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BROADBAND: DOCSIS SET-TOP GATEWAY

By RON HRANAC

When cable modems were introduced to the industry in the '90s, the technology was proprietary. That is, a given vendor's cable modem termination system (CMTS) and cable modems were incompatible with CMTSs and cable modems from other vendors. The Data Over Cable Service Interface Specification (DOCSIS), a specification developed by CableLabs and a consortium of MSOs—and later taken through the standards-setting process by SCTE, brought us interoperability. Today it's possible to mix and match DOCSIS CMTSs and cable modems, regardless of brand.

One advantage of interoperability is the retail availability of cable modems. Another, and perhaps more important benefit is reduced cost. It wasn't that long ago that cable modems cost several hundred dollars each. Cable operators are now paying around $50 each for modems, and retail prices aren't much more than that.

Standards for set-tops

A similar parallel exists in the world of set-top boxes. Most set-tops are based on proprietary technology, essentially locking a cable operator into using one vendor's product once it has been chosen for deployment. With input from then-AT&T Broadband and Time Warner Cable, and in an effort to give the industry an alternative to proprietary set-top technology, CableLabs and several vendors—Cisco Systems, Excite@Home, Motorola, Scientific-Atlanta, SCM Microsystems and YAS Corp.—contributed to the development of the DOCSIS Set-top Gateway (DSG) Interface Specification (www.opencable.com/downloads/specs/SP-DSG-I01-020228.pdf).

The DSG spec "...defines the interface requirements for transport of a class of service known as 'Out-Of-Band (OOB) messaging' between a set-top network controller (or servers) and the customer premise equipment (CPE)." Most current set-top technology relies upon a dedicated channel to transmit messaging from the headend controller to each box. Conditional access (CA), system information (SI), electronic program guide (EPG), emergency alert system (EAS) and other generic messages are sent via an RF carrier that is separate from the channels actually being watched—hence the term out-of-band. Upstream traffic requires a dedicated upstream carrier, too.

The OOB carriers use part of the RF spectrum—a valuable commodity these days—and require separate, vendor-specific headend equipment such as out-of-band modulators and return path demodulators. The DSG spec moves away from traditional OOB transport, instead incorporating it into existing DOCSIS digitally modulated carriers now used for cable modem service. A DOCSIS CMTS may be used to transmit OOB messaging to compatible set-tops.

And what's a compatible set-top? It's a DOCSIS set-top box—basically a box with its own DOCSIS cable modem—that has appropriate DSG client software.

It's important to understand that DSG isn't intended to be compatible with existing set-tops. Think of existing set-tops as being analogous to proprietary cable modems. When a cable operator makes a decision to migrate from proprietary to DOCSIS modems, the proprietary modems already in use won't be compatible

with the newly installed DOCSIS CMTS. The proprietary modems generally will be left while new DOCSIS modems are deployed. DOCSIS can be thought of as an overbuild technology—at least in systems already using proprietary modems. The proprietary modems may be replaced by DOCSIS modems over time, or left in place to operate in parallel with the newer modems. Likewise, DSG technology can either replace legacy set-tops or operate side-by-side with them. Migration to DSG can be done on a timetable that fits each situation.

Migration path

So what does DSG do for the industry? First, it provides a way to migrate from proprietary to open standards-based set-top technology. Current OOB solutions are limited, because they're proprietary. DSG allows existing DOCSIS headend equipment to be used, with little more than a CMTS software upgrade. DSG can be thought of as the first step toward a converged network that uses what amounts to next-generation OOB messaging.

What about applications for DSG? In one-way systems DSG will operate with no return path. DSG works fine in two-way systems, and if return path impairments become a problem, downstream control still works. DSG adds the power of DOCSIS for new services—accelerating the rollout of bandwidth-intensive interactive services such as Web surfing, T-commerce, email, and targeted advertising—and supports monitoring and management.

Greenfield deployments get the advantage of starting out without the burden of proprietary technology. All users benefit from technical advantages and continued innovation of DOCSIS.

So, how does it work? As mentioned, OOB data is sent to the set-top via the same DOCSIS digitally modulated carrier in use for cable modem service. The CMTS is configured to be a set-top box gateway, passing OOB messaging to compatible set-tops through up to eight "tunnels." Unlike modems, DSG set-tops don't go through the standard DOCSIS ranging and registration sequence. The set-tops must, however, be capable of finding the downstream digitally modulated carrier that contains DSG data, and receiving media access control (MAC) messages such as upstream channel descriptors (UCDs), MAPs and timestamps. The set-top hardware address does not have to be resolved to an Internet protocol (IP) address because the CMTS does not have access to that address on a one-way plant. This also preserves IP addresses. For advanced two-way services, an IP address could be provisioned just like any cable modem.

The DSG architecture has two objectives: Allow DOCSIS set-tops to operate on a one-way or a two-way plant; and allow existing network applications from the legacy system or OpenCable-based applications to run in a DOCSIS network. The architecture also must allow for one-way broadcasts and multicast traffic to all set-tops; be transparent to application data; and be compatible with current DOCSIS 1.0 and 1.1 cable modems.

Some cable operators may choose to have DSG OOB messaging transmitted in existing DOCSIS cable modem data streams. Some may dedicate a separate CMTS downstream for DSG set-tops, while yet others may opt for a standalone DSG device in the headend. The DSG spec supports all of these scenarios.

I spoke with a senior engineering executive at a major MSO, and he told me that DSG isn't about "some killer app—rather, it's part of the life cycle of technology." His interest in DSG is in part related to a desire to move to open standards in the set-top arena. Another reason? Lower set-top cost is a potential benefit.

By itself, DSG isn't going to generate revenue. That same engineering executive believes DSG is a first step toward new revenues. The industry is still deploying new DOCSIS-based services, and DSG is simply another tool in our toolbox.

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