TECHNICAL COLUMNS

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DEPLOYING VOIP RELIABILITY ON THE OUTSIDE PLANT, PART 2

By RON HRANAC

Last month's column focused on the ability of high-speed data and voice to be deployed successfully on a network if the entire cable system—headend, distribution network and subscriber drops—meets certain minimum technical performance parameters. Those parameters include the technical requirements in government cable regulations such as Part 76 of the Federal Communications Commission's Rules; the assumed RF channel transmission characteristics outlined in the Data Over Cable Service Interface Specification (DOCSIS); and ensuring the plant's unavailability contribution does not exceed 0.01 percent.

With regard to the latter, the PacketCable Availability Reference Architecture assumes 99.94 percent end-to-end availability, of which 0.015 percent is allocated to PacketCable Subscriber Access. The 0.015 percent number, in turn, is broken down to include 0.0025 percent for the cable modem/multimedia terminal adapter (MTA); 0.01 percent for the cable network itself; 0.0019 percent for the cable modem termination system (CMTS); and 0.0006 percent for the edge router. If we look at just the outside plant, 0.01 percent unavailability translates to 99.99 percent availability.

Defining `availability'

Before getting too far into this discussion, let's look at the definition of availability, courtesy of Modern Cable Television Technology, 2nd Edition, by Walt Ciciora, Jim Farmer, Dave Large and Michael Adams. (This book is the source of much of the information in this month's column, by the way.) Availability is the ratio of time that a service is available for use to total time. Here's an example: A 365-day year has 8,760 hours, so one hour of outage during a given year is 8,759/8,760 = 0.9998858, or, converted to a percentage, just under four nines: 99.98858 percent. That means the "four nines" we hear of so often is about 53 minutes maximum outage time per year!

One more thing: Availability is NOT the same thing as reliability—which is the probability that a system or device will not fail during some specified period—so it's incorrect to say "99.99 percent reliability."

Critical elements

OK, back to availability in the outside plant. It's affected by such things as network architecture, system powering, redundancy, status monitoring, system maintenance practices, subscriber drop installation quality and service restoration. Let's look at each of these in a bit more detail.

Network architecture—In general, hybrid fiber/coax (HFC) is more reliable than tree-and-branch. Factors such as homes passed per node are important, too, since that defines failure group sizes per optical path. The number of cascaded devices from the headend to subscriber plays a huge role in overall availability and includes headend equipment; optoelectronics and fiber; amplifiers; coax segments or spans (each piece of cable between two connectors counts as a segment); hardline connectors and line passives; and drop cable, connectors and passives. Now think for a moment about how many individual bits and pieces exist between the headend and any one subscriber. Yikes!

System powering—Relatively speaking, power is by far the largest contributor to outage rate and a substantial contributor to outage hours. How reliable is your commercial power service? Standby power in the outside plant makes a difference, but the tougher decision might be choosing between distributed and centralized power. As well, the amount of backup power—that is, the length of backup time—impacts availability. What's suitable? Three hours of backup? Eight hours? And while not directly part of the outside plant, a headend generator and uninterruptible power supply (UPS) will get one closer to the desired four nines. The same applies to hub sites.

Redundancy—How much, if any, redundancy is used in your system? And just how reliable are the redundancy switches themselves? Insufficient or no redundancy for key components may reduce overall availability, while too much redundancy approaches a point of diminishing returns for the money spent.

Status monitoring—In the past, we used our subscribers for status monitoring. They'd call us on the phone and tell us when things were broken. That model just doesn't work in today's competitive environment, let alone in a system that's providing voice service. At the very least, figure on some sort of status monitoring for nodes and power supplies.

System maintenance practices—I've seen way too many cable operators attempt to reduce expenses by eliminating dedicated preventive maintenance programs, which is clearly the wrong direction to go when voice is part of the service package. The reality is that long-term expenses will be less with an effective preventive maintenance program in place. Furthermore, a good maintenance program will have a positive impact on network availability. Regular readers of this column know that I'm an advocate of forward and reverse sweeping, aggressive signal leakage and ingress management, and preventive maintenance in general. These days, though, nondisruptive maintenance is critical. We can't afford to be taking the network down for such things as routine amplifier adjustment—at least during peak voice and data traffic times—so disruptive maintenance must be scheduled during times least likely to affect a large number of users.

Subscriber drop installation quality—Drop problems are a fairly small contributor to outage rate, but they have nearly the same relative impact as power does on outage hours. What's important here? The use of high-quality drop materials; good installation practices; installer training/qualification; and a good quality control program that checks a small percentage of randomly selected installs for follow-up evaluation.

Service restoration—Keeping the time required to restore service down to an absolute minimum after an outage has occurred is an important part of high availability. Properly trained staff, a stock of spare critical parts, adequate test equipment to do the job, after-hours personnel and vehicle availability, familiarity with the network, and up-to-date documentation (system maps, headend wiring diagrams, equipment instruction manuals, etc.) all impact mean time to repair (MTTR).

Can a cable system's outside plant really meet four nines availability? Absolutely, but it's not as easy as just having a recently upgraded HFC network. For more on this subject, I encourage you to read Chapter 20 in Modern Cable Television Technology, 2nd Edition.

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