



## Difference between speed, bandwidth & throughput

When the Internet took off in the mid 90s, everybody was using dial-up Internet. At that 9.6Kbps and later 14.4Kbps speeds, people were sort of crawling instead of surfing the web. And downloading large files often meant you could go for a nap and wake up and still have to stare at the download bar moving from left to right. From this “slow” environment, people started referring to their Internet experience by how fast or how slow it took to view pages and download content. So people started referring to their Internet lines by **speed**. Technically, it is not quite accurate.

When you say you have a slow 9.6Kbps dial-up line or an ultra-fast 100Mbps broadband line, you are actually referring to the maximum amount of data (kilobytes or Megabytes) that can pass through your line per second. So it is really referring to the capacity or “**bandwidth**” of your line, but since having a higher capacity means you are able to get more data through in the same time period, the end result is that the time taken for your to view and download your content is shorter. For the human senses, it is simply a faster experience. That is why the words speed and bandwidth have been used interchangeably in the Internet world.

When you surf the Web, data packets need to travel from your computer through the huge morass of interconnected network of data-carrying lines called the Internet to the web server hosting your content and back through the Internet to your computer. Along this entire journey, there are many different hops for your data to reach its destination and back. It's a bit like travelling from Singapore to Kuala Lumpur. Some parts of the roads are wider and your data car zips through. But if there are a lot of other data cars trying to squeeze through the same lane or if the lane is really small, then your data car will take longer to pass through that part of the journey.

The number that you see on your broadband plan (i.e. 512Kbps, 100Mbps, etc.) is only referring to the “last mile” of your Internet journey. Think of it like getting from your home to the Woodlands checkpoint. But it does not tell you the condition of the roads on the rest of your journey beyond Woodlands. What is the bandwidth of the other connecting roads? Are there a lot of cars on a specific road you are travelling on? So what is really important to you is how long it will take you to reach Kuala Lumpur. For Internet users, what is important is to know your end-to-end rate of data transmission – i.e. the amount of data that actually gets transmitted from your PC, through the Internet to the web server and back in a single unit of time. This is known as **throughput**. When you download files, you will see a bar that shows the progress of your download and a number that shows your rate of download. This is your throughput. Your throughput is never a constant, and it fluctuates even within the same download session. It will obviously always be a lower number than your 512Kbps or 100Mbps line speed. A simple analogy is to view your line speed as the maximum throughput that you can ever achieve, while your actual surfing experience is determined by your actual throughput.