Measuring Broadband New Zealand

Speed at your router **VS** Speed at your device

RealSpeed Report, 2024

The Measuring Broadband New Zealand (MBNZ) programme measures the quality of New Zealand's fixed line, fixed wireless and satellite 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.

Many people may not realise that the speed delivered to their router doesn't necessarily match the speed available on their devices. This is particularly the case when using Wi-Fi instead of connecting directly to the router with an ethernet cable.

This report compares measurements taken from the router with measurements taken on various devices around the home, on both Wi-Fi and via ethernet, conducted by over 700 MBNZ volunteers using the SamKnows RealSpeed test between 1st July and 31st July 2023.

Contents

Overview

RealSpeed test results show the comparison of two consecutive tests; one measuring the performance and quality of the connection that the retail service provider (RSP) is delivering to the user at the router level without the local network having an impact, and the other from a device within the home where a user is actively utilising their internet connection. The goal is to help consumers understand how their home set-up can impact the performance of their broadband connection within their home.

RealSpeed Performance

1. For higher speed plans (Fibre 300, Fibre Max and HFC), there is a larger difference between download speeds achieved to the Whitebox compared to speeds achieved to the device compared to ADSL, VDSL, LEO Satellite and 4G Fixed Wireless plans. One reason for this could be that lower speed plans are less likely to have Wi-Fi capabilities limiting the speed provided by their internet connection.

2. Lower speeds to the device compared to the router can be due to a number of factors, such as the location of the router within the home, technological capabilities of the hardware (router), or testing from an older device. Running tests from rooms closer to the router should see an increase in download speeds, as Wi-Fi can be weakened over distance. Older routers may have less advanced Wi-Fi capabilities and/or produce weaker Wi-Fi signal.

3. Average download speeds for RealSpeed tests run from a mobile or tablet are lower on average than those run from a computer for Fibre plans.

Some results within this report are shown with error bars representing the 95% confidence interval for each plan's average speed. This means that 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.

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.
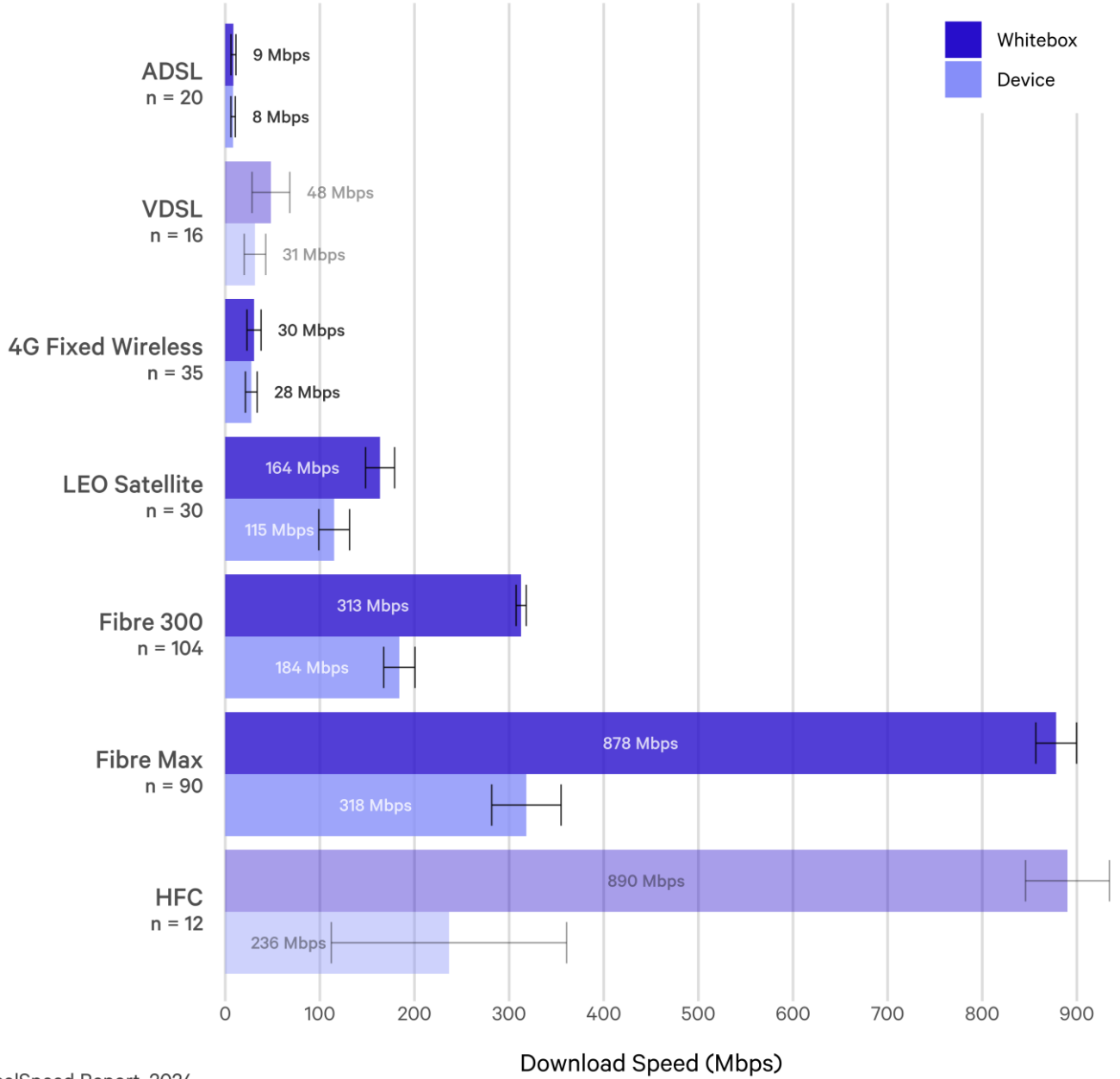
Speed Tests - Download

