



TECHNICAL COLUMNS

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By **Ron Hranac**, former **Senior Technology Editor**, **Access Intelligence** and **Communications Technology Magazine**

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MIGRATING TO ALL DIGITAL, PART 2

By **RON HRANAC**

The biggest logistical challenge in the move to all-digital operation will without a doubt be the process of migrating all of a system's subscribers from analog to digital services. Most, if not all, subs will need a digital set-top box connected to each TV set. Exceptions may include customers who have made the digital TV set plunge, but even that's an "it depends." Here's why: If you plan on using some sort of conditional access to secure your digital video services, then each digital TV will need a set-top if it doesn't support CableCard technology or downloadable conditional access (DCAS)—assuming the latter ends up being adopted and deployed by the cable industry.

New CPE

Getting one or more digital set-tops in each subscriber's home is no small undertaking. Those set-tops cost money, and the truck rolls to install them may cost nearly as much. Then there's the how. It's not possible to install thousands of digital set-tops overnight, so this will have to be done at least somewhat gradually, perhaps on a node-by-node basis. One thought is to implement digital simulcast (discussed briefly last month), then begin the migration. Throughout this process, you must educate subscribers about what's going on and why, when it will happen, and keep them updated on a regular basis. And don't forget about teaching your subs how to use their new set-tops and electronic program guides (EPGs) and the fact that their old analog cable-ready TV sets and VCRs no longer will be able to receive signals directly from the cable network.

T&M

Maintenance and troubleshooting a plant that's all-digital requires rethinking everything from the kind of test equipment you use to staff training. Since the majority of the downstream signals on an all-digital plant will be 64- or 256-QAM (quadrature amplitude modulation) digitally modulated signals, you'll need appropriate test equipment. For example, signal level meters (SLMs) that support digital channel power measurement will be mandatory. Older analog-only SLMs will for the most part become obsolete. QAM analyzers are another tool that will see regular duty in an all-digital environment and will be far more common than they are today.

Some of the old standby gear such as sweep transmitters and receivers (the sweep transmitters will have to be tweaked for optimum performance with a spectrum full of QAM signals), spectrum analyzers, metallic and optical time domain reflectometers (TDRs), optical sources and power meters, digital multimeters and the like will remain in the test equipment stable. So, too, will your leakage detection gear, assuming you use a continuous wave (CW) carrier for detecting and measuring leaks. See last month's column for comments about some of the leakage detection challenges that will exist in an all-digital environment.

Training

Prior to migrating to all-digital, I recommend that a comprehensive staff training program be put in place. Topics with which all headend and outside plant personnel should be familiar include digital modulation basics; digital channel power measurements; test equipment operation; optoelectronics and amplifier alignment and maintenance; linear distortions; signal leakage in an all-digital network; set-top and cable



modem diagnostics; troubleshooting digitally modulated signal problems; and doing proof-of-performance tests.

Speaking of proofs, I suspect that Part 76 of the FCC's rules eventually will be modified to accommodate all-digital operation. There will likely be some cable operators that decide to keep a few analog TV channels on their systems, so some of the existing regulations will remain intact. But for an all-digital system, certain measurements will be a bit different than what we're used to today. For instance, how does one measure distortions in an all-digital cable network? Composite second order (CSO) and composite triple beat (CTB) don't go away when you turn off analog TV channels and replace them with digitally modulated signals. In the world of all-digital, CSO and CTB look like noise rather than the more familiar beat clusters. There is a measurement parameter for this today: It's called carrier-to-composite intermodulation noise (CIN) and is similar to carrier-to-noise ratio (CNR).

Before I get too far from the subject of training, don't forget your customer service reps (CSRs). They'll get bombarded with subscriber questions and complaints about the migration to all-digital, so your CSRs must be prepared.

Bennies

One potential benefit of migrating to all-digital is the possibility that doing so likely will free up headend or hub site rack space. You may find that all-digital means a little less equipment in the headend once you get rid of a gazillion old analog processors, modulators and other gear. That in turn could translate to lower electricity and air conditioning costs.

Recommendations

I noted this last month, and it bears repeating: Check and adjust your fiber links and amplifiers before making the switch to all-digital. Sweeping the forward and reverse is highly recommended, along with documenting end-of-line performance to establish a baseline. This would be a good opportunity to measure optical power levels at downstream laser transmitter outputs, node downstream inputs, node upstream laser outputs, and headend optical receiver inputs, too.

Did I mention that you should educate your subs about what's going on and why, when it will happen, and keep them updated throughout the migration to all-digital? If this happens to slip through the cracks, expect a PR nightmare.

As I discussed in Part 1, a move to all-digital is inevitable. I've just scratched the surface of this topic, and there are many other factors that must be considered. Still, if you start thinking about it today, it will be easier to lay the groundwork for when it does occur. The benefits of migrating to all-digital include more efficient use of the available RF spectrum; new business opportunities; and, in some countries, complying with government mandates.

A modern HFC network that meets or exceeds relevant government cable technical regulations and is DOCSIS-compliant should have no problem with all-digital operation. It's important to check and adjust as required all fiber links and amplifiers before the move to all-digital. Assuming the outside plant is in good shape, the biggest challenge there will be ensuring that RF levels—specifically digital channel power—are correct relative to what the old analog TV channel levels were.

Get staff training sorted out beforehand and realize that your test equipment requirements will change to accommodate maintenance and troubleshooting an all-digital network. It's important to know that references to constellations have nothing to do with stars in the night sky.

Finally, the major logistical issues are likely to be customer-related: Digital set-top boxes will be required for most or all cable subscribers, and it's critical that you communicate with subscribers about the migration to all-digital.

Ron Hranac is technical leader, HFC Network Architectures, for Cisco Systems, and former senior technology editor for *Communications Technology*. Reach him at rhrnac@aol.com.