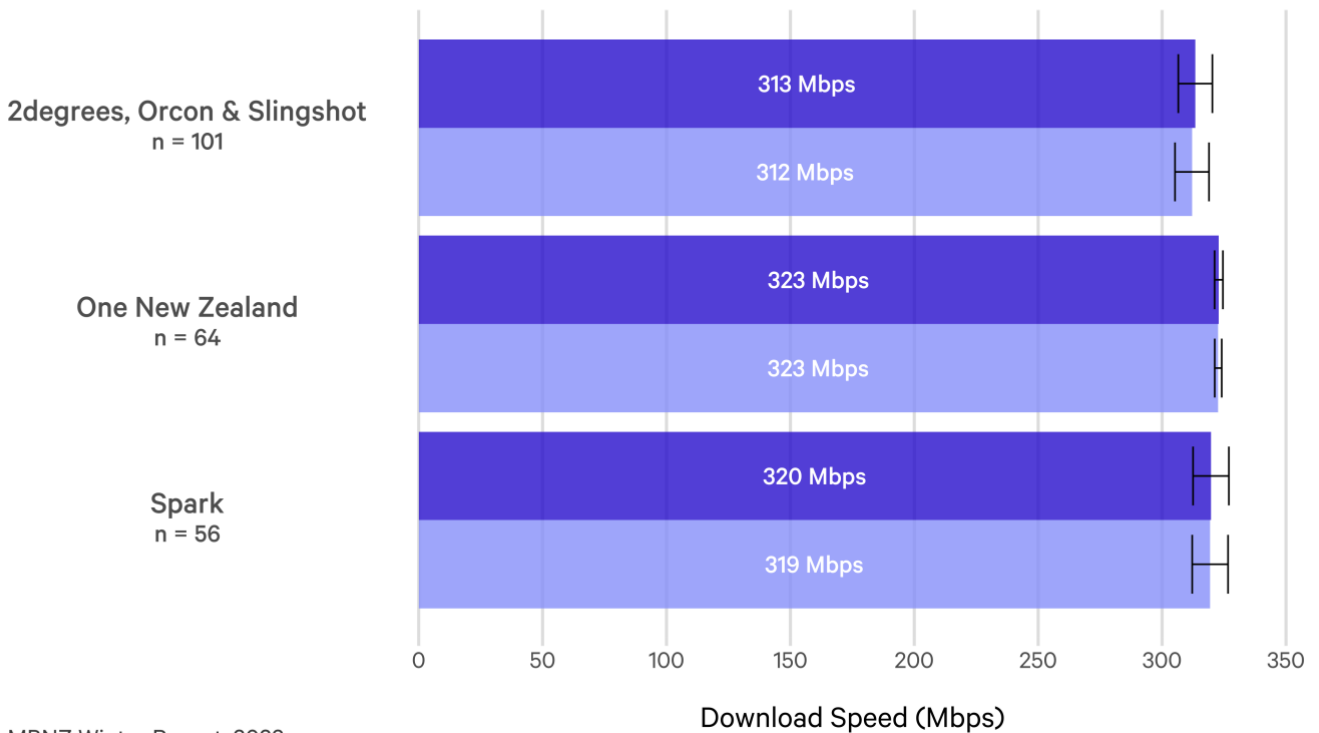
Fibre 300 Breakdown by Region

Figure 20: Average Fibre 300 Download Speeds by Region.

