

FREEDOM INTERNET NEW ZEALAND'S**GUIDE TO INTERNET SPEEDS**

Internet service is all about speed. With all the talk about Megabits per second (Mbps), Gigabits, DSL, Wi-Fi, copper, fiber, radio and broadband, it's easy to feel overwhelmed. That's why we've provided this easy-to-follow guide to everything you need to know about Internet speed. We'll break it all down for you.

What is Internet speed and why is it important?

Think of Internet speed like water pressure: it's all about how much volume is moving in a given amount of time. Computers connected to the Internet transfer information to each other in electronic packets. A packet is simply a unit of data. Think of it as a drop of water. Just as more water pressure will deliver more drops of water in a shorter amount of time, a faster Internet connection will deliver more packets in a shorter amount of time but just like a water hose, the type, size and physical capacity of the Internet connection makes a difference to how much data can pass.

The volume of data transferred through a connection in a given amount of time is that connection's Internet speed.

For example, you could technically wash your hair with water barely trickling out of the showerhead but having enough pressure to quickly rinse the shampoo out makes all the difference. As far as Internet speed goes, you could technically stream a video by watching one or two frames at a time and then waiting for it to buffer for a few minutes, but nobody wants to do that.

How much Speed do you need?

Knowing your Internet speed and how it compares to recommendations for Internet-based streaming services, like Netflix and Amazon Prime, can help you get the most out of your connection. For example, you need a minimum download speed of 3 Megabits per second to watch a single video stream in clear, standard definition (SD). You need at least approx. 5Mbps of Internet speed to support a single SD stream, and if you go all the way up to 4K streaming, or Ultra High Definition, your bandwidth should start at approx. 25Mbps for a single stream. The size of the screen you're streaming to doesn't impact the requirement it's the resolution that does, the higher the resolution (the quality of the picture) the greater the bandwidth requirement...and keep in mind this is for a single stream (video) at a time and the minimum represents perfect connection conditions. Unfortunately, there are a ton of factors that can affect your Internet connection performance so most people, and Internet Service Providers, recommend purchasing plans that are significantly larger than the "minimum required".

Different households can have drastically different Internet needs. A single person who uses the Internet only to access email won't need as much Internet speed as a family of five streaming Netflix in every room.

Let's look at some Internet speeds and what you can do with them at home. Note: These speeds are for reference only, many factors affect Internet performance.

Internet Speeds (Up and Down)	Works Best For:
5 – 25Mbps	• Checking email • Single music stream or SD video on one device • Searching on Google
25–50 Mbps	• Streaming a HD video on one device • Video calling with Skype, Teams or FaceTime • Online gaming for one device
50–100 Mbps	• Streaming HD video on a few devices • Multiplayer online gaming • Downloading large files
100–500 Mbps	• Streaming video in UHD on multiple screens • Downloading multiple large files simultaneously • Gaming online for multiple players & devices
500–1,000+ Mbps	• Doing a lot of almost anything

Upload speed vs. download speed

Download speed is the speed at which information travels from the Internet to your Internet-connected device. For example, if you open the Facebook app on your phone, your download speed would determine how long it takes to load your feed. If you have a slow download speed larger files will take longer to get to your device, or a movie will take longer to start and may “refresh” or “buffer” (pause) while you’re watching it.

Upload speed is the opposite. It is the speed at which information travels from your Internet-connected device to the Internet. So, if you post to your Facebook timeline, your upload speed would determine how long it takes your post to get to the Facebook server for all your friends to see.

Upload speed, download speed, and your Internet activities

With most Internet plans, download speeds are much faster than upload speeds. This makes sense because consumers generally download much more information than they upload. Streaming videos or music, reading a blog post, or scrolling through your Instagram feed are all activities that don't really need a lot of upload bandwidth once they're initiated but a video call does since its “uploading” your image and sound (voice) stream much the same way sending a large file in an email takes time to send from your device.

Upload speeds become much more important for interactive applications. While some common interactive applications, like online gaming and video chat, are better with decent upload speeds, most consumer Internet services provide enough upload speed to handle these things without many issues.

Upload speeds are also critical in corporate settings. Sharing large files can require a lot of upload speed as well.

If you need to send an image to a client for approval, you'll want good upload speed. That's especially important if you have multiple people doing this same thing at the same time since everyone on the same network shares Internet bandwidth. Also, if you make HD videos or any other type of large file content and need to upload them to a server or "the cloud", your upload speed will come into play.

Of bits and bytes

Internet speed is a measure of the rate at which information is transferred from one place on the Internet to another. That measurement can be expressed in several ways, but the first step to understanding it is to understand the units of electronic information.

