OPINION

FTTH and GPON technology

Optics has changed everything. Today, fiber to the home (FTTH) or fiber to the node (FTTN) are looking like must-haves. Beyond fiber however, the kind of passive optical networking (PON) deployed gives telecom service providers options in terms of capital expense, projected ROI and electrical/optical network maintenance costs.

Broadband networking of any sort, especially broadband to the individual consumer, demands new access strategies. Traditional copper loops were designed for analog voice service. The way voice has been provided has evolved over the years to use more fiber-linked remote digital loop carriers (DLCs). And with the need to develop broadband connections to consumers, DLCs were upgraded to so-called "new-generation DLCs" (NGDLCs) that supported digital subscriber loop (DSL) connections over the same copper pairs. These NGDLCs are fed by a fiber connection, creating what is popularly called a "fiber-to-the-node" (FTTN) architecture.

The network architecture

Fiber is not a new development in access networks. Not only has it been used for almost two decades in the provisioning of high-speed commercial/enterprise customers, service providers in the 1990s found that replacing large bundles of copper by a few fiber strands could improve service reliability and lower craft cost.

Pushing fiber close to the customer is generically called "deep fiber," and various acronyms are used to indicate just how deep the fiber is. FTTH means "fiber to the home," which is the extreme of giving every user an optical-electrical termination. FTTC takes "fiber to the curb," serving a group of homes, while FTTN means "fiber to the node" or "neighborhood," and allows each fiber remote to serve a larger population.

Deciding what approach is best for a given geography requires the careful balancing of a number of factors. There is no question that FTTH deployment is less likely to be rendered obsolete than any FTTN approach, but it is also more costly up front. Today's estimates are that FTTH will cost approximately four times as much as FTTN in "pass cost," but it may pay most of that back within 10 years on outside plant maintenance costs.

While PON systems use a common fiber architecture but a variety of opto-electric approaches. The original broadband PON (BPON) and the successor Gigabit PON (GPON) are both based on ATM. The new Ethernet PON (EPON) standard has been ratified, and most operators contemplating major new PON deployments are conducting assessments and procurements of EPON. GPON and EPON have sufficient capacity for video delivery and high-speed Internet. Some providers like the ATM framework of GPON for its ability to create multiple independent service channels to the user via virtual circuits. Others prefer EPON because it matches better with Ethernet-based metro architectures.

Factors to be considered during fiber deployment

Planning for access network fiber deployment demands a careful consideration of the following:

1) The demographics of the area to be served, including household income, family size, and age distribution. This data is critical in establishing the service market opportunity. In general, favorable demographics justify deeper fiber deployment.
2) The geography and topology of the service area, including the household density (average lot size), the rights of way available, and whether cabling is underground or above ground. This data is critical to set the cost points for each approach. Obviously, poor characteristics here will create profit margin challenges if not taken into account. Studies in Japan, where fiber deployment is high, indicate that even whether the ground is flat or hilly has an impact on deployment cost.
3) The service mix to be provided, over at least a five-year period, considering both trends in demand and in competition. The worst possible outcome in an access fiber deployment is a new set of requirements that the fiber architecture deployed cannot effectively support.

In the installation and maintenance phase, access networks present special problems because of the high cost of rolling a truck to fix a problem. A broadband consumer may require three years to pay back the cost of a single service call. This means that it is absolutely critical

that each fiber strand be properly installed and that, in particular, the splicing used in PON installations be carefully done and verified. Fiber should also be tested end-toend prior to committing it to customers. Unlike copper, whose problems tend to develop over time, operators report that most fiber problems are uncovered shortly after installation and result from improper practices.

Conclusion

The requirement for high-speed broadband could be generated by aggressive multicast IPTV plans, expected competition from cable operators that convert to DOCSIS 3.0, migration to HDTV, and increased consumer demand for Internet bandwidth—and in any combination. In areas of high demand density (suburban/urban areas with above-average household income levels), it is unlikely that many operators will be able to avoid FTTH and GPON in the next decade. Moreover, fiber is an asset that doesn't become obsolete, and GPON technology shows every sign of offering those who deploy it a steady increase in available per-customer capacity not only for residential services but for many business sites as well.