



Mapping the future:

what you need to know about choosing your next access technology

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Achieving the 10G milestone involves careful assessment of investment required, likely future demand and how that affects business. All of the above are critical in order for 10G to be effectively implemented.



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Today's telco industry is on a quest. The digital age is advancing rapidly and the fuzzy line that exists between the speeds that internet users would like to have and those which are essential for participation in modern society is growing fainter.

Conventional wisdom leads us to believe that 10G access speed is the next key milestone that providers need to hit in order to fulfil the demand and stay competitive.

However, it is important to remember that there is nothing magical about 10G as a figure; nor does this quest have a clear single path that businesses will follow to fulfil it.

In fact, what lies beneath the surface of that goal is a major debate about the technologies we should be pursuing, the intensity of investment that needs to be made and the realities of what the demand curve will look like in the coming years

and decades. Understanding these dynamics, and how they will map onto business outcomes, is a vital task for the businesses that manage the architecture underpinning modern digital life.

The challenging telco forecast

Let's start with the question of what users actually do and will need. CommScope is fortunate to be able to analyse the usage of millions of customers, over a multi-year dataset, giving it an important insight into market realities. Currently, that analysis reveals an average peak bandwidth usage which hovers somewhere around the 4Mbps mark. This figure, of course, follows a period of significant change in network usage: both an accelerating trend towards higher quality, more frequent video streaming and the post-pandemic demands that remote working places on networks mean that bandwidth requirements have shot up recently.

Tracking forward from that figure, CommScope's analysis currently projects a conservative forecast which, on a linear growth path, sees us reaching an average peak usage of 100Mbps by the next century. It's important to note, however,



that the error bars on that projection get exceedingly wide even just a few years down the road. If we instead project a compound annual growth rate of 21% – essentially assuming that the recent snowballing growth will persist – we will see that 100Mbps figure reached by around 2040.

To try and narrow down these wildly varying forecasts, we must reckon with the complex dynamic between availability and usage: in essence, do consumers find ways to use increased bandwidth as and when it becomes available, or does growth in bandwidth availability track demands from consumers who need to use it? In truth, this is a chicken and egg problem where neither factor takes simple priority, and which one will get focused on at any given moment is unpredictable.

When Apple, announced its Vision Pro headset earlier this year, it came with a suggested minimum bandwidth requirement in order of 100Mbps. That's a step change which means that widespread Virtual Reality/Augmented Reality adoption would quickly tip the scale towards the upper end of bandwidth growth predictions. But will actual adoption take off in a significant enough way to make a real difference? Might it in fact turn out that VR/AR devices like the Vision Pro only really go mainstream when consumers feel that they have excessive bandwidth to use on something?

One thing we can say for certain is that, at least for now, a traditional gap between network architecture and marketing promises has been inverted. For a long time, it felt like we were playing catch up to a vision of connectivity that consumers were being promised. Now, the technology being rolled out has plenty of capacity for the usage increases being seen in the short term.

That gives providers a little breathing space but it also raises important questions about how they prepare for the future. We are decisively through that pressurised period during the pandemic when 'whatever works to keep things running' was the necessary course of action. Now, we have real choices to make around evolving infrastructure, transforming it with all-new approaches, or taking hybrid approaches. At stake is a balance of CapEx and OpEx factors, as well as preparing for the very real possibility that estimates about usage growth prove in fact to be overly conservative. End users demands for connectivity appears to be limitless.

A menu for change

Thinking again about the current quest for 10G, both DOCSIS and PON offer pathways that will potentially get us there.

DOCSIS of course is a familiar and trusted technology that Cable operators have been relying on, and continually improving, for decades. DOCSIS 4.0 nudges access speeds up to that coveted 10G mark. While further improvements and investment would be needed to achieve a symmetrical offering, getting there for downstream would cover the bulk of high-bandwidth use cases.

There are, however, serious questions to be asked about how much runway is left in DOCSIS investment. Just as voice-grade copper telephone networks ran out of headroom to improve internet speeds in the 1990s, new DOCSIS standards and switching equipment will not improve services running on hybrid fibre-coaxial cables infinitely. Perhaps more pressingly for providers, passive optical networks offer the advantage of lower maintenance and upgrade costs, ultimately delivering a significantly reduced OpEx.

Two PON technologies are particularly worth taking note of in this context. The immediate option is XGS-PON, formally denoted G.9807.1 by the ITU-T. As the name suggests ("XGS", here, being shorthand for 10G symmetrical), the standard defines a 10G optical offering both up and down and underpins many of the Alternative Broadband network service providers which have arisen to capitalise on the market promise of fibre-to-the-home. As these services further proliferate and alter consumer expectations in the process, entrenched players in the market may experience greater impetus to modernise.

It's notable that while both DOCSIS 4.0 and XGS-PON are standards which are designed for 10G access speeds, we don't yet see fully-fledged 10G offerings in the wilds of the telecoms market. Both for this reason and in the interest of more thoroughly future-ready investment, some will already be looking ahead to future PON standards.

There are many such options, some mature and some yet to be ratified. Among these, G.9804.hsp (sometimes known as Higher Speed PON) stands out to me as a real contender. With a nominal line rate of 50Gbps, it promises to accommodate even the most aggressive possible growth curve in bandwidth demands. Importantly, it also represents a shift towards digital signal processing to demux connections, rather than the optical splitters that distribution networks traditionally rely on. This solution makes G.9804.hsp significantly more future-proofed from a hardware perspective, potentially making the standard more attractive from the perspective of amortising its up-front expense.



While G.9804.hsp has so far only seen limited roll-out, the existence of it and other emerging standards put providers looking to make the leap to PON in the classic bind of identifying the optimal moment to go all-in. Strong arguments can be made for both reaping benefits today and holding out for a more powerful solution tomorrow. It's little wonder, then, that many are opting to neither stick nor twist with their investment strategy.

Many routes, one destination

There is industry momentum gathering behind so called “cap and grow” strategies, in which DOCSIS remains central to operations, but its future growth is capped, with additional demand being gradually met by developing XGS-PON deployment. Likewise, many are exploring a hybrid approach which relies on DOCSIS provisioning of ethernet passive optical networking (or DPoE) to keep existing OSS/BSS infrastructure in play alongside fresh rollouts.

The flexibility that an amalgamation opens up has an obvious attractiveness: not only do providers get to keep squeezing value from long-standing DOCSIS investments and keep PON CapEx at a manageable level but it opens the door to pivots towards other PON solutions as and when the market demand for them becomes clearer.

At the same time, however, operators need to balance this strategically against the potential management overheads of such systems, in which the added complexity may prove to be an anchor when going up against providers that have built around PON from day one.

It is, perhaps, unsatisfying to conclude by saying that the right strategy will depend heavily on the unique technological and market context that a given operator has – but significantly there's just as much diversity in businesses' current situations as there is in future options. Each of them will need to accept and plan for the reality of an unpredictable digital future.

In the meantime, keen industry watchers will be keeping an eagle eye on the shifting fortunes of different routes to, and beyond, the 10G milestone. As providers sketch out their plans, ready to activate as and when consumer demand requires, which one will emerge as a victor? It is certainly an exciting time, if not always easy, to be in this sector.

