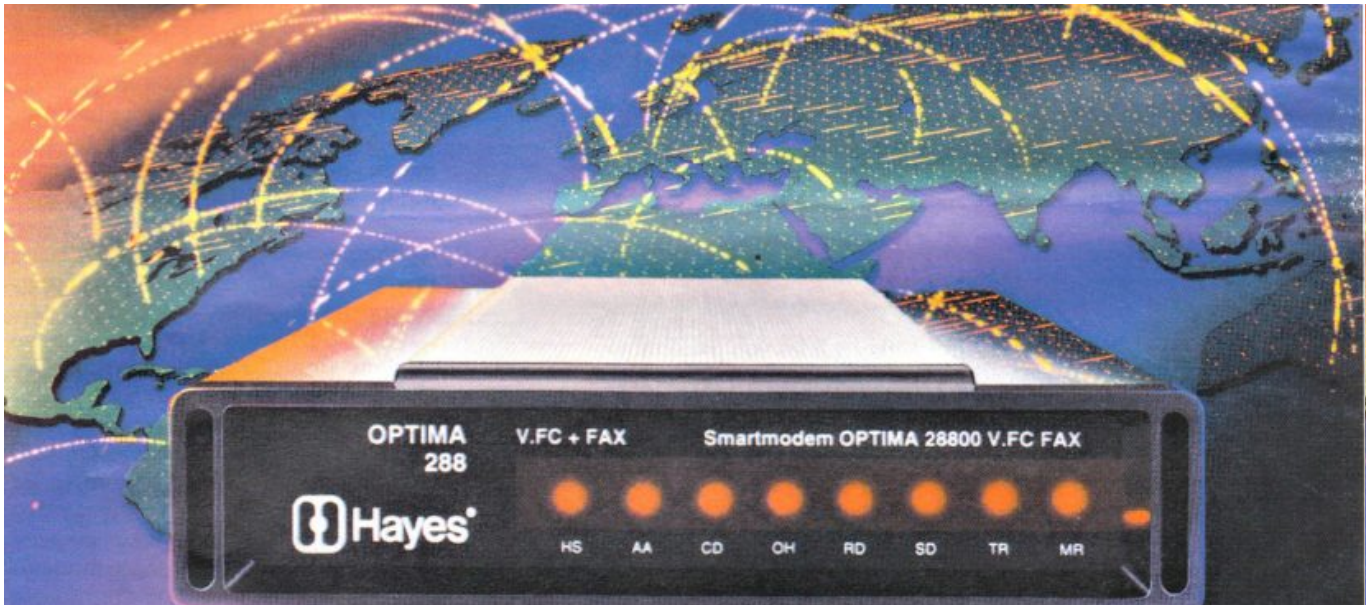

Super Speeds on the Net

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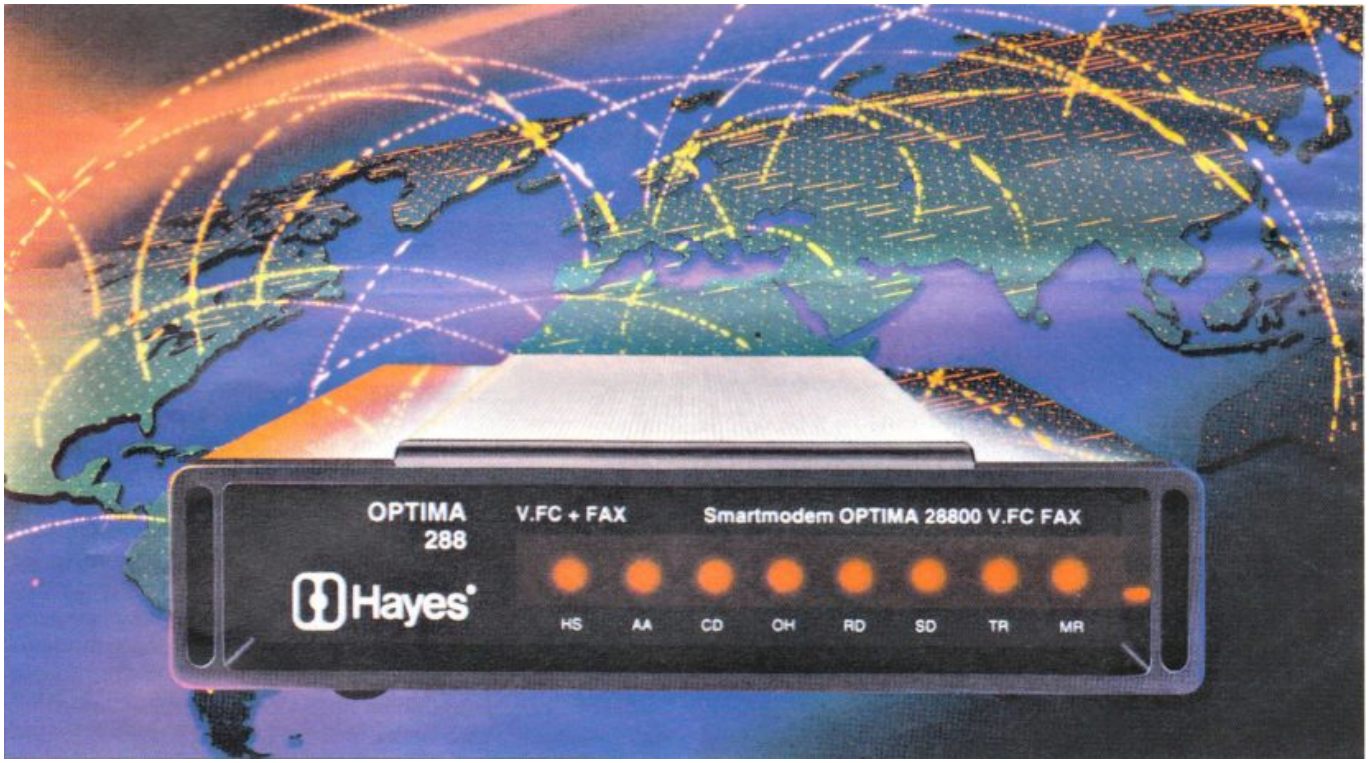
Are 56 kbps modems going to offer a faster internet?



A BUSINESS MAGAZINE IS HARDLY the place to discuss Electronic Engineering theories, but the occasion is too tempting for me to throw some important (read boring) technical information at you, taken ditto from my past university lecture notes. I do not think even my elderly Analog Electronics professor realized the true significance of all the stuff he poured to the heads of the batch of dozy second year undergraduates then, but as you know well, things change. few years back non-technophilies did not know the difference between an analog device and a digital one. These very people now talk about x.25 data services and ISDN. So I would not be surprised if you are already familiar with Shannon's Law, which was known only to a selected group of Communication Engineers just a few years back.

Shannon's Law, or Shannon – Hartley Law to be precise, was discovered by Claude Shannon and his assistant in 1948. Mathematically, it is expressed as C – B Log2 (1+S/N). The letter 'C' stands for the Channel Capacity and 'B' is the Channel Bandwidth. 'S/N" is the Signal to Noise ratio. If this equation sounds like Greek, do not worry, you can just ignore it, but not Shannon's Law. It is too important to neglect. It is one of the principal laws that govern how long you have to wait looking at the hour glass until the requested web page appears on your screen.

In other words, it was Shannon who told us that the maximum data transmission

speed we can achieve in analog phone lines under close to ideal conditions is somewhere around 33.6 kbps.

I hope you note the word ‘ideal’ in the above statement. It refers to US standards, with a Signal to Noise ratio of 1000:1. In a country like ours this ratio will be much less and even 33.6 kbps is a distant dream for us. To be fair, I should mention that the conditions are improved now. Just a few years back, getting a speed of 9600 bps was also considered a great achievement.

So what is all this fuss about 56 kbps modems? Has anyone cracked Shan- non’s Law and found a miracle cure for our communication bottlenecks? Will the Internet users in future be able to download web pages from Internet without eternal waits? Can we throw our 28.8 kbps modems into dustbins and enter into a super speed Internet era with these smart fresh 56 kbps ones?

I am sorry to disappoint you, but the truth is that nobody has yet challenged Shannon’s Law. It still holds good. In plain language, over an ordinary telecom line, the data transmission speed is still going to be theoretically limited to a mere 33.6 kbps. What manufacturers like Rockwell, Motorola, Lucent and U.S.Robotics have done by introducing 56 kbps modems is just finding a son of loop hole’ in Shannon’s Law. It’s just like this: You transmit ordinary “data at a rate of 33.6 kbps. So what will happen if you compress the data? Theoretically, if you compress it by two you will get a speed of 67.2 kbps and if you compress it by three you can even beat the 100 kbps level. In the practical world things do not work in such nice ways. The researchers have found that even if you compress the data you can only go up to a maximum of 56 kbps.

Will the 56 kbps modems really deliver? Will it be possible to download a 500 KB screen saver from Internet within a few seconds in future? It is difficult to provide straightforward answers to these questions. Getting a web page into your computer screen is a sort of team effort”. A chain of events is involved in the process and this chain, unfortunately, is going to be as strong as the weakest link. So, to determine the real impact of the 56 kbps modems all these factors should be taken into account individually.

First in the list is the type of computer. A 200 Mhz Pentium Pro with 32 MB RAM and a 2 GB hard disk capacity is most certainly faster than a 133 Mhz Pentium with 8 MB RAM and a 500 MB hard disk. However, the machine itself is not going to increase the transfer speed of the files. A good machine can only make the already

downloaded web pages appear in your screen faster. If you have a 9600 bps modem, even the fastest PC in the universe will not be able to make your surfing speed faster than 9600 bps. The corollary is that even a 56 kbps modem is not going to help you if you have a 486 with 4 MB. It will be like driving a bullock cart on a national highway.

Another important factor that matters is the type of the serial port in your computer. This is the place to which you connect the data cable coming from the modem. Every serial port uses a device known as a 'UART (Universal Asynchro-



nous Receiver and Transmitter) to send and receive data. Until recently, the type of these UARTs did not pose a problem since the data transfer speeds they handled were much below their maximum possible limits. 486 machines usually have UARTs which can handle speeds not more than 14.4 kbps or 19.2 kbps. The present

standard, 16550 UART has a maximum speed of 115.2 kbps. It may appear so, but it is not as large as we guess. A transfer with 2:1 data compression, using a 56 kbps modem can bring you close to this limit.

Then, there are other factors beyond your control. The things at the other end, i.e. mainly at Internet Service Provider's (ISP's) are also going to matter. You can never imagine how many ways are available for a bad ISP to make you loathe the Internet. Unlike your terminal, the Internet web server of an ISP (or for that matter, of any host server) is shared by hundreds and thousands of clients simultaneously. So it MUST be a powerful machine. Surprisingly, there are many important companies who do not realize this basic truth. For instance, Microsoft had used Pentium PCs for their servers, until the celebrated computer columnist John Dvorak brought out the issue in PC Magazine. Heard anybody complaining that the web site of the Microsoft is one of the most difficult to access? You now know why.

Theoretically, an ISP should always consider increasing the number of Internet servers in proportion with the increasing number of clients but in the real world this does not happen always. Another way to overcome the problem is to introduce what is known as 'proxy servers'. A proxy server keeps a record of the logging habits of the regular clients in a cache memory and when ever such a client logs in downloads the files into his machine even before contacting the host. So far three ISPs in Sri Lanka have announced 'proxy servers'. These techniques will justify going for a faster modem, but definitely not one as fast as 56 kbps. At least not at this point.

For apparent reasons, ISPs have modem pools, not single modems. These are connected to the communication lines they have (these can be ordinary phone lines or leased lines). Again, both these numbers, the number of modems and the number of lines place restrictions on the Internet access speed of a client. The speeds of these modems also largely matter. However, you are hapless here. You cannot force your ISP to upgrade their modems or increase the number of communication lines (they will definitely, if they are not stupid) so more people can use Internet facilities at the same time. In Sri Lanka, many users complain about difficulties in logging to some web servers between 4 pm – 6 pm on week days, due to the heavy usage. If you are also in the same boat, the only thing you can do, I advice you to have a "trial run' before doing this, is to go for a new ISP. A 56 kbps modem placed at your end, will not offer you any solution. Somehow, if your ISP puts 56 kbps modems at his end it is an entirely different story. Provided he is connected to the net through a fast communication channel, such a step can make

life much easier for his clients.

Finally, the critical factor that eliminates even the tiniest possibility of successfully using 56 kbps modems in a country like ours: the low speed communication lines. To say the least, we all know the standards of the local telecommunication structure is not in par with those of many other countries. I have elaborated on this point on several earlier occasions and do not intend to repeat. It is a pity that this condition had even prevented us from getting the conspicuous advantage of 56 kbps modems. The biggest plus of them is they work over 'POTS' -Plain Old Telephone Systems – from your computer to the central site, (Please Note: all the other modern digital technologies need special lines of some sort) but the telephone network should have a digital backbone. Our antique telephone system does not posses a digital backbone and will not in the near future, making 56 kbps modems of no use to us at all, even if we are ready to pay the price.

Then there are intrinsic problems. Numero uno the upload/download asymmetry. All 56 kbps modems are asymmetric in nature. They work at that speed only when you download something, not during uploads. During the uploads you can expect to reach a speed of 33.6 kbps, if all the conditions are ideal. (We know, they would never be!) This is be- cause of the complication in precisely converting the analog signals to digital equivalent. It is more difficult than the other way around. The same theory applies when you perform a data transmission between two computers, both use 56 kbps modems but connected via ordinary phone lines. The bottom line: To get the maximum benefit of a 56 kbps modem, the server should always be connected to a digital high speed line. (So there would not be an analog to digital conversion at that end). Remember this is in theory. We all know there is a difference between what we 'think' we could achieve and what we actually achieve. No 56 kbps modem tested at the Byte laboratories was actually able to record a speed higher than 43.2 kbps.

The story is not over. Next comes the other barrier to cross – the standards. So far, no two 56 kbps modems in the market speak the same language. To be fair, we cannot expect them to, because they are from different manufacturers. This presents a problem difficult to triumph over. What one modem tells will appear as useless garbage to another. A similar situation persisted just after the arrival of 28.8 kbps modems to the market, which had later resulted in the popular v.34 standard. No standard has yet been declared for 56 kbps modems but it will be shortly.

There is one more important fact that the modem manufacturers never tell you.

They talk about data compression at the modem but some engineers seriously doubt its feasibility. If it is raw data, no problem. But how often do we transfer raw data over Internet these days? Most file transfers today are encrypted (for security reasons) compressed (for speed) or both by the host and cannot be compressed by the modem. In fact, it is found in some cases, that a secondary modem compression can actually increase the amount of data in the file when you compress a previously compressed file.

With all these difficulties, a user has little or no reason to go for a 56 kbps modem at this stage. This does not mean they are not practical. They just do not belong to this year. In another ten years they can be the entry level.