HDMI Reliability No Longer A Problem

When Manufacturers Pass New Compliance Tests

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When I introduce myself as a co-inventor of High-Definition Multimedia Interface (HDMI), I usually hear more complaints than praise from my colleagues in the CEDIA/Custom Installer crowd. Why? They've been burned by HDMI. A typical complaint I hear: "The technology is great on paper, but we keep running into interoperability problems. The last thing we want is to get to a job, hook everything up with HDMI, and then find out that this component doesn't work with that component." That situation should be going away, thanks to new compliance and interoperability tests that became available in 2007 from Digital Content Protection (DCP), LLC, and Simplay Labs. But the availability of these tests alone is not sufficient—HDMI manufacturers must run their products through these non-mandatory test suites. Therefore, as a co-inventor of HDMI, I'm writing to implore all HDMI manufacturers: Get your products tested! You afflict all of us in the industry when you don't.

HDMI History

HDMI was pioneered in 2002, so it's disappointing that, six years later, many custom installers still think HDMI is unreliable. Something must have gone wrong. The industry has a number of theories as to why HDMI products have had more than their share of interoperability problems. For example:

- HDMI is a very powerful technology with lots of features
- Every new standard goes through interoperability growing pains
- It's been so successful (200 million HDMI devices expected to ship in 2008, and an installed base of one billion to be reached by 2010), you're bound to have some problems due to the sheer volume.

These are all fine explanations, but after six years something else must be going on. My theories: 1, inadequate compliance and interoperability testing; 2, lack of engineering education available for HDMI/HDCP product designers; and 3, manufacturers underestimating the software effort required to make an HDMI/HDCP product work correctly and work with products from other manufacturers. The good news is, the first item has been addressed in 2007, and if manufacturers take advantage of it, I predict that HDMI interoperability problems will become a thing of the past.

How Could This Have Been Avoided?

In one word, testing. In my opinion, the HDMI founding companies who control the HDMI standard made a fatal error in 2002, when they introduced the first compliance tests for HDMI and left out HDCP testing. HDCP, the content-protection layer added to HDMI that allows the content that people care about (movies) to be seen over HDMI, is not owned by the HDMI founding companies, but rather by DCP, a wholly owned subsidiary of Intel. Back in 2002, HDMI wanted to keep its options open for content-protection schemes; perhaps there would be a need for a method "more advanced" than HDCP in the future. Deeming HDCP optional left the door open for HDMI to adopt a new content-protection scheme. That's fine, but why not test HDCP while it was being used on HDMI? (And, by the way, I don't foresee a new content-protection method coming to HDMI anytime soon.) I'm sure there were many good reasons, but instead of trying to guess what happened six years ago, why not just fix it?

The Fix Is Here

In early 2007, three important events happened in the HDMI/HDCP world.

1. DCP announced plans for the first DCP-sponsored HDCP Compliance test suite.
2. Simplay Labs introduced a new test suite, with comprehensive HDMI and HDCP tests, as well as real-world "plug testing."
3. Best Buy® announced it would require manufacturers to undergo "sufficient" HDMI/HDCP testing, or else their products could be refused by Best Buy.

Arguably, the most significant development was number 3, because without a channel consequence, manufacturers may not be motivated. And why did Best Buy make such a pronouncement? One word—returns. Imagine the direct and indirect impact to Best Buy when a consumer returns an HDMI system containing a flat screen HDTV and a few HDMI components and cables. The lost sale can easily exceed many thousands of dollars, but the goodwill lost with the consumer may cost much more over time.

Firsthand Experience

Radiient, the company I co-founded in 2005, has made a living on HDMI "plumbing" products. Why? We make HDMI products that work. Radiient sells HDMI switches and distributors that implement the most difficult-to-implement class of HDMI products—repeaters. An HDMI repeater is a device that sits between the other two HDMI product classes—sources (optical disc players, set-top boxes) and sinks (TVs). Why are HDMI repeaters the most difficult to implement? Repeaters must appear to a source as the representative of all devices downstream of the repeater, accumulating the capabilities of the downstream devices, maintaining HDCP integrity with each downstream branch, and reacting to dynamic events downstream in the appropriate manner. Such operation requires efficient software, or else the repeater can introduce long delays noticeable to the user, making the system sluggish and annoying.