Figure **1** shows results to the device and to the Whitebox, split by plan.

Figure 1: Average Download Speeds by Test Type
Average of household averages.
Error bars show 95% confidence intervals of the mean.

RealSpeed Report, 2024

Key Observations

- ADSL speeds were consistently achieved to the Whitebox and device. 4G Fixed Wireless and VDSL plans showed a small difference between speeds achieved to the device in comparison to the Whitebox, with differences of 2 Mbps and 17 Mbps respectively.

- LEO Satellite and Fibre 300 plans saw a slightly larger decrease in average speeds between the Whitebox and the device, with a difference of 49 Mbps and 129 Mbps respectively.

- For both Fibre Max and HFC plans, while there is a large difference between speeds achieved to the Whitebox in comparison to speeds achieved to the device, both plans averaged over 200 Mbps to the device. Lower speeds to the device than Whitebox could be due to a number of factors such as the device being far away from the router, the technical capabilities of the router, Wi-Fi signal interference within the home, or using an older device limited with low maximum speeds.

- The majority of plans see similar performance compared to the previous RealSpeed data collected in March 2022, with most plans seeing a small increase in both average download speeds to the Whitebox and the device. Average download speed to the device for Fibre Max plans has increased from 285 Mbps to 318 Mbps.
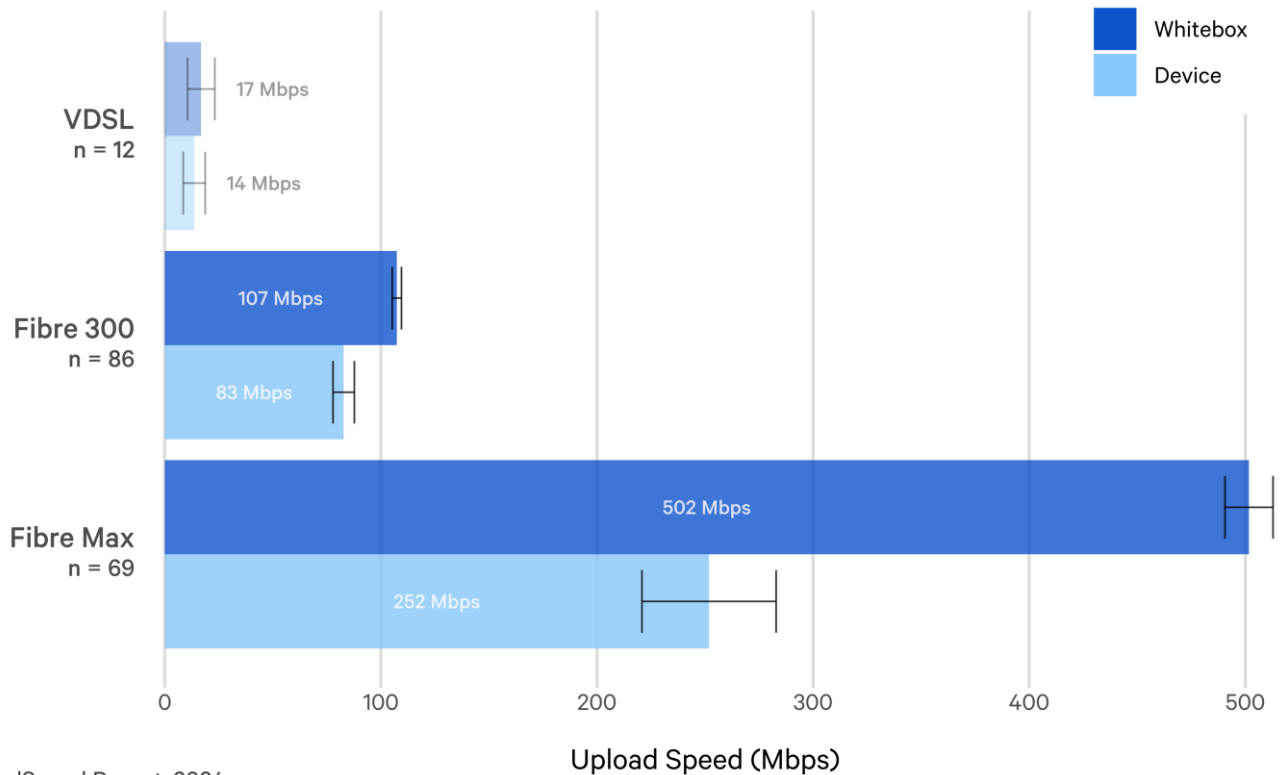
Speed Tests - Upload

Figure **2** compares upload results to the device and to the Whitebox, split by plan. ADSL plans are not included due to a small sample size.

Figure 2: Average Upload Speeds by Test Type

Average of household averages.
Error bars show 95% confidence intervals of the mean.

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Key Observations

- VDSL speeds were consistently achieved to the Whitebox and device. Fibre 300 plans showed a larger difference of 24 Mbps between speeds achieved to the device in comparison to the Whitebox.

- Fibre Max plans showed a large difference between upload speeds achieved to the Whitebox in comparison to speeds achieved to the device, with average upload speeds to the device measuring just over half of the average upload speeds to the Whitebox.

