# Cable Companies Join the Gigabit Party

Deployment of true, reliable gigabit services by cable companies has begun even before issuance of a final standard for DOCSIS 3.1.

By Steven S. Ross / *Broadband Communities*

Prodded by competition from Google and other gigabit fiber-to-the-home builds, Comcast and other cable operators have moved up their planned deployments for DOCSIS 3.1, originally slated for 2016 – despite the fact that DOCSIS 3.1 electronics are unlikely to be produced in quantity until next year. In addition, they are testing the option that allows use of EPON from DOCSIS nodes into households, which makes possible connection speeds up to 10 Gbps downstream and 1 Gbps upstream, along with the point-to-point Ethernet network diagnostic tools that help ensure reliable, seamless service.

DOCSIS 3.1 is technology-agnostic at the customer end, and some vendors are experimenting with GPON rather than EPON. The overall technical effort has been pushed by U.S. cable companies and the other large cable deployer, China. As China favors EPON, that standard has moved faster, and high equipment volume should promote lower costs. Equipment is already becoming available, despite the fact that the draft standard is just on the verge of approval and the final standard is not due until next year.

In a typical brownfield MDU deployment, the use of DOCSIS 3.1 would translate to fiber to the basement (if the building is big enough to have its own DOCSIS node) or fiber to the curb for smaller multifamily dwellings or even single-family neighborhoods. The final jump to users would usually be over existing coax, using the pending EPoC (EPON over Coax) standard that is part of IEEE 802.3.

However, in greenfield deployments and in existing buildings that have unsuitable coax but a good business case for the bandwidth, the signal path would be fiber all the way – true FTTH from cable companies. The DOCSIS node becomes a local point of presence for active Ethernet (and maybe, eventually, GPON).

New carrier-quality wireless gateways can reduce the need for broadband providers to rewire inside customer premises and therefore significantly reduce the cost of connecting customers to gigabit services. The gateway (essentially an ONT with a fancy Wi-Fi antenna) is all that most residential and small-business customers should need for on-premises connectivity.

Comcast alone is working on at least a dozen brownfield and greenfield MDU and planned-unit development projects and seems set to announce them this fall. It has also confirmed ongoing tests of DOCSIS 3.1 to single-family homes in Chicago and Denver.

Will there be enough capacity in downstream fiber from the DOCSIS nodes to cable aggregation points? And what about reliability? Carrier Ethernet gains reliability by connecting to multiple access points and by using a ring architecture. If a metro Ethernet ring suffers a failure, the signal flow's direction can be reversed to bypass the failure point. However, core cable networks were originally designed for sending massive amounts of video in smoothly flowing streams toward all customers at once, not for redundancy.

DOCSIS 3.1 attacks the reliability issue in multiple ways. First, even partial conversion to EPON brings better management tools and allows the use of existing and ever-cheaper components to wring more bandwidth out of a strand of fiber – most notably via wave-division multiplexing and Ethernet burst mode.

DOCSIS 3.1 also uses 4,096-bit QAM, which requires between 800 and 900 MHz (by bonding of about 125 channels) to deliver 1 Gbps. That would be in one direction, typically downstream toward users, which suggests that even more video channel space will be devoted to delivering raw bandwidth and that large cable companies may be accepting the idea of à la carte programming (over the bonded channels or the fewer available "video only" channels).

Comcast has been talking quietly about converting entirely to IPTV over the next five years or so. This change would make its network more reliable, reduce power consumption and allow longer distances from aggregation points to DOCSIS nodes. All-digital EPON or GPON signals can travel 12 to 60 miles; analog video signals more typically travel less than 10 miles and require more power on the network edge. IPTV also allows cable companies to abandon set-top boxes if they wish. ❖

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