Bits per second

When computers send information over the Internet, that information is in bits or bytes. The bits or bytes take time to reach their destination. That time is measured in seconds. So Internet speeds are measured by identifying how many bits are transferred in one second, hence bits per second. (bps)

Because the bits are so small, the number transferred in a single second is almost always well over 1,000 (kilo). The common practice is to express those large numbers using the metric-based prefixes:

- kilo for 1,000
- mega for 1 million
- giga for 1 billion

Putting this all together, Internet speeds can be measured in several different ways as well.

- kilobits per second (Kbps) – If measure your Internet is measured in Kbps it may be pretty slow.
- megabits per second (Mbps) – Mbps is the general standard used to Measure Internet Speeds
- gigabits per second (Gbps) – Well if you have an Internet speed measure in Gbps WOW you're fast! But you may be paying of for more than you need.

Bandwidth

While "bandwidth" and "Internet speed" are often used interchangeably, they actually refer to two different aspects of Internet service.

Internet speed is the measure of how fast information is transferred, think of it as how fast the water is flowing inside a hose, while bandwidth refers to the capacity of an individual Internet connection, this can be thought of as the size of the hose used. So if your Internet connection has a bandwidth of 5 Mbps, your speed would only be that fast assuming it's operating at full capacity in perfect conditions.

Several factors can slow your Internet speed from reaching its full bandwidth, but a connection's bandwidth will always cap how fast it can transmit information over the Internet. This is why Internet Service Providers list their Internet services with speeds "up to" a given speed. They aren't really advertising the speeds of their services; they're advertising the bandwidth of their connections by informing you of the highest speed those connections are capable of transmitting. They do this because there are a multitude of factors that can impact your experience that they sometimes just can't control, things like the age of your device, type of access point, distance from an access point, and browser settings just to name a few.

Latency

Latency is the time required for a signal to travel from one computer to another computer on the network and back. In terms of Internet service, latency usually means the time required for a signal to travel to the Internet Service Provider's (ISP's) server and back.

Latency is often referred to using different terms, including delay, ping, ping rate, and lag. People use these interchangeably, but they actually mean different things:

- **Latency** is the time it takes for a signal to make a round-trip journey from your computer to the ISP and back.
- **Ping rate** is the measure of latency, usually in milliseconds.
- A **ping** is the signal sent to test latency.
- **Lag** is a result of latency.

Whatever you choose to call it, the lower the number the better. High ping, or high latency, results in longer wait times when information uploads to, or downloads from, the Internet.

Satellite Internet has high latency because the signal must travel to a satellite orbiting the earth and back in order to reach the ISP's server. This distance is much farther and takes more time than land-based Internet connections. Traveling from the satellite to Earth takes more time, leading to higher latency. Radio and fibre services have often been tagged as having the lowest latency but this all just depends on what two implementations you're measuring.

Broadband

The term "broadband" has largely been replaced by "high-speed Internet," but this carries the same false-equivalency as referring to "bandwidth" as "Internet speed."

As Internet connection technology improved, particularly in the 1990s, it allowed the transmission of information over a much larger variety of frequencies. Thus the term "broadband" was used to describe this wide (broad) range of frequencies (bands).

So what are the different types of Internet?

Internet connections come in five basic types:

Dial-up – Not much of this around anymore and as for speed, it just doesn't have the speeds needed for the average content that out there anymore. It's also very hard to find a service provider to sell you a plan that uses dial up technology anymore.

DSL (as in ADSL or VDSL) – This is broadband and some of these services can deliver pretty good speeds. Check how close the service is delivered to your home as this distance impacts the performance significantly.

Cable - Cable Internet is delivered using the same cabling your TV may have used in the past. It is a broadband service and can deliver some real speeds.

Fiber – By now we've all heard about fibre Internet. Fibre has become a common "cabling" system in new offices, and some apartments. Fibre is fast and generally has low latency or delay but every fibre service is different and the speeds and pricing you can get depends on how it's implemented. Talk to your neighbour about how it works for them because more often than not different Internet Service Providers actually use the SAME fibre network and so may not be any better than yours.

Radio – Radio has been around since the beginning. Radio frequencies have carried voice and data for ages. It can travel long distances and has extremely low latency, or delay. Service providers, like Freedom Internet, often use Radio to carry Internet Services where fibre and other access types can't get to. The speeds Radio networks can deliver are measured in Gigabits per second (Gbps) so there are extremely fast.

Satellite – Used only in limited applications and mostly for remote areas where Fibre is not cost effective to reach. Keep in mind you need a clear view of the sky above you for Satellite to work well. Speeds have increased but be sure to check out coverage, pricing and speeds as well as plan download/upload caps.

Mobile – Often used when Fibre just can't get to you. Older buildings that can't be retrofitted with Fibre cabling often have no choice but to use a mobile Internet service. But be sure to check out coverage, pricing and speeds as well as plan download/upload caps. Also, don't mix up the mobile terminology 4G or 5G with Wi-Fi 2.4 GHz or 5 GHz. In mobile terminology the "G" represents "Generation" as in the 4th Generation of a type of mobile tech whereas in Wi-Fi terminology "5G" or rather 5 GHz the "G" represents a Wi-Fi radio frequency. Generally, the higher the frequency the faster the connection speeds but often requires more power to go longer distances.

Home networking – Wifi vs Ethernet

To this point, this article has focused on the connection between the Internet and your home or business. This section focuses on your home network.

Wi-Fi is a term for a specific configuration of router hardware and controls that allows for wireless transmission of information.

When this technology was developed, industry leaders wanted to give it a name that would help it gain popularity. They chose the term "Wi-Fi" basically because it was catchy. Now, some people use "Wi-Fi" and "Internet" interchangeably, though THEY ARE NOT THE SAME.

Your home Wi-Fi network can also impact your Internet speed. Among a bunch of other things, the more devices on your WiFi network using the Internet at the same time, the more bandwidth you will need. You also have to account for the size of your home and the material it is made of. You may need multiple Wi-Fi Access Points connected to your in-home router/modem if you have a larger home.

Many Internet Service Providers offer Wi-Fi networking devices with their service. If you want to get the most out of your Internet service, we highly recommend considering this depending on the size of your home. Sometimes you can even have your ISP's installation technician set up your home Wi-Fi network for you...or at least offer advice.

As earlier mentioned, it's important to understand Wi-Fi frequencies and what they do. Wi-Fi frequencies typically operate in the 2.4 GHz and 5 GHz bands. The 2.4 GHz band offers a longer range, greater physical material penetration (i.e. walls), but slower speeds, while the 5 GHz band provides faster speeds, but less penetration capability, and over a shorter range. Some newer routers also support the 6 GHz band, offering even faster speeds than 5 GHz but with the shortest range.

Ethernet is copper cabling that may or may not be already present in your home. Old phone lines used to use copper cabling, the really old ones were called CAT3. But even these old copper lines are capable of delivering 100Mbps within your home with the right cabling, router and use of a power adapter for your router. A lot of homes used CAT5 cabling to deliver the phone line and/or DSL services inside your home. This can be converted to support Ethernet very easily with a good cabling and a little know-how.

Today, some homes have dedicated CAT5 Ethernet copper cabling and some even have newer CAT6 or even CAT7...the higher the number the newer and more capable it is. A Cat5 cable over a short distance (less than 100M...which is pretty long for most houses) can deliver Gigabit speeds which means it's usually enough to get the data from your device to the Internet Service Providers router and out to, or from, the Internet.

Copper Ethernet connections in your home will generally always be more a stable and consistent connection than a Wi-Fi connection, however, you need to be physically connected to an Ethernet wall socket, which isn't as convenient for a "mobile" device. Things like TVs, Desktop PCs, Home media centres or game consoles that don't move around much will benefit from a physical Ethernet connection over Wi-Fi.

Just as a side note, almost every Fibre service delivered to a home is connected to the in-home router/modem via a copper connection and most in-home routers have extra Ethernet ports on them so you can plug devices like your TV etc into them. With the help of a handy cabling and a plan you may be able to connect up all your "non-mobile" devices in different rooms to a physical Internet connection to lighten the load on your Wi-Fi network and have the best home network....fast, stable and convenient.

Routers and modems

Your modem is the gateway between your home network and the greater Internet. Your router is the switchboard for all the different connections among the devices on your network.

The equipment you get from your ISP is usually sufficient for basic Internet usage and supplied or supported by the Internet Service Providers to work best with their service. But be sure to ask about

some of the capabilities of the device so that it matches your needs i.e. Does it support Wi-Fi & Ethernet? How big of a house will the Wi-Fi cover? Does it support the speed of the service you purchased (i.e. anything over 100Mbps needs a Gigabit speed capable device).

Freedom Internet

Feel free to give us a call on +64 9 281 2970 or drop us an email at support@freedomInternet.co.nz to ask any questions you might have. Check us out at www.freedomInternet.co.nz