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Why does MPLS cost so much more than Internet connectivity?

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MPLS [1] is **really** expensive. Internet connectivity is **really** inexpensive.

Why do private WANs cost so much? More specifically, why are enterprise WAN services - MPLS, Frame Relay - priced so high?

A couple of columns back [2] we took a brief look at the history of the enterprise WAN. Here, we'll dive deeper into the reasons why Frame Relay and MPLS - the now-dominant private WAN service - are priced the way they are.

I double majored in economics as an undergraduate, as well as computer science, and I'm a firm believer that the market sets prices, and those prices are based on supply and demand.

Why are private WANs priced so high? It's clearly **not** primarily because of cost-based pricing. Let's assume that in the early 1990s the customer price for Frame Relay service quite likely *was* largely a function of the cost of providing the service. Back then, in fact, Frame Relay was the price leader among WAN services, with groundbreaking price/performance, far better than the X.25 and leased lines it replaced.

In the roughly 15+ years since that service became widespread, the cost/bit of the equipment to operate a carrier data network has gone down dramatically. And while the ongoing costs of an "over-engineered" IP network, and of the headcount needed to provide better MTTRs in enterprise SLAs for last-mile failures, mean that the cost/bit of running a private WAN service like MPLS no doubt **is** somewhat higher than for "plain old Internet service," those ongoing costs are certainly not more than about, say, twice the cost/bit of providing Internet service.

As we saw when covering why the NEW architecture will happen [3] MPLS is typically priced at **\$300 - \$600** per Mbps per month for the copper connectivity typically deployed at all but the very largest enterprise locations, while the monthly price of broadband connectivity is now **\$1.50 - \$15** per Mbps per month.

Broadband Internet service costs roughly **\$25 - \$200** per month, and the bandwidth available is in the range of **3 Mbps** to **150 Mbps**. One can argue that the telecom SPs were dragged into pricing this way because the cable companies - which had no telecom service market to protect - priced their product somewhat aggressively to target the consumer market, and have continued to increase the bandwidth available (e.g. FiOS 150

Mbps downstream for \$199.99 / month from Verizon [4], or the more widely available XFINITY Internet at 105 Mbps downstream for \$199.95 / month from Comcast [5].

Fiber MPLS connectivity at customer premises is typically in the **\$60 - \$200** per-Mbps-per-month range, while fiber Internet connectivity at a customer location is typically half that, and high-bandwidth Internet connectivity at a colocation facility is typically down around **\$10 - \$20** per Mbps per month, and you even see it advertised for under \$2 / Mbps per month [6] in some cases.

There is simply no way that the cost of providing private WAN connectivity is **20 - 100** times the cost of providing public Internet connectivity. And so the pricing is clearly based on what the market will bear, which is surely the right of the carriers – and should be – in a free market economy. But a look deeper into why the pricing is what it is can be quite revealing.

Whatever the initial reasons for the pricing strategy of broadband, the fact remains that broadband is a growth business for the telecom SPs, and outside of wireless, broadband is one of their biggest investment areas. And while monthly service prices for broadband seem to have more or less stabilized, price/bit continues to improve as the amount of bandwidth available per connection increases. By contrast, the price for MPLS service has come down somewhat in the last few years after being fairly flat for the first half of this decade, but has still not come down with Moore's Law as with, oh ... everything else in technology!

Why haven't MPLS prices come down that much? I'd submit that it's primarily for the following reasons:

- **The last mile RBOC/PTT monopoly.** "Backhoes don't obey Moore's Law" is the old saying, and with the telcos owning the last mile TDM links – especially the copper connections to the overwhelming majority of business locations – they have been able to continue charging monopoly rents for these links. Other than at colocation facilities and in portions of some "NFL cities," the same has largely been true for higher-speed fiber links to business locations as well.
- **Oligopoly of small number of vendors as credible national (global) providers of FR, MPLS.** The oligopoly of 2 ½ vendors (AT&T, Verizon [formerly MCI], plus Sprint as the remaining ½) in the U.S., and similar monopolies or duopolies in most other countries, limited enterprise's choice of providers, especially since there has never been meaningful interoperability of FR or MPLS networks. With fewer choices comes higher pricing.
- **WAN buyers are correctly risk averse.** Given limited IT staffs at most remote locations, it makes sense to be risk averse when it comes to the WAN, as the yearly savings of going with a cheaper but less-reliable WAN service can sometimes be eaten up in handling even a single incident. And given limited staffs, paying lower WAN costs and handling connectivity problems on their own when they arise – and

arise fairly frequently - is not even an option for some businesses with large numbers of locations.

