

CONSUMERS WANT PAINLESS NETWORKING AND INTEROPERABILITY OF MULTIMEDIA DEVICES. HERE, TWO STANDARDS GROUPS PAINT SOMETIMES-CONFLICTING PICTURES OF HOW TO ACHIEVE THAT GOAL—AND HOW FAR SUCH SHARING SHOULD EXTEND.



DLNA and HANA: two visions of consumer multimedia networking

We're a long way from the idealistic vision of mobile gadgets, living-room entertainment systems, and home PCs all sharing multimedia without a hitch. Indeed, today's digital consumer devices tend to be idiosyncratic, isolated, and unwilling to share their audio and video treasures.

Two industry groups, the DLNA (Digital Living Network Alliance, www.dlna.org) and the HANA (High-Definition Audio-Video Network Alliance, www.hanaalliance.org), are working on open standards that they claim will provide the "seamless" interoperability that consumers—thanks to premature hype—now believe to be imminent. The groups' visions share common elements and even overlap in many respects. But on some issues they disagree vehemently.

If you're working in the consumer realm, you may soon have to grapple with which of these standards to support, not to mention when and how to do so. *EDN* invited representatives from each group to lay out the scope of their plans, detail their progress, and make their case to the engineering community.

DLNA: EMBRACE THE ENTIRE ECOSYSTEM

Scott Smyers, DLNA

The DLNA, now in its fourth year of operation, is aggressively and successfully addressing the issue of interoperability among devices in the consumer's digital-AV universe.



Although the alliance has a broad and ambitious scope and goal—encompassing consumer-electronics devices, PCs, and mobile devices such as portable video players and multimedia cell phones—the DLNA is making unmistakable and unprecedented progress, as is evident by a growing slate of DLNA-certified products in the marketplace.

The DLNA targets a consumer-

focused ecosystem of interoperable products that allows access to and enjoyment of content in a substantially better way than today's confusing and inconsistent home-networked world. The organization is working to provide consumers with seamless and convenient access to all forms of content in a manner that is transparent, that protects the consumer's investment in commercial content, that protects the rights of content owners, and that respects the consumer's sensibilities and expectations of access and usability. These goals are collectively consistent and synergistic. With its progress toward these goals, the DLNA is enabling the next killer app: easy access to content, anywhere, at any time, and on any authorized device in the consumer's interoperable domain.

Through its efforts, the DLNA's goal is to bake a bigger pie from which all participants can take a rightful piece. This goal stands in contrast to current examples of individual companies that are working to make a pie that they wholly control. It also stands in contrast to recent industry activities that hoped to create interconnected technology islands that stood in isolation, before it became clear that connectivity to the global Internet would become a business necessity, as it now has.

To be clear, the DLNA is working to create a thriving, sustainable ecosystem that is an integral part of the Internet, and, to this end, the DLNA's technology platform is founded on proven and ubiquitous Internet protocols. The DLNA ecosystem includes device manufacturers, service operators, retailers, and content owners. And it is an open ecosystem, in which all parties can participate and from which all parties can derive business value.

STACK DEFINED

To achieve its admittedly ambitious goals, the DLNA must establish an actual, adequate, and usable platform without going too far up the stack and without falling short of the goals. History provides a long list of efforts with scopes too narrow—or too broad—to be commercially useful.

The DLNA has carefully chosen its

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target for the overall interoperability stack. At the lowest level of that stack, the DLNA has established 802.11a, b, and g, plus wired Ethernet. Although the DLNA guidelines spell out these physical interfaces, other physical interfaces can carry the DLNA stack, provided that they have IP (Internet Protocol) mapped onto them. Future DLNA guidelines may include other physical interfaces, depending on the interests and support of DLNA members.

Moving up the stack, the DLNA has chosen the UPnP (Universal Plug-n-Play) Device Architecture, or UDA, Version 1.0. The UDA provides network autoconfiguration, device discovery, and device capabilities and service discovery. Next, the DLNA guidelines document how to use the UPnP CDS (Content Directory Service) for content discovery and selection. Above that, the DLNA guidelines identify HTTP (Hypertext Transfer Protocol) for device communication and content movement across the network.