A/V receivers that have both HDMI inputs and outputs also represent the HDMI Repeater class, and it is this type of product that has too often received unwarranted blame for HDMI interoperability problems. A common scenario: A consumer purchases a new flat screen HDTV with HDMI. To go with it, he wants HD source material, so he picks up an HD cable or satellite box, and maybe an HD optical disc player, either HD DVD or Blu-ray Disc, or both. He hooks those to his HDTV's HDMI inputs (if he doesn't have enough HDMI inputs on the TV, he probably buys a Radiient HDMI switch). He hooks that all up, and it generally just works. HDMI has delivered on its promise of

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ease of hookup and performance, and life is good. Then, a few months later, the consumer decides it's time to turn that system into a home theatre, by adding surround sound. To do so, he'll need an A/V receiver or processor, so he buys an HDMI A/V receiver, brings it home, and hooks it up between his sources and the TV. Suddenly, nothing works! It must be the A/V receiver, right? Sometimes, but usually it's the HDMI sources. Why? Many sources don't understand how to handle an HDMI repeater correctly. What's a consumer to do? Well, most return the A/V receiver and likely the extra cables and loudspeakers that went with them, and forego home theatre; he'll wait until he thinks it's safe to buy again. The consumer is disappointed, the store that received the returns loses a sale, and if it can't sell the open-box product, the manufacturer gets it back. Everyone loses.

When we set out to design the Radiient Repeat-6, 1-to-6 HDMI Distributor/Repeater, we knew it would be a challenge. Even so, it surprised me how complicated the software was to manage each output independently, maintaining a unique HDCP-authenticated and -encrypted link, and respond to devices on the outputs that would come and go. (As usual, when an inventor of a technology is subjected to implementing that technology, he learns a lot about how he could have made it easier.) After we finished our hardware, software, HDMI-compliance testing, and internal interoperability testing, it was time to decide if we'd go through the optional additional tests: HDCP and Simplay. It was an easy decision for us to get HDCP tested by DCP, because its test was absolutely free, as long as we sent our unit and an engineer to the DCP test lab outside Portland, Oregon. At that time, absolutely no distributor with multiple HDMI outputs had passed the HDCP test. The people at DCP were actually concerned that their test may have a bug, and because I'm a co-inventor of HDMI, they were interested in seeing the results with the Repeat-6. Well, the Repeat-6 failed a couple of tests at first, too. But we quickly figured out the problems, and then it passed. Wow, that sure was worth it—if replicated in the real world, those test failures could have caused customer returns for us. Next, it was off to Simplay testing. While not free, Simplay offered more testing than HDCP. Since our results at DCP had already humbled us, and we had reaped marketing benefits from having passed Simplay with our Select-4 and Select-4ce HDMI switches, we decided to test the Repeat-6 with Simplay as well. We flew through the directed tests, but in the interoperability "plug tests," when the Repeat-6 was subjected to all sorts of real-world systems and user activity, like turning components on and off while they are still connected to the unit, they uncovered a scenario in which we failed. No multi-output HDMI distributor had ever passed the Simplay test either, so they, too, were wondering if their test may be flawed. Nope. It was our bug again. Since this failure occurred with real devices being used by consumers, we found this testing invaluable. We fixed that last bug, and then proudly announced we were the first multi-output HDMI distributor/repeater to have passed all three compliance tests: HDMI, HDCP, and Simplay. But, more importantly, we haven't had any returns on our Repeat-6, which we started selling in August 2007. That's the bottom line.

Make The Smart Choice—Get Your Products Tested

If the co-inventor of HDMI can make mistakes on an HDMI implementation, I'm hoping other manufacturers will realize the need to submit their products for HDCP and Simplay testing. Why would I encourage potential competitors to get the same testing as I? Because all of us selling HDMI products lose when consumers experience problems with HDMI interoperability. WSR

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