- LEO Satellite and 4G Fixed Wireless plans are not included as Whitebox and device measurements are unable to be compared.
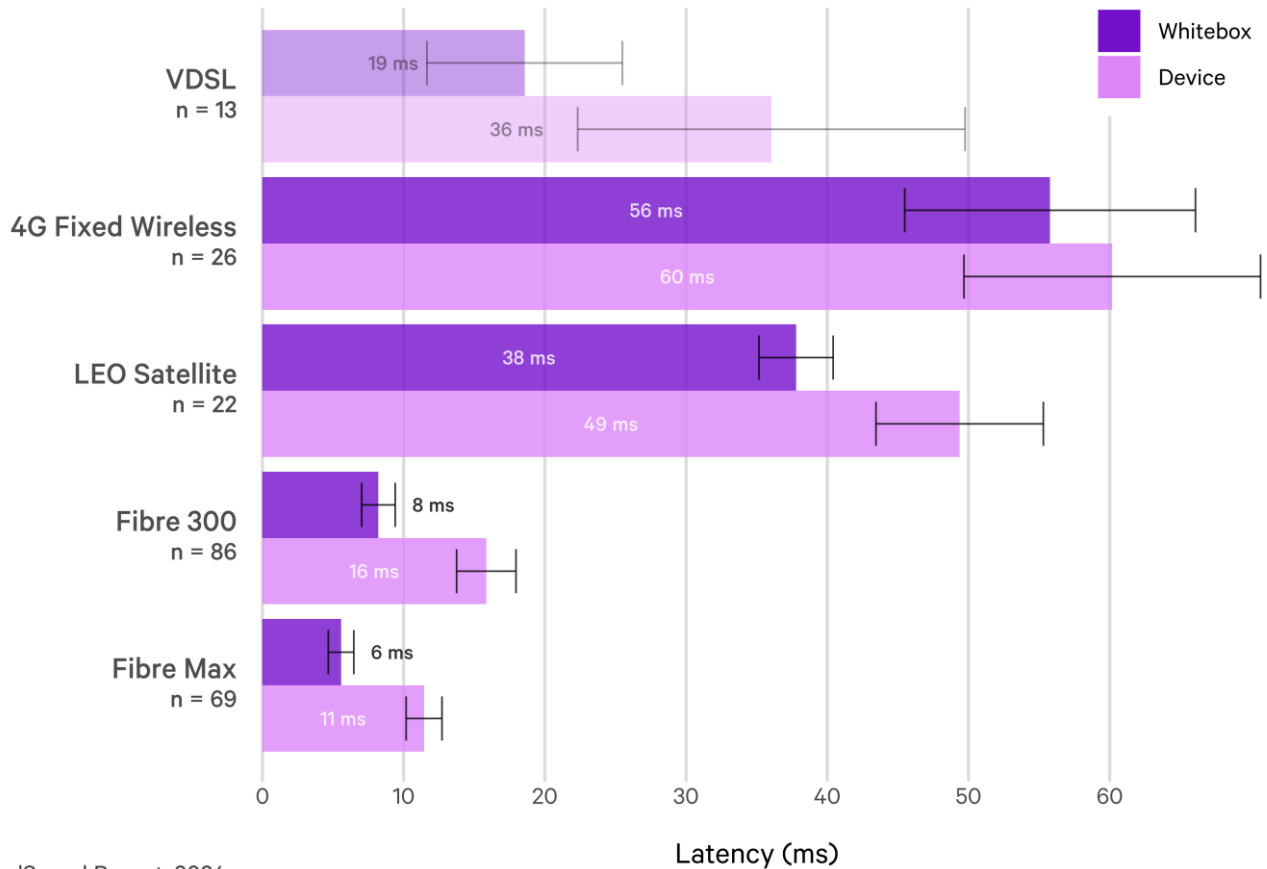
Latency

Figure **3** compares latency results to the device and the Whitebox, split by plan.

Figure 3: Average Latency Speeds by Test Type
Average of household averages. Lower is better.
Error bars show 95% confidence intervals of the mean.

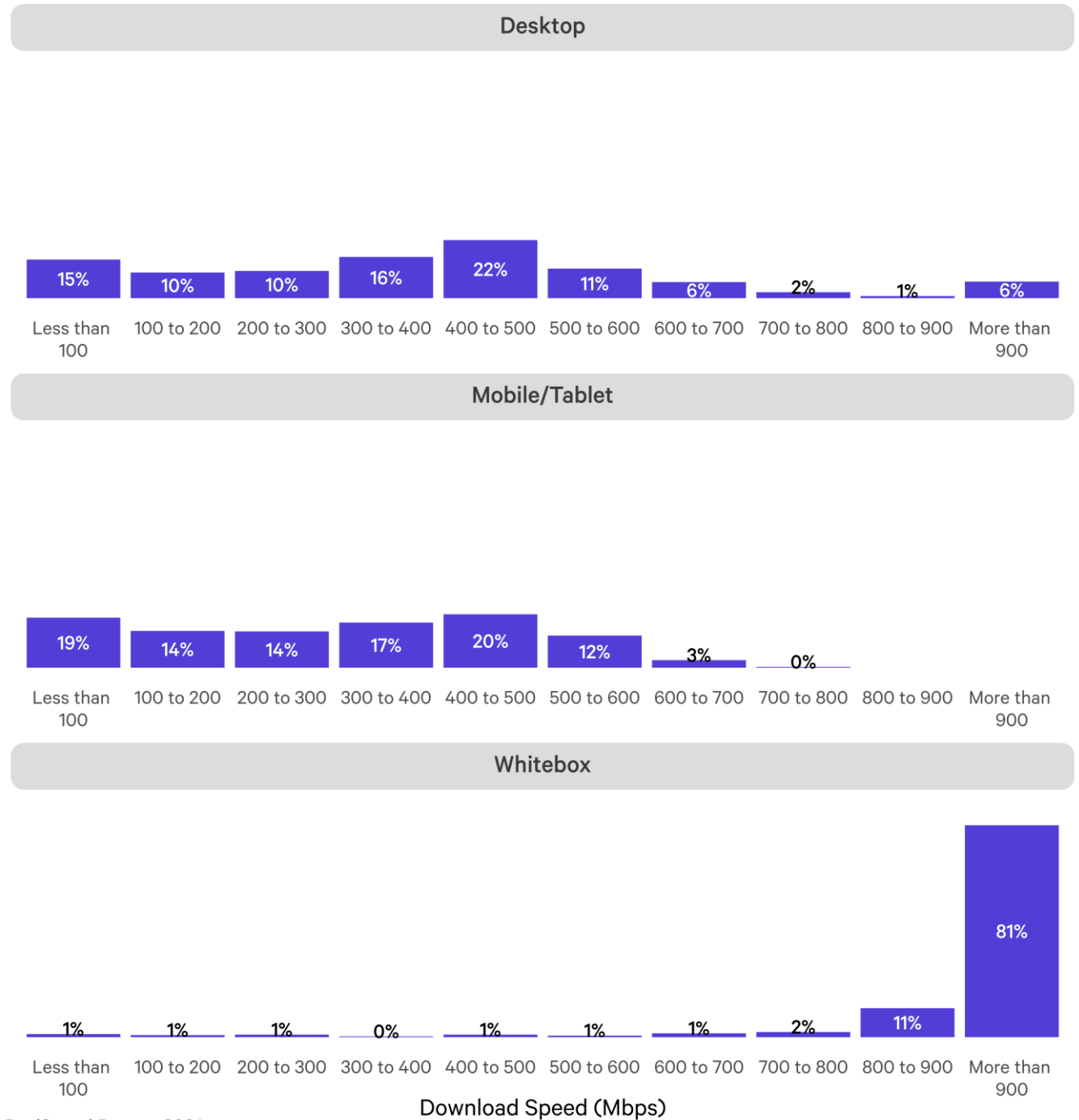RealSpeed Report, 2024

Key Observations

- All plans showed higher latency results to the device than to the Whitebox, with the majority of device tests being run over Wi-Fi.

- The increase in latency between the device and Whitebox is unlikely to be noticed by an end user. If the user is using a latency sensitive application, such as video gaming, one way to decrease the latency to the device is connecting to the router via an ethernet cable.

Distribution of Fibre Max Results

Figure **4** shows the distribution of results run on Fibre Max lines to both the Whitebox, and the device used to run the RealSpeed test.

Figure 4: Download Speeds on Fibre Max Plans

Distribution of Test Results across 90 Fibre Max Units.
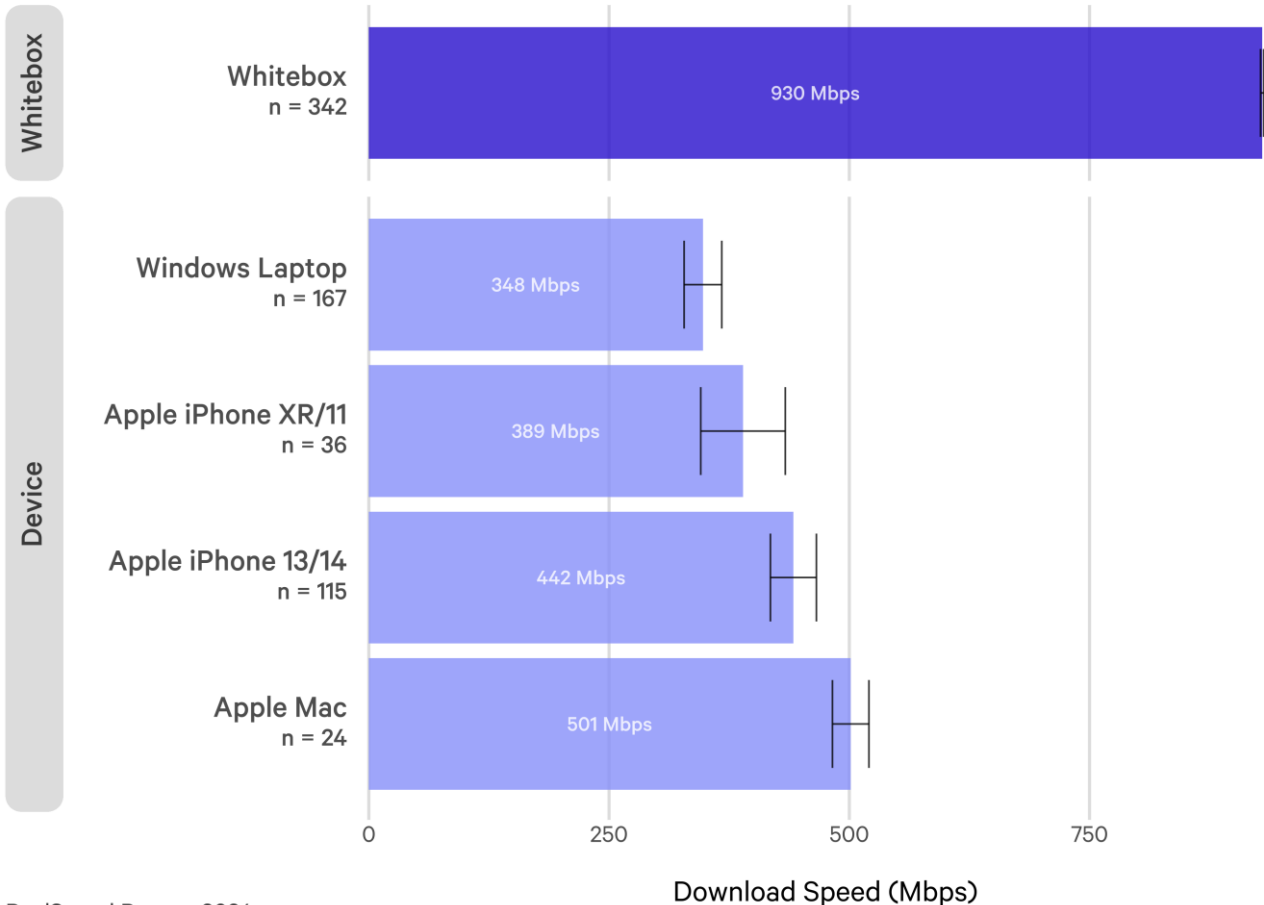

RealSpeed Report, 2024

Key Observations

- For all download RealSpeed tests run on Fibre Max plans, around 17% of the download speeds measured across all devices were less than 100 Mbps. This is a decrease compared to the previous RealSpeed data collected in March 2022 where 27% of device measurements on Fibre Max plans achieved speeds below 100 Mbps. Download speeds measured by the Whitebox remained consistent, at around 1% achieving download speed results less than 100 Mbps across both reports.

- Around 19% of tests on mobile or tablet devices see speeds of less than 100 Mbps to their device. This could be because they are testing from a room far away from the router, resulting in poor Wi-Fi signal strength, testing from an older device with a low maximum speed limit, or running the tests during peak hours or while other members of the household are also using the connection. Different routers also have different Wi-Fi capabilities which can impact average speeds achieved by the device.

- Around 6% of RealSpeed tests achieved speeds above 900 Mbps on desktop devices. This is likely due to running the test using a wired connection (e.g. a device connected to the router with an Ethernet cable) to maximise download speeds.

Distribution of Fibre 300 Results

Figure **5** shows the distribution of results run on Fibre 300 lines to both the Whitebox and the device used to run the RealSpeed test.

Figure 5: **Download Speeds on Fibre 300 Plans**

Distribution of Test Results across 104 Fibre 300 Units.

Desktop

Less than 50	50 to 100	100 to 150	150 to 200	200 to 250	250 to 300	More than 300
13%	21%	5%	6%	9%	17%	28%

Mobile/Tablet

Less than 50	50 to 100	100 to 150	150 to 200	200 to 250	250 to 300	More than 300
19%	18%	10%	7%	10%	15%	22%

Whitebox

Less than 50	50 to 100	100 to 150	150 to 200	200 to 250	250 to 300	More than 300
0%	0%	1%	1%	2%	14%	81%

Download Speed (Mbps)

RealSpeed Report, 2024

Key Observations

- Average Fibre 300 download speeds to the device show a higher percentage of users achieving speeds closer to the maximum speed than for Fibre Max plans, with 28% of users achieving speeds to the device between 300 and 350 Mbps on a desktop device, and 22% on a mobile or tablet.

- Around 19% of users on mobile or tablet devices see speeds of less than 50Mbps to their device. This could be because they are testing from a room far away from the router, resulting in poor Wi-Fi signal strength, testing from an older device with a low maximum speed limit, or running the tests during peak hours or while other members of the household are also using the connection. Different routers also have different Wi-Fi capabilities which can impact average speeds achieved by the device.

Look Inside a Home

Figure **6** shows the average speeds to different devices within a single home run over Wi-Fi.

The number of tests run to each device is shown below (e.g. n = 342).

Figure 6: Download Speeds within a Home

Average download speeds to each device within a single home on a Fibre Max connection


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Key Observations

- The majority of tests were run when no-one else in the home was using the connection. The home also has two additional Wi-Fi access points connected to the router to boost Wi-Fi signal in different areas of the home. All devices had average speeds above 300 Mbps, with maximum speeds achieved to the device on an iPhone 13 reaching over 600 Mbps.

- Average download speeds vary across different devices running RealSpeed tests within the home. This could be due to a variety of factors, such as testing the devices in different rooms, or newer devices having better Wi-Fi capability.

About RealSpeed

RealSpeed is how SamKnows measures the impact of the local network on internet performance. When a user with a SamKnows Whitebox (or an RSP's supplied Modem/Router with SamKnows' Router Agent installed) browses to https://samknows.com/realspeed/, our system detects that a RealSpeed-enabled device is available, and instructs that device to run our Quality of Service tests.
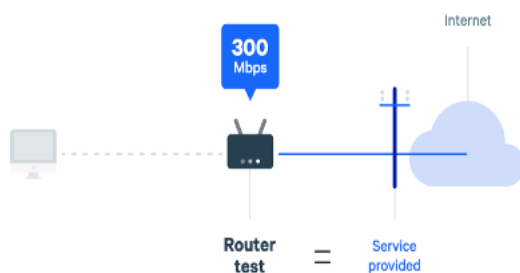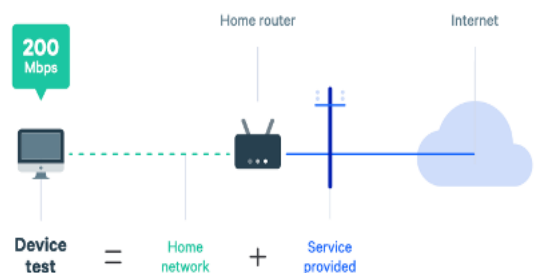
The results of these tests show the performance and quality of the connection that the RSP is providing to the user at the router level, without the local network having an impact. We then run tests from the device that was used to browse to the RealSpeed page, giving us a second set of results from the user's perspective.

Mobile device limits

Due to hardware and software configurations, mobile devices have a maximum speed limit. Often these limits can be below the available speed a user is trying to test, obscuring the real speed. These figures aren't published or readily available, so SamKnows uses machine learning to sift through our vast dataset of previous tests to create a database of device limits.

Examples:

- iPhone 11 limit: 930 Mbps
- iPhone 7 limit: 476 Mbps
- iPad mini 2nd Gen limit: 150 Mbps

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](https://www.measuringbroadbandnewzealand.com/sign-up)[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.

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[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.