On top of this stack is the DLNA media-format-interoperability model. This model identifies a set of media formats that are necessary to achieve interoperability. Each format in the set of required formats is an open standard, and the DLNA bylaws themselves legislate this restriction. This step ensures that open industry standards will provide the foundation of media-format interoperability for all time.

In addition to the required media formats, the DLNA has published a set of

optional media formats. Manufacturers of DLNA-compliant devices are free to implement and use any documented optional format, provided that it enables them to interoperate successfully. In the event that two devices do not implement the same optional format, they must then use one of the required formats to achieve interoperability.

This scenario means, for example, that a DLNA-compliant server must transcode content from an optional format into one of the required formats in the event that the server is attempting to stream content to a player or a rendering device that implements only one of the required formats or one that implements a different optional format. Using this mechanism, the organization seeks to ensure that DLNA-certified devices will meet expectations when the consumer discovers some interesting piece of content and hits the virtual "play" button.

This DLNA stack provides a solid foundation for interoperability. Content of all types, including commercial content, will flow across that foundation. To protect commercial content, the DLNA has now finalized its Link Protection Guidelines, which the organization will publish in the near future. These guidelines rely on well-known and trusted content-protection technologies to meet first-stage, near-term content-protection requirements.

The DLNA has recently chartered a new subcommittee to continue work on commercial-content interoperability. In setting up this work, the DLNA leadership expended great effort to set directions and realistic, but commercially useful, goals. The first fruits of this effort are the aforementioned Link Protection Guidelines. The DLNA based the next goal on the realistic expectation that at any point in history, more than one DRM (digital-rights-management) system will be operating in the world of consumer devices.

Choosing and mandating a single DRM system for all devices, therefore, are unrealistic goals, and achieving these goals is not the DLNA's intention. Instead, the DLNA is seeking technology approaches that address what the

organization calls DRM interoperability. “DRM interoperability” means that, even if you own a variety of content that an array of DRM technologies protects and even if you own a variety of devices that collectively implement a multitude of DRM technologies, you should be able to access all content that you are authorized to access on all legitimate devices that you own. This goal is another ambitious one, to be sure, but one that is at hand, thanks to the realization, among all participants in the consumer-product and commercial-content value chains, that network interoperability is the foundation for the next killer app.

UNPRECEDENTED EFFORT

In its short existence, the DLNA has realized a rock-solid platform of interoperability based on proven, ubiquitous, and open industry standards; a certification and logo program that speaks to the consumer; and an effective process for building on the interoperability platform and managing the evolution of technology. These achievements represent a degree of collaboration we’ve never before witnessed in any standards-setting body. Moreover, DLNA has chosen the right target, going as far up the stack as necessary to realize interoperability without going too far up the stack or limiting member companies’ ability to differentiate.

DLNA has earned the interest and participation of content owners and service operators, thereby ensuring that commercial content will flow and that the DLNA platform will support the deployment of new services and content businesses. Device retailers are also actively participating in DLNA efforts to bring the interoperable home network to the consumer. In short, DLNA is delivering on its promise, and the future is bright.

AUTHOR’S BIOGRAPHY

Scott Smyers is the chairman of the DLNA. He is also the vice president of the Network and Systems Architecture Division of the Platform Technology Center of America at Sony Electronics (www.sony.com).

HANA: FIRST, FIX THE LIVING ROOM

By Bill Rose, WJR Consulting

Years ago, all you had to do to watch TV was connect one wire and pick up one remote. Modern AV systems deliver a far richer experience, of course, but they have also become so complex that consumers have difficulty installing and even using them. HANA wants to restore the simplicity of that earlier era and still allow consumers to enjoy all of the latest capabilities.



HANA has developed a standards-based framework that delivers interoperability among home-entertainment devices and also simplifies setup. The cornerstones of this approach include requiring only one connection cable for each device and allowing a single remote to control multiple devices through simple on-screen interfaces.

Because DLNA is also promoting a standards-based approach to interoperability, it’s fair to ask whether both are necessary. You could argue that, because DLNA is addressing every kind of network-enabled device, including home-entertainment equipment, PCs, and mobile devices, