Types Of Internet Access Technologies Explained, And What You Should Expect

By Guy McDowell

What kind of Internet access do you really have? Broadband? High Speed? Wireless? Satellite? Fibre? There are so many different names for selling Internet access, but most of them don't tell you *how* you are connecting to the Internet. Now is a good time to find out and see just what they mean for you.

Before we get into this, if you are new to looking at the techno-side of the Internet, relax and stay calm. You can figure this stuff out and we're here to help. If you want a basic understanding of how the Internet works in general, we've got an article for that too. Remember, everybody starts at zero when it comes to learning new things. I did too! Look at me now, writing and working with this stuff everyday!

Dial-up

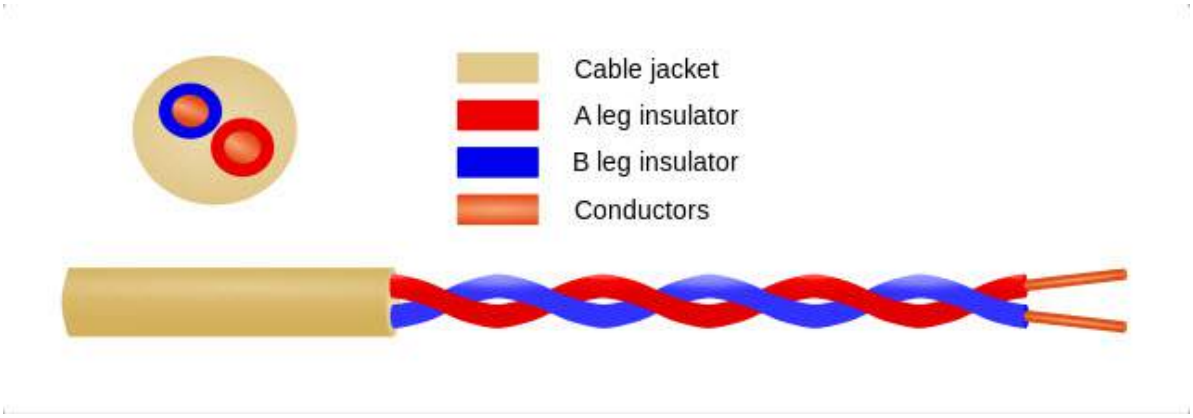
This is where it all started. You would take your home or office phone handset, and put it into a cradle called a **mod**ulator/**dem**odulator, or modem as we know them today.

The modem took digital signals from your computer and turned them into audible sounds that would get transmitted though the mouthpiece of the handset. Off the signal would go over ordinary telephone wires to the computer that was acting as your Internet service provider. The signal coming back from the Internet would be played into the ear-piece of the phone and the modem would translate that audible signal into a digital signal that the computer could work with.

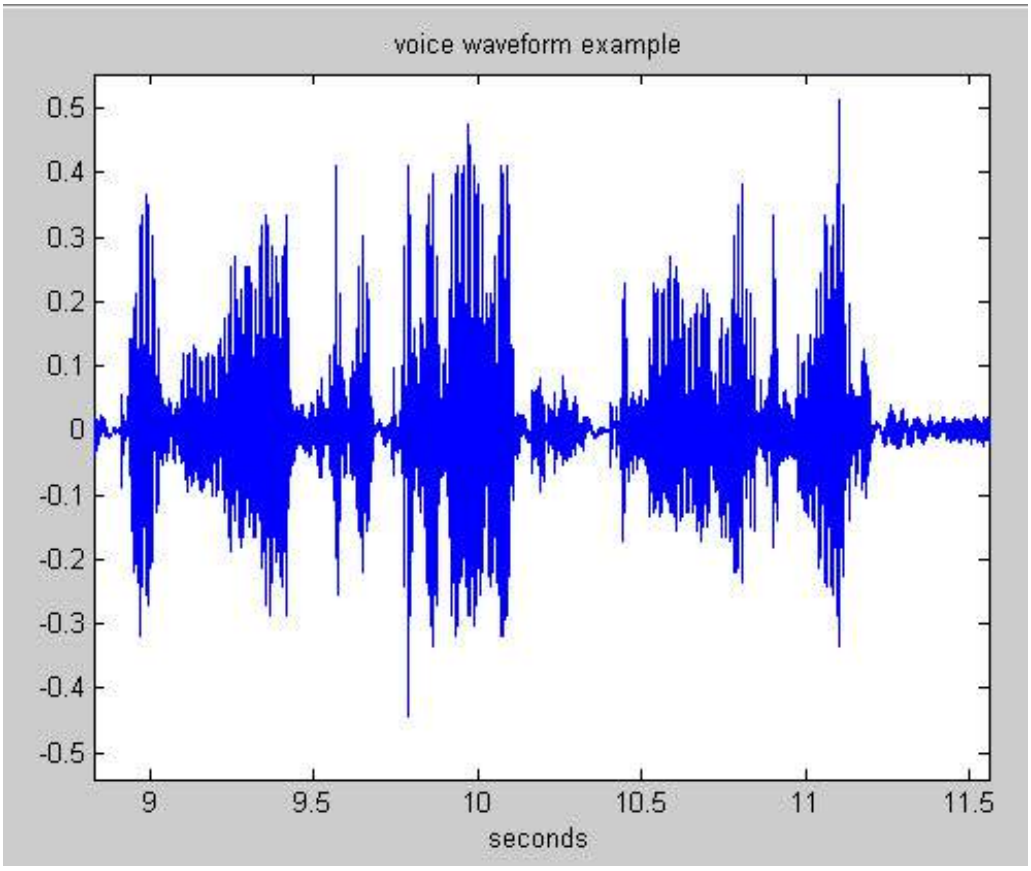
That is the essence of how all Internet communications go between your computer and wherever

on the Internet your communicating with. What's changed is the medium which these signals travel through, and the signal itself.

With the dial-up modem, the signal was analog and the medium was a phone line made of a pair of copper wires. This was the "tin can and string" of the Information Superhighway, but it was the best (and only) method there was for a long, long time. Below is a diagram of the basic twisted pair of cable that phone systems use.



The signal, being analog, was not the most efficient way to communicate. If you were to picture a graph, an analog signal would look like a series of peaks and valleys, drawn with seemingly no meaning. Your voice is an analog signal, live music is an analog signal, sounds in nature are analog signals. Now you get the picture. These peaks and valleys are very nuanced, and mostly pleasant to our ears. But does it ever take up a lot of space!

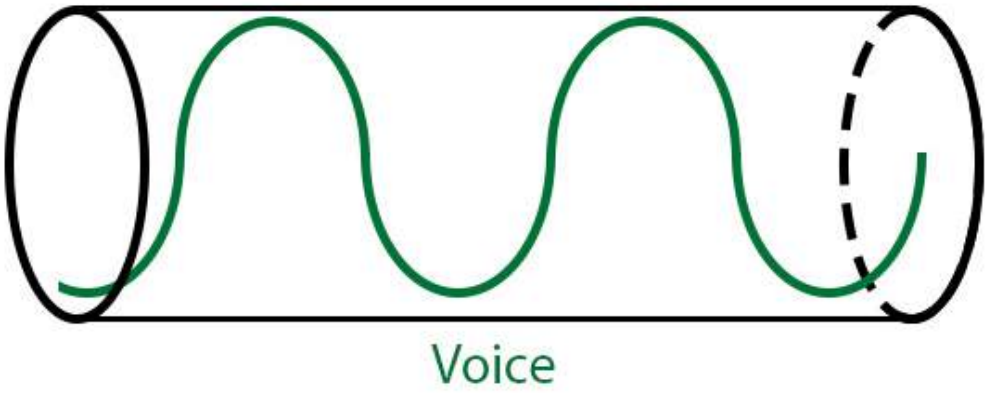


Think of a vinyl record. It's huge! Twelve inches across with a surface area of about 226 square inches. And all you could fit on it were maybe twelve 3-minute long songs. Not very efficient when you start thinking about how many thousands of songs you have on your iPhone, is it?

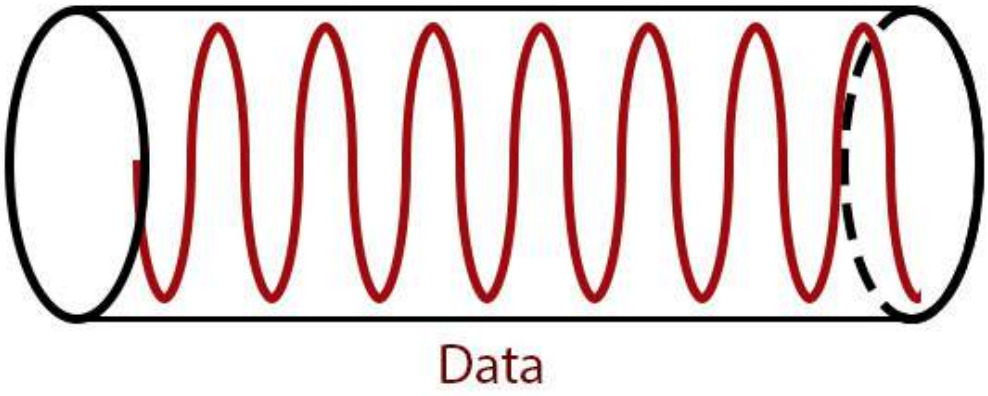
What You Can Expect: Dial-up providers throw the term '56k' around a lot. In reality, you can expect 33 kbps on average. If you can find a dial-up ISP, it'll cost you well under $10 USD per month.

DSL (Telephone Line)

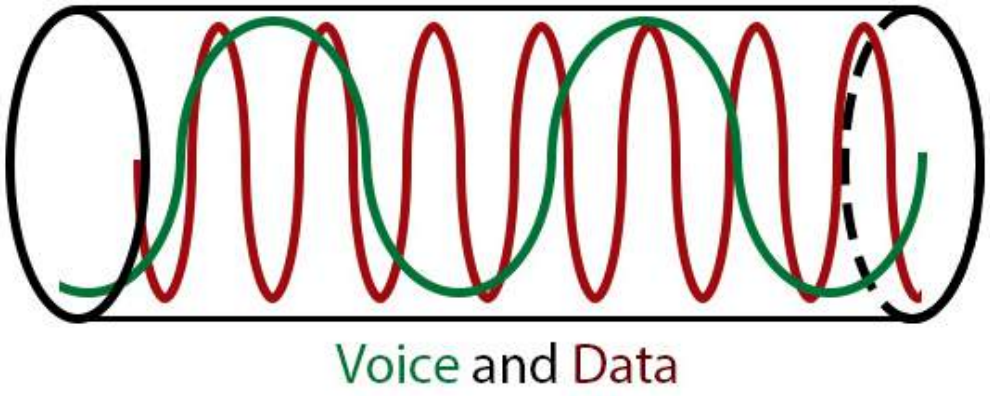
DSL is an initialization of **D**igital **S**ubscriber **L**ine. The phone companies developed a way to send a second signal down the phone lines, and they did this by sending it at a higher frequency. It's a pretty complex method, but if you're trying to explain it to someone, here's a simplified analogy. Imagine a pipe that you send a green marble down every 60 seconds. When there are green marbles in the pipe, that appears to be all that you can really do with it – send green marbles. Those green marbles are the voice communications.



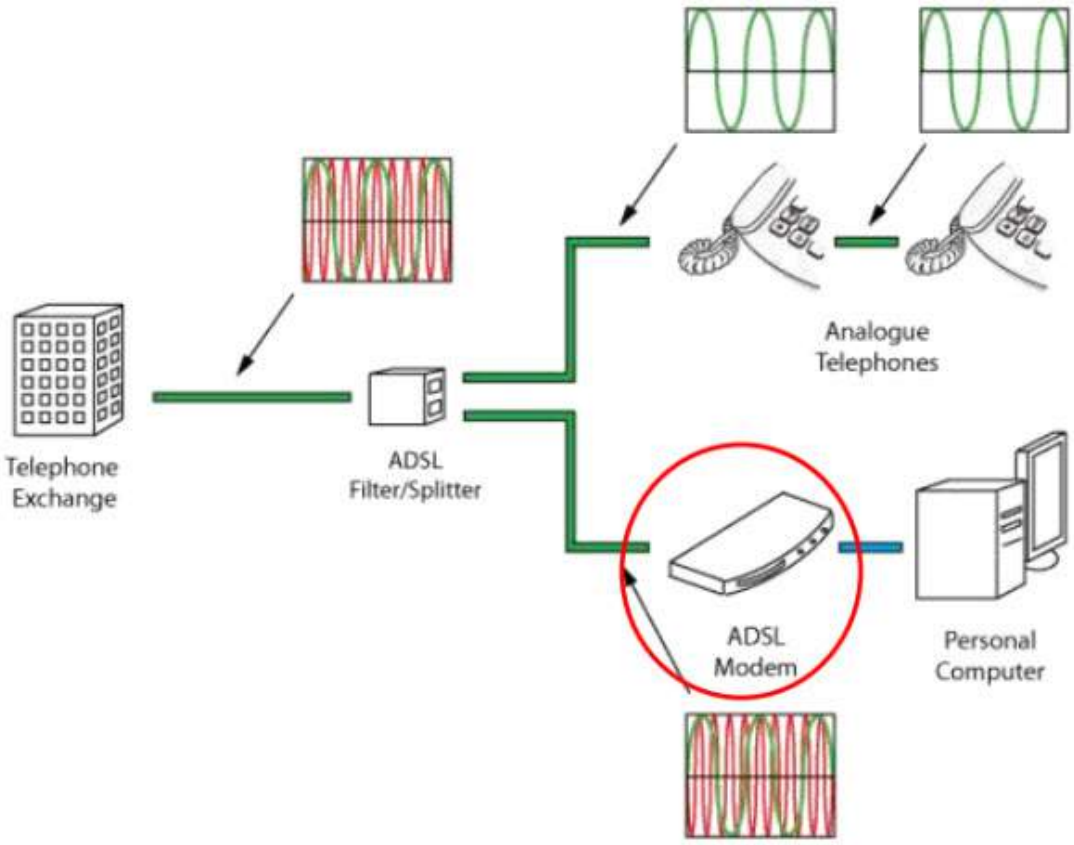
Now imagine that you could start sending red marbles down the pipe, between sending the green marbles. Let's say you send the red marbles every 5 seconds. The red marbles are data. As you can tell, the data (red marbles) travel at a higher frequency than the voice (green marbles).



Yet we can still use the same old pipe that we only used for voice before *and* have data flow through it.



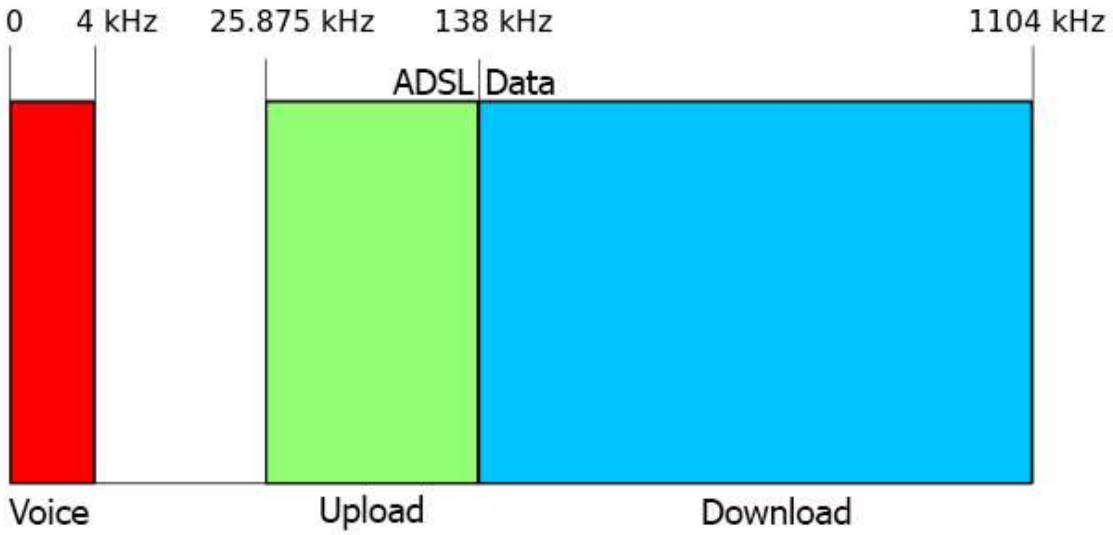
At the other end of the pipe, there's a machine that sorts the marbles. All the data marbles go to the computer, all the voice marbles go to the phone.



In real life, this is done by a signal filter. If you have DSL service, you know what these look like. It filters out the high frequency so you can hear the voice better. Otherwise there would be a high-pitched hiss on the phone line.

To make DSL work even better, the smart folks came up with **A**synchronous **DSL** (ADSL). They figured out that your average person is more concerned with download speeds than upload speeds. When you're on Facebook, most of the time you are only typing a few letter and sending a few mouse clicks. That doesn't need much bandwidth. But you're downloading everyone else's statuses, pictures, and videos. That takes a *LOT* of bandwidth.

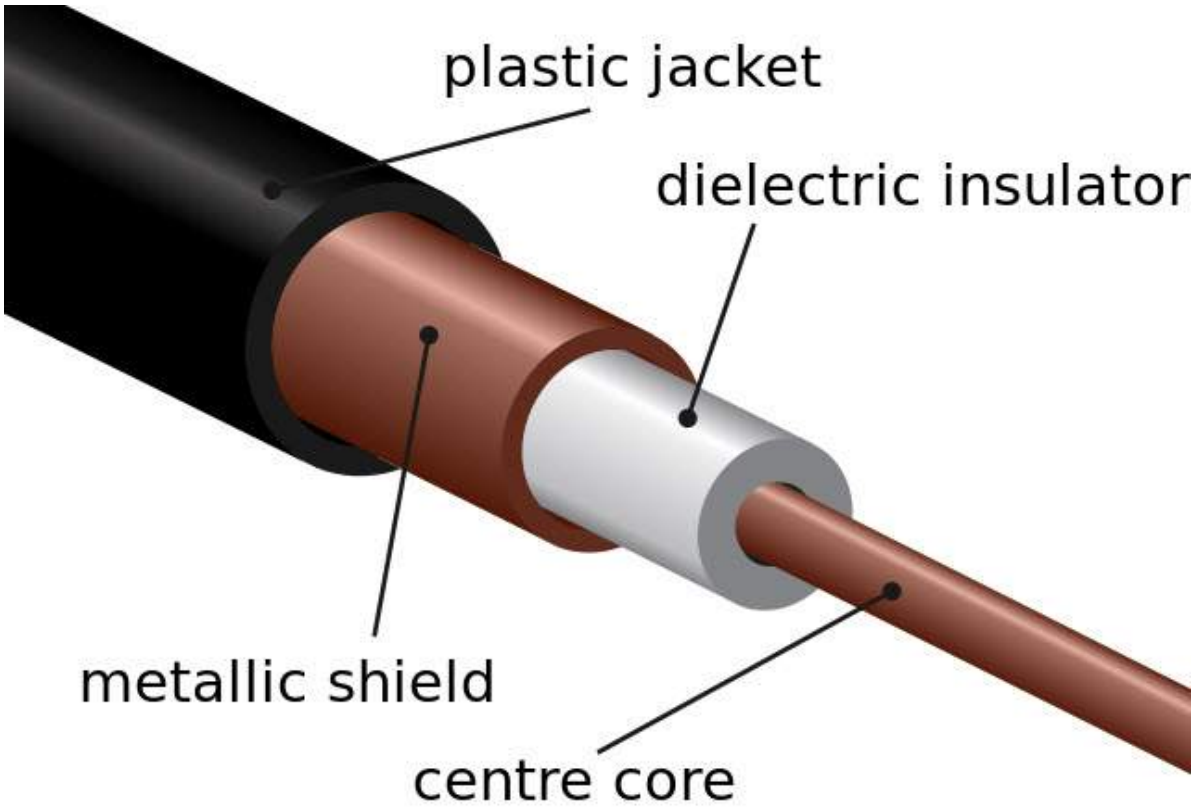
The most popular analogy is a four-lane highway between two towns. Normally, you'd have two lanes going east, and two lanes going west. That would be a synchronous highway. We have more traffic going west than east though. So why not use one lane to go east, and three lanes to go west? That's an asynchronous highway. The one lane is your mouse clicks and typed letters, the three lanes is everyone else's statuses, pictures, and videos. You can see it in this chart that also shows the voice part in the lower bandwidth range.



What You Can Expect: DSL ISPs promise speeds from 1.5 Mbps to 10 Mbps, however new technology could push it to 100 Mbps. A more realistic number is about 80-90% of what your ISP advertises. DSL service cost range widely, as the speeds do, from $20 USD to $120 USD or more.

Cable (Coaxial Cable)

When Internet access made the jump from dial-up, cable was the first new medium to be used. The cable used is the same as the cable that you may have for cable TV. One of those round cables, with a solid copper wire core inside of a thick plastic like insulator. Around the insulator there is usually a foil shield with a braided aluminum jacket around that. All of that is inside the outer plastic jacket of the cable.



The beauty of cable was that many homes already had it. Coaxial cable had been used for decades to send multiple signals, why not add Internet? So they did.

Delivering Internet access over cable uses a standard called **D**ata **O**ver **C**able **S**ervice **I**nterface **S**pecification (**DOCSIS**). This method isn't a whole lot different than what DSL does by using a high frequency for data and a low frequency for voice. Cable, however, uses many different frequencies – one for each channel. The oversimplified explanation of how DOCSIS works is that they added another channel (or frequency) for data. Cable can also use asynchronous data transmission, like DSL does.

Of course, cable Internet access does require special modems to work. The modem has to separate the data from the television channels and present the signal to your computer in a fashion that it will understand.

What You Can Expect: Residential service can go up to about 250 Mbps, but most ISPs offer somewhere between 10 Mbps and 120 Mbps. Cost? From around $10 USD to $100 USD per month.

Fibre Optic

The technologies that we've talked about so far use electricity and copper wires to transmit the signal. Then along comes fiber optics. In it's simplest terms, the signal is light and the medium is a special type of flexible glass or clear plastic cable. Glass allows light to travel quite well, right?

Here's an oversimplified explanation of how a fibre optic communication system works:
There is a transmitter on one end that converts the electrical signal to light. It pulses, in a similar way to how Morse Code pulses. The light travels down the glass cable to a receiver at the other end. The receiver detects the light and generates an electrical signal that your computer can use.

Light actually travels faster than electricity, a *lot* faster, at least when it comes to electricity flowing through a copper wire. According to UCSB's Science Line site:

> "Light travels through empty space at 186,000 miles per second. The electricity which flows through the wires in your homes and appliances travels much slower: only about 1/100 th the speed of light."

That's a big part of the reason why fiber optic networks are so fast.

Unfortunately, fiber networks are not as inexpensive or simple to install and run as wire-based networks. That's why it's most often used for large trunks on the Internet between major cities and

across oceans. More and more, you are able to get fibre to the home, though.

What You Can Expect: Download speeds up to 1 Gbps, however most services offer 100 Mbps. You can expect to pay $85 USD per month and above, as your service speed increases.

Broadband over Powerline

You might not have heard of this method of connecting to the Internet. There was some talk about it in the news about 10 years back. The basic idea is almost identical to using cable or phone lines. The signal goes over the power lines that come to your house. Why not? The lines are already there!

Remember the big blackout on the east coast of North America back in 2003? Part of the cause of that was that all the regional power suppliers have systems that aren't the same. That makes it difficult to make the system work for reliable Internet access.

In theory it was a good idea, but not yet good enough to become a solid option to the Internet access methods we already have.

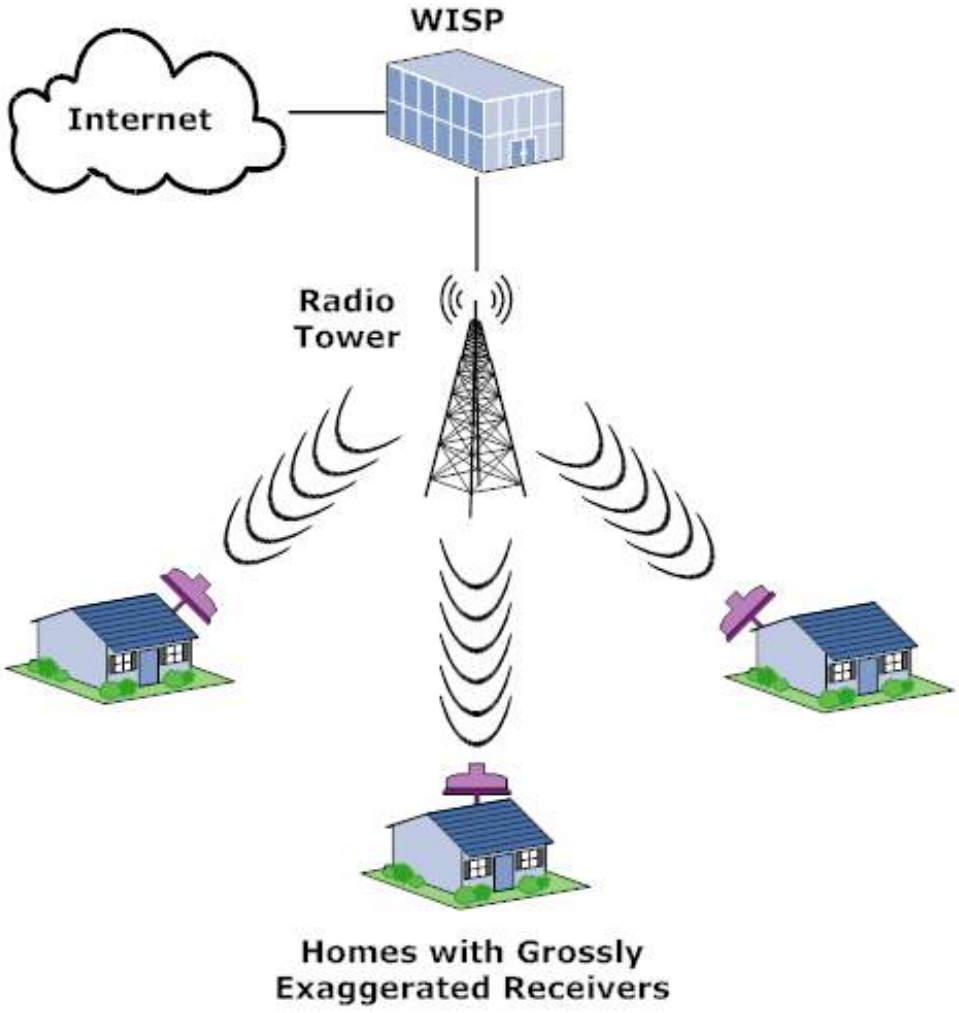
What You Can Expect: Don't expect it.

Wireless Internet Access

The term ‘wireless’ is a big catch-all term to cover any type of Internet access that doesn’t require a cable between you and your ISP. This makes it important for you to ask a few questions before signing up for ‘Wireless Internet’. Each type works a little bit differently and has it’s own pros and cons.

Wireless Broadband

When ISPs advertise wireless broadband for your home, this is usually the type that they are talking about. The ISP will connect to the Internet through a cabled connection and then broadcast that connection using radio waves. You, as the customer, would have some sort of antenna and modem set up that would let you communicate with the ISP.



These systems work almost identically to cordless phones, even on the same frequencies that cordless phones do. The ISP just broadcasts with higher power so the signal will travel further. The one challenge is that your antenna needs to have a clear line-of-sight to their antenna. If there are trees or buildings in the way, you will get little to no service.

Wireless broadband is almost always only considered an option when you don't have cable or DSL service to your home. It's a good option for rural homes or cottages.

The service speeds with wireless broadband aren't nearly as fast as with fiber or cables, for the same reason that your WiFi isn't as fast as being connected to a network cable. Signals travel better in cables than free-air.

We do have an article that will give you a more in depth look at how wireless broadband works, if you're interested.

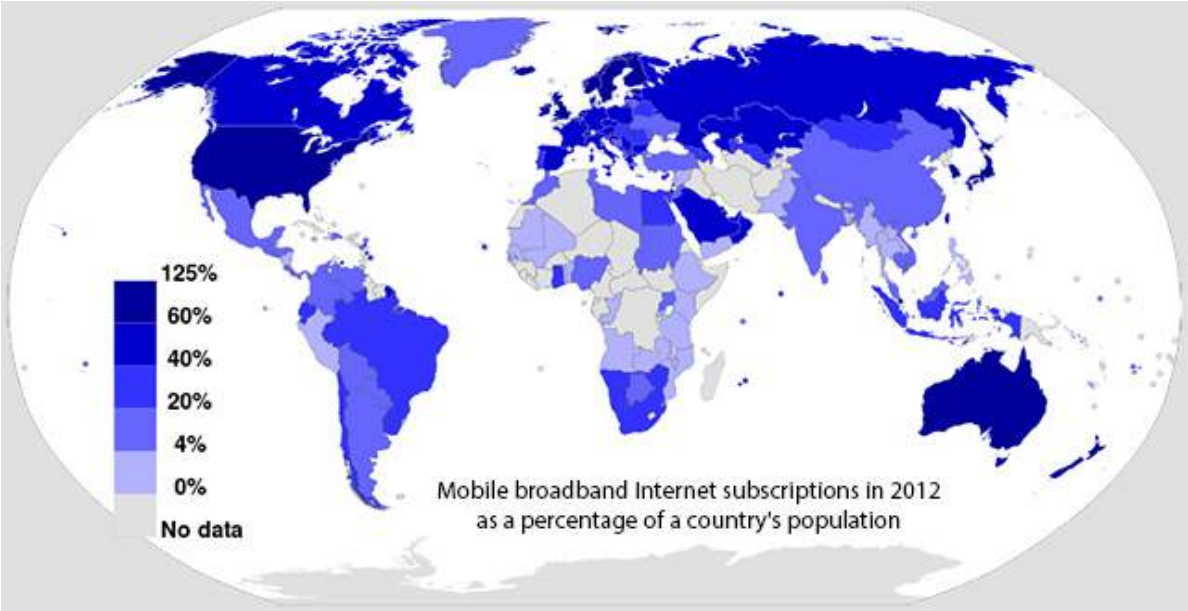
What You Can Expect: Maximum of 1.5 Mbps, more like 800 Kbps at around $40 USD to $50 USD per month.

Mobile Internet

This is how you get the Internet on your phone, USB stick, or PC cards that go in your computer. Service providers typically refer to it as Mobile Wireless Broadband, even though the term broadband isn't technically being used correctly.

For a large part of the world, if you have cell phone service, you should be able to get mobile Internet service. Being available practically everywhere, and so many people having smartphones,

there is an argument to be made that wireless Internet is the future.



Mobile Internet works with radio waves, similar to wireless broadband. Most people don't realize that their cellphones are actually a type of radio. Over the years, service providers have figured out a way to transmit voice and data at the same time. There are several different ways that data can be sent over the cell signal. You've heard the terms 3G, 4G, and more recently, LTE. Each of those methods has a different way of sending data. 3G is an older, slower method and LTE is the newer faster method. The underlying principle is still the same though.

What You Can Expect: With LTE service, up to 150 Mbps, but more like 75 Mbps. Much less if you're not in an LTE zone. Prices vary wildly.

Satellite Internet

As the name suggests, this is a way to get Internet access via a satellite dish. The signal gets beamed to a satellite which turns around and beams the signal to you, and vice versa. Like wireless broadband, it is a line-of-sight technology. Your dish needs to have a clear shot at wherever the satellite is in the sky. That's why it takes a professional installer to set it up.

Each transmission takes about a 45,000 mile trip between you, the satellite, and the ISP. From what we talked about earlier, you know that a signal traveling that far will get pretty weak. Attenuation. That's part of why satellite Internet service isn't usually your first choice. Another reason is that everyone in your area using satellite Internet has to share the same bandwidth. The area is the size of Utah or Ghana. That could be a lot of people. If you're hogging the bandwidth, the ISP will slow your connection down to a crawl to give everyone else a chance. If you want to learn a bit more about how satellite Internet works, we've got an article on that too.

What You Can Expect: Up to 10 Mbps, but expect about half of that. It can cost from $40 USD to $100 USD per month.

Summing It Up

Just like there are many ways to get your television or phone service, there are many ways to get your Internet service. Often, all three of these services are using the same method to come into your home. That prompts the question – where does the phone and TV stop and the Internet begin? Hint: they're all part of the Internet now.

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