Average of monthly household averages. Peak hours are Monday - Friday, 7pm - 11pm.
The number of Whiteboxes contributing to each result is shown under each geographical area (eg n = 305)
Error bars show 95% confidence intervals of the mean.
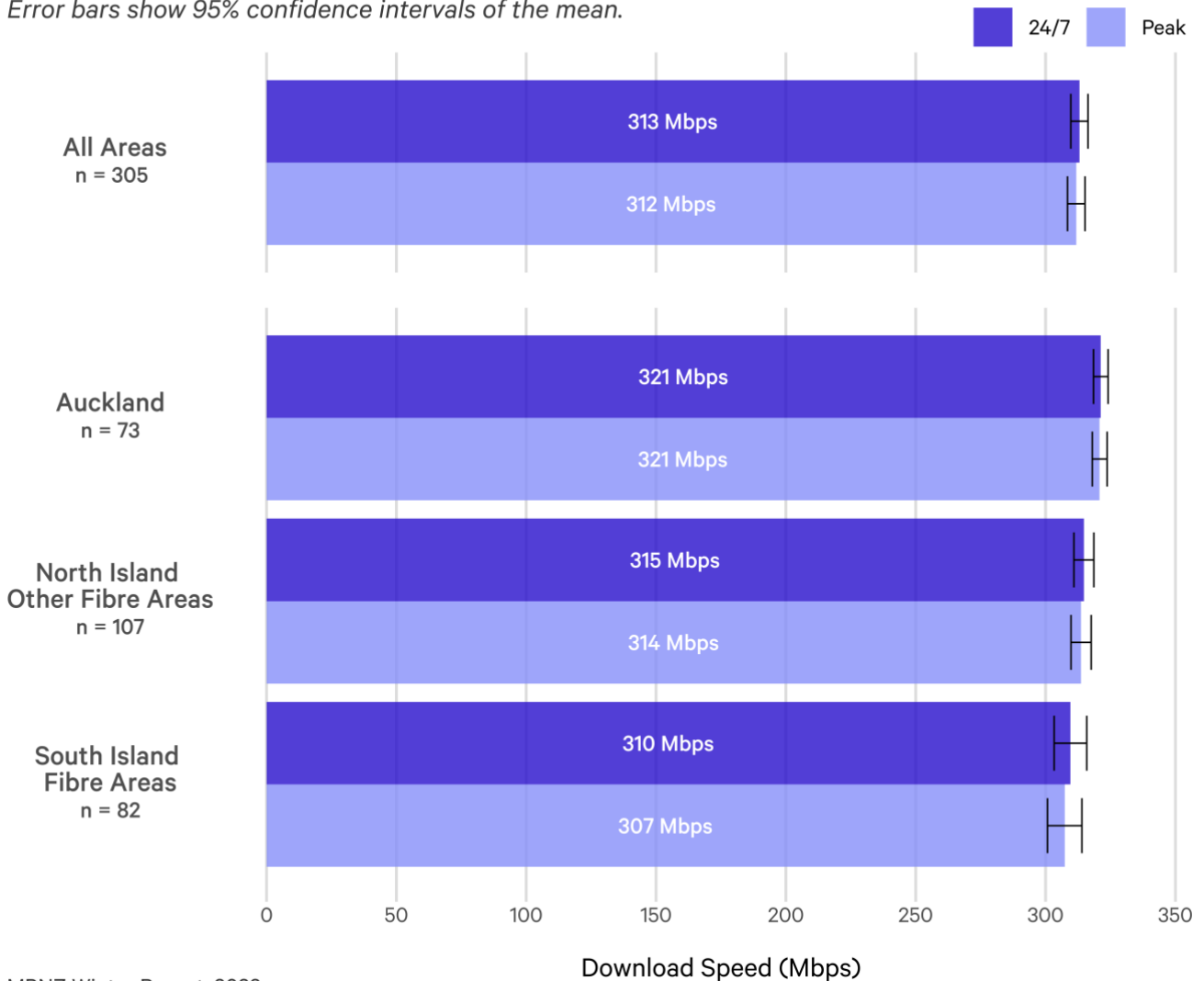
MBNZ Winter Report, 2023

Key Observations

- There is a small difference in performance between the main islands, but the difference is at a level which is unlikely to be noticed by end users.

- 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.[1]

---

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

How we test

Measuring home broadband across New Zealand

- The SamKnows Whitebox is a purpose-built testing agent that connects to your router.

- It runs regular, automated performance tests to record the quality and performance of your internet connection without interfering with your network.

- The Whitebox does not record any personal information or browsing history.

Join the MBNZ Programme!

We are always on the hunt for more volunteers to help us expand on the technologies reported on in the MBNZ programme. Joining our awesome volunteer network enables us to gather even more data so we can continue shining a light on different technologies, RSPs and regions in New Zealand! Sign up at the [following link](#)[1], and if you're already a volunteer, encourage your friends and family to join too!

- Have 24/7 access to your own data.

- View all your data in one place via the SamKnows One platform.

- Create customised charts and save the results that mean the most to you.

- Track changes in your connection over time.

---

[1] 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 do not 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.
HFC	Hybrid Fibre-Coaxial. A broadband connection that uses coaxial cables to send data.
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.
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.
LEO Satellite	Low Earth Orbit Satellite. A broadband connection that is transmitted wirelessly using a satellite and ground based satellite dish.
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, defined in New Zealand as between 7pm and 11pm.
RSP	Retail Service Provider. A company that provides consumers with access to the internet.
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.

Summary Tables

Table 1: Download, Upload and Latency Performance by Plan

Plan	SFA Area	Peak or Off-Peak	Number of Units	Average Download (Mbps)	Average Upload (Mbps)	Average Latency (ms)
ADSL	All Areas	24/7	48	9 Mbps	1 Mbps	25 ms
		Peak	48	9 Mbps	1 Mbps	27 ms
	Non-Fibre Areas	24/7	44	9 Mbps	1 Mbps	26 ms
		Peak	44	8 Mbps	1 Mbps	28 ms
VDSL	All Areas	24/7	51	41 Mbps	10 Mbps	17 ms
		Peak	51	40 Mbps	10 Mbps	18 ms
	Non-Fibre Areas	24/7	37	36 Mbps	9 Mbps	17 ms
		Peak	37	36 Mbps	9 Mbps	18 ms
LEO Satellite	All Areas	24/7	85	183 Mbps	21 Mbps	42 ms
		Peak	85	151 Mbps	21 Mbps	41 ms
	Non-Fibre Areas	24/7	80	184 Mbps	21 Mbps	42 ms
		Peak	80	151 Mbps	21 Mbps	41 ms
4G Fixed Wireless	All Areas	24/7	87	45 Mbps	17 Mbps	55 ms
		Peak	87	33 Mbps	16 Mbps	56 ms
	Fibre Areas	*24/7*	*21*	*46 Mbps*	*23 Mbps*	*54 ms*
		Peak	*21*	*30 Mbps*	*21 Mbps*	*55 ms*
	Non-Fibre Areas	24/7	66	45 Mbps	16 Mbps	56 ms
		Peak	66	34 Mbps	15 Mbps	57 ms
Fibre 300	Fibre Areas	24/7	303	313 Mbps	108 Mbps	7 ms
		Peak	303	312 Mbps	108 Mbps	7 ms
Fibre Max		24/7	332	875 Mbps	500 Mbps	6 ms
		Peak	332	861 Mbps	498 Mbps	6 ms
HFC Max		*24/7*	*22*	*913 Mbps*	*103 Mbps*	*12 ms*
		Peak	*22*	*913 Mbps*	*103 Mbps*	*12 ms*
5G Fixed Wireless	All Areas		*9*			

Plan	SFA Area	Peak or Off-Peak	Number of Units	Average Download (Mbps)	Average Upload (Mbps)	Average Latency (ms)
WISP Fixed Wireless			*4*			

Table 2: Fibre 300 and Fibre Max Download Speed Summary by RSP

Plan	RSP	Number of Units	Average Download (Mbps)
Fibre 300	2degrees, Orcon & Slingshot	101	313 Mbps
	One New Zealand	64	323 Mbps
	Spark	56	320 Mbps
Fibre Max	2degrees, Orcon & Slingshot	121	875 Mbps
	MyRepublic	62	817 Mbps
	One New Zealand	41	912 Mbps
	Spark	52	902 Mbps

Table 3: Downlink Latency to Popular Social Media Platforms by RSP, Fibre Plans Only

Social Media Platform	Media Type	RSP	Number of Units	Average Latency
Instagram App	Image	Spark	109	6 ms
		One New Zealand	114	6 ms
		MyRepublic	83	10 ms
		Mercury	*32*	*8 ms*
		2degrees, Orcon & Slingshot	242	8 ms
Instagram Messenger	Text	Spark	109	14 ms
		One New Zealand	114	11 ms
		MyRepublic	83	13 ms
		Mercury	*32*	*14 ms*
		2degrees, Orcon & Slingshot	242	22 ms
	Image	Spark	109	6 ms
		One New Zealand	114	6 ms
		MyRepublic	83	10 ms

