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PASSIVE OPTICAL LANS

by
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Over the past few months there has been considerable discussion of Passive Optical LANs. Despite this coverage, confusion abounds about exactly what a POL is and how it maps on to the wider landscape of telecommunications infrastructure options within premises. Some industry watchers have assessed it as a logical extension of the FTTP environment into commercial premises - not that we have much FTTP in the UK. Other, less charitably, suggest that it is being promoted due to a desperate need to sell products developed for the FTTx market into a different customer-base due the failure of the FTTx market. Whatever the truth may be, the purpose of this article is to describe POLs and to discuss some of the claims being made for them.
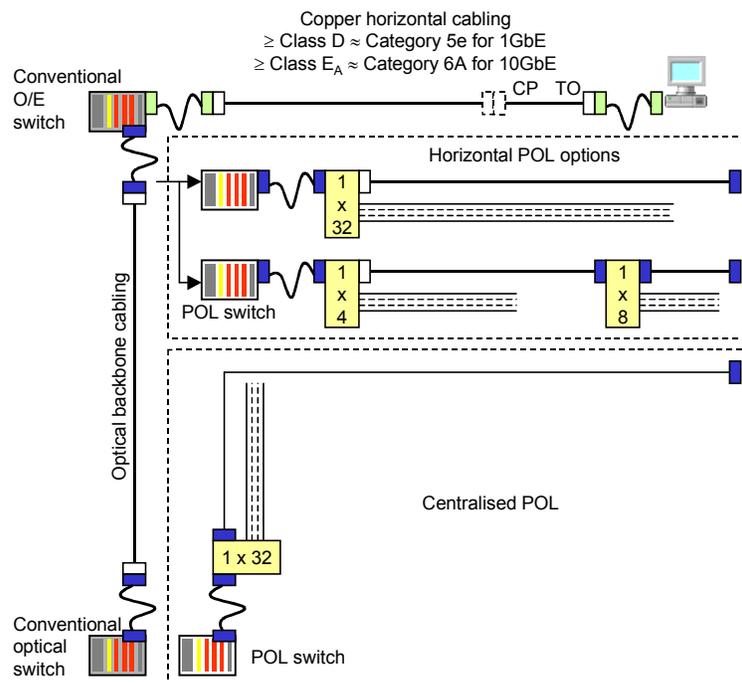
So what is a POL? Well, unlike structured cabling, a POL is not a point-to-point delivery system. Instead it uses passive splitters to deliver a share of an FTTx-style protocol to each user.

This is shown schematically in the figure which compares a conventional cabling infrastructure with a number of POL options.

In order to implement 1 GbE to the desk, a Class D balanced cabling horizontal infrastructure would be connected to a physically independent optical backbone at a "floor distributor". The backbone would not necessarily be "all optical" as not all services to every TO would be the same - allowing considerable flexibility in both cabling implementation and equipment choice.

By comparison, the POL solution is to install a POL switch (or similarly termed piece of equipment), which delivers a ITU-T style PON application, either at the floor distributor (in the case of a horizontal POL) or at the building distributor (in the case of a centralized POL) and to deliver a broadcast Ethernet service to the TOs via a series of passive splitters. Not surprisingly, in view of its pedigree, the ITU-T applications (e.g. ITU-T G.984 covering G-PON and ITU-T G.987 for XG-PON) and the associated products are based on singlemode optics and are well standardised - up to a point. For example, the splitters (without connectors) are specified in [BS] EN 61753-031-3.

This FTTx pedigree also brings with it some technical issues which may not be fully realised until later. The first, of course, is that we are delivering singlemode optical fibre direct to the user and the viability of such optical connections in an operational office environment may be impacted by contamination. There are ways around this e.g. by installing an optical-balanced cabling interface directly at the TO (preventing user access to the optical TO). A second concern is that of the optical power budget - the ITU-T specifications allow a maximum of 24 dB but also require a minimum value which is generally delivered by the splitters. A 32-way splitter, or a combination of a 4- and 8-way splitter, generates up to 19dB which leaves 5 dB for all cables and connections (including those

to the splitters). This may restrict implementation options in terms of both the physical configuration of the system components and also the cabling installation techniques - meaning that POLs are not necessarily installable as a direct replacement for conventional systems.   There are versions of the ITU-T specifications which allow an extension of the optical budget by 4 dB to 28dB but care needs to be applied in ensuring which implementation is being offered - and how much component interoperability is supported.

Users will also have to convince themselves that the broadcast solution is appropriate for them. The bandwidth sharing and asymmetric nature of the services delivered to and from the TO deserve serious consideration but it is more than conceivable that for many users the approach will provide perfectly acceptable quality of service. Questions have been raised about the level of flexibility - i.e. you get what you get, and that's it - but for many users the data rates delivered will be more than acceptable.   There are certain aspects of the ITU-T delivery specifications that need to be better understood - for example, the BER values appear to be orders of magnitude worse than those of conventional, IEEE, specifications.

There are "downsides" that cannot be ignored - many premises owners are moving toward convergence of cabling implementations to provide a wide range of building services of which information technology data to desktops is just one. A primary driver of that concept is the ubiquitous delivery of dc power - clearly POLs cannot compete in this area and any convergence models are irreparably damaged. So what would encourage a user to revert to a differentiated distribution model? The answer, as almost always, must be cost - and also, as almost always, the devil is in the detail.

There have been a number of presentations that demonstrate substantial cost savings generated by the installation of POLs but few of them are delivered by persons with a convincingly wide understanding of premises cabling infrastructures or the types of services that are now demanded to be operated over them.   This is hardly surprising since the proponents of POL solutions are from an FTTx background in which data delivery to a subscriber is king. However, the world of premises cabling is radically different and CapEx cost comparisons are often partial, at best, and OpEx, which must support a flexible and evolving workforce, requires much more careful analysis.

So what should be the correct approach to POLs?   When all is said and done, a POL is a system solution and is, in essence, block wiring using optical fibre. One has to look at the operational benefits and disadvantages at a system level and then, having been told the truth by all the suppliers, an informed decision can be made.

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USEFUL REFERENCES

[BS] EN 61753-031-3: Fibre optic interconnecting devices and passive components performance standard. Non-connectorized single-mode 1xN and 2xN non-wavelength-selective branching devices (NWBD) for Category U. Uncontrolled environment

ITU-T Recommendation G.984.2: Gigabit-capable Passive Optical Networks (G-PON): Physical Media Dependent (PMD) layer specification - download free from www.itu.int/publications/

ITU-T Recommendation G.987.2: 10-Gigabit-capable passive optical networks (XG-PON): Physical media dependent (PMD) layer specification - download free from www.itu.int/publications/