- **...and so they are not hugely price elastic.** Unlike consumers, and many other parts of the computing or networking business, where a price reduction of 2x can sometimes result in 10 times the sales, service providers found that lowering private WAN prices did not result in higher revenues. So they didn't lower prices!
- **The Internet on its own never got reliable enough.** While public Internet connections have improved from the ~1 nine (**90% - 95%**) reliability they had 10 years ago, they are still only about 2 nines (**99%**) reliable – where reliability means the union of simple connection availability plus the ability to get your packets through to their destination without being lost or excessively delayed – unlike the 3½ to 4 nines reliability available from FR and MPLS.
- **...and unlikely ever will.** The reasons for this have little to do with technology, and everything to do with economics and billing. The carriers simply don't get paid extra for making the public Internet – a network of networks – 4 nines reliable, and so it doesn't pay for them to over-engineer their networks, and the network interconnections, and supporting network management, troubleshooting, etc. to do so. The billing issues would be incredibly complex as well. The billing issue alone is a key reason technologies like multicast and IntServ over the public Internet never really “happened” either.
- **Carriers are milking the FR/MPLS cash cow.** While the telecom SPs have indeed aggressively moved customers from FR to MPLS, under the auspices of the lower cost of operating a single data network and ostensibly to deliver the QoS needed for real-time applications like VoIP, they haven't been investing all that much in their enterprise data networks, but instead have focused their investments in wireless, consumer broadband and perhaps the Internet core.

Bottom line: the limited supply of credible carriers coupled with the quite rational risk-averse behavior of Enterprise WAN managers to the lack of QoS and imperfect reliability and predictability over the Internet has led to private WAN service prices staying stubbornly, some might say obscenely, high.

The high prices and consequently limited bandwidth available on enterprise WANs contributed mightily to the growth of the innovation of WAN Optimization by companies like [Peribit Networks](#) [7], [Riverbed Technology](#) [8] and [Silver Peak Systems](#) [9] in the past decade: if bandwidth is expensive, then we need to wring every last bit (pun intended!) of performance from those thin pipes.

This decade, it is the innovation of [WAN Virtualization](#) [10] from companies like [Talari Networks](#) [11] and [Ipanema Technologies](#) [12] that is giving rise to the [Next-generation](#)

Enterprise WAN architecture [13]. In contrast with WAN Optimization, WAN Virtualization's driving force to address the high cost of private WAN bandwidth is the observation that there **are** lots of cheap bits out there, thanks to the Internet, that just need to be made reliable enough for business quality.

In fact, given the above factors, absent a technology like WAN Virtualization, I'd argue that Enterprise WAN managers – even those generally aggressive in rolling out new IT for competitive advantage or to lower costs – have done exactly the right thing being conservative with their WANs for the past 10 years.

But just as RAID enabled businesses to leverage cheap and “unreliable” PC hard disk technology 20 years ago for their enterprise-class storage needs, WAN Virtualization, by solving the reliability and performance predictability issues associated with using public Internet transport, is now enabling enterprises to finally take advantage of the carrier's huge and ongoing investments in wired and wireless public Internet connectivity for their corporate Intranets.

And when combined with WAN Optimization, with the diverse, scalable, inexpensive Internet bandwidth available at colo facilities, and with the other technologies that are integral to the NEW architecture [10], WAN Virtualization will enable enterprises to migrate to cloud computing (public, private or hybrid) in a secure, reliable and cost effective manner in a way that MPLS can simply not provide.

With this next-generation WAN, enterprises will for the first time gain leverage over their telecom SPs and be able to do something about those extremely high MPLS prices.

The market does work!

MPLS cloud computing cloud computing WAN architecture MPLS WAN WAN optimization WAN virtualization

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