Social Media Platform	Media Type	RSP	Number of Units	Average Latency
		Mercury	*32*	*8 ms*
		2degrees, Orcon & Slingshot	242	8 ms
Facebook App	Text	Spark	109	13 ms
		One New Zealand	114	11 ms
		MyRepublic	83	13 ms
		Mercury	*32*	*13 ms*
		2degrees, Orcon & Slingshot	242	21 ms
	Image	Spark	109	6 ms
		One New Zealand	114	6 ms
		MyRepublic	83	10 ms
		Mercury	*32*	*8 ms*
		2degrees, Orcon & Slingshot	242	8 ms
Facebook Messenger	Text	Spark	109	14 ms
		One New Zealand	114	11 ms
		MyRepublic	83	13 ms
		Mercury	*32*	*14 ms*
		2degrees, Orcon & Slingshot	242	21 ms
	Image	Spark	109	6 ms
		One New Zealand	114	6 ms
		MyRepublic	83	10 ms
		Mercury	*32*	*8 ms*
		2degrees, Orcon & Slingshot	242	8 ms
Snapchat	Text	Spark	107	131 ms
		One New Zealand	109	131 ms
		MyRepublic	82	131 ms
		2degrees, Orcon & Slingshot	232	131 ms
	Image	Spark	109	441 ms
		One New Zealand	113	444 ms
		MyRepublic	83	443 ms
		Mercury	*32*	*436 ms*

Social Media Platform	Media Type	RSP	Number of Units	Average Latency
		2degrees, Orcon & Slingshot	241	440 ms
Whatsapp	Text	Spark	109	13 ms
		One New Zealand	114	11 ms
		MyRepublic	83	13 ms
		Mercury	*32*	*13 ms*
		2degrees, Orcon & Slingshot	242	20 ms
	Image	Spark	109	12 ms
		One New Zealand	114	11 ms
		MyRepublic	83	12 ms
		Mercury	*32*	*13 ms*
		2degrees, Orcon & Slingshot	242	21 ms
X (formally Twitter)	Text	Spark	109	35 ms
		One New Zealand	114	35 ms
		MyRepublic	83	35 ms
		Mercury	*32*	*165 ms*
		2degrees, Orcon & Slingshot	242	35 ms
	Image	Spark	109	28 ms
		One New Zealand	114	11 ms
		MyRepublic	83	12 ms
		Mercury	*32*	*13 ms*
		2degrees, Orcon & Slingshot	242	13 ms

Table 4: Latency to Various Online Gaming Servers by RSP, Fibre plans only

Game	RSP	Number of Units	Average Latency
Among Us	Spark	109	155 ms
	One New Zealand	113	153 ms
	MyRepublic	83	161 ms
	Mercury	*32*	*156 ms*
	2degrees, Orcon & Slingshot	242	162 ms
Apex Legends	Spark	106	36 ms
	One New Zealand	*31*	*34 ms*
	MyRepublic	81	35 ms
	Mercury	*31*	*33 ms*
	2degrees, Orcon & Slingshot	230	35 ms
Diablo III	Spark	108	36 ms
	One New Zealand	108	36 ms
	MyRepublic	83	35 ms
	Mercury	*32*	*33 ms*
	2degrees, Orcon & Slingshot	240	35 ms
Dota 2	Spark	107	35 ms
	One New Zealand	111	34 ms
	MyRepublic	81	35 ms
	Mercury	*31*	*32 ms*
	2degrees, Orcon & Slingshot	234	35 ms
FIFA	Spark	106	40 ms
	One New Zealand	112	37 ms
	MyRepublic	81	37 ms
	Mercury	*31*	*35 ms*
	2degrees, Orcon & Slingshot	233	37 ms
Fortnite	Spark	108	48 ms
	One New Zealand	112	45 ms
	MyRepublic	81	45 ms
	Mercury	*31*	*41 ms*

Game	RSP	Number of Units	Average Latency
Hearthstone	2degrees, Orcon & Slingshot	233	45 ms
	Spark	108	145 ms
	One New Zealand	112	163 ms
	MyRepublic	83	134 ms
	Mercury	*32*	*165 ms*
Heroes of the Storm	2degrees, Orcon & Slingshot	242	135 ms
	Spark	107	145 ms
	One New Zealand	97	163 ms
	MyRepublic	81	134 ms
	Mercury	*32*	*165 ms*
Overwatch	2degrees, Orcon & Slingshot	238	136 ms
	Spark	109	35 ms
	One New Zealand	113	36 ms
	MyRepublic	83	35 ms
	Mercury	*32*	*33 ms*
PUBG	2degrees, Orcon & Slingshot	242	34 ms
	Spark	108	42 ms
	One New Zealand	106	38 ms
	MyRepublic	83	39 ms
	Mercury	*32*	*36 ms*
Rainbow Six Siege	2degrees, Orcon & Slingshot	240	39 ms
	Spark	109	39 ms
	One New Zealand	113	36 ms
	MyRepublic	83	37 ms
	Mercury	*32*	*35 ms*
Rocket League	2degrees, Orcon & Slingshot	240	37 ms
	Spark	109	35 ms
	One New Zealand	113	34 ms
	MyRepublic	83	34 ms
	Mercury	*32*	*32 ms*

Game	RSP	Number of Units	Average Latency
Valorant	2degrees, Orcon & Slingshot	240	34 ms
	Spark	109	40 ms
	One New Zealand	113	37 ms
	MyRepublic	83	37 ms
	Mercury	*32*	*35 ms*
World of Warcraft	2degrees, Orcon & Slingshot	240	37 ms
	Spark	109	36 ms
	One New Zealand	113	36 ms
	MyRepublic	83	35 ms
	Mercury	*32*	*33 ms*
	2degrees, Orcon & Slingshot	242	35 ms

Table 5: Latency to Various Video Conferencing Services by RSP, Fibre Plans Only

Video Conferencing Service	Free or Paid	RSP	Number of Units	Average Latency
GoToMeeting	Free	Spark	109	161 ms
		One New Zealand	113	159 ms
		MyRepublic	83	169 ms
		Mercury	*32*	*142 ms*
		2degrees, Orcon & Slingshot	242	169 ms
	Paid	Spark	109	191 ms
		One New Zealand	113	188 ms
		MyRepublic	83	184 ms
		Mercury	*32*	*188 ms*
		2degrees, Orcon & Slingshot	242	185 ms
Google Meet	Free	Spark	109	41 ms
		One New Zealand	114	43 ms
		MyRepublic	83	42 ms
		Mercury	*32*	*36 ms*
		2degrees, Orcon & Slingshot	242	38 ms
	Paid	Spark	109	41 ms
		One New Zealand	114	43 ms
		MyRepublic	83	42 ms
		Mercury	*32*	*36 ms*
		2degrees, Orcon & Slingshot	242	38 ms
Microsoft Teams	Free	Spark	109	45 ms
		One New Zealand	114	43 ms
		MyRepublic	83	45 ms
		Mercury	*32*	*41 ms*
		2degrees, Orcon & Slingshot	242	44 ms

Video Conferencing Service	Free or Paid	RSP	Number of Units	Average Latency
Skype	Paid	Spark	109	45 ms
		One New Zealand	114	43 ms
		MyRepublic	83	45 ms
		Mercury	*32*	*41 ms*
		2degrees, Orcon & Slingshot	242	43 ms
	Free	Spark	109	49 ms
		One New Zealand	114	47 ms
		MyRepublic	83	50 ms
		Mercury	*32*	*46 ms*
		2degrees, Orcon & Slingshot	242	48 ms
Zoom	Free	Spark	109	201 ms
		One New Zealand	113	200 ms
		MyRepublic	83	190 ms
		Mercury	*32*	*206 ms*
		2degrees, Orcon & Slingshot	239	191 ms
	Paid	Spark	109	54 ms
		One New Zealand	113	51 ms
		MyRepublic	83	53 ms
		Mercury	*32*	*52 ms*
		2degrees, Orcon & Slingshot	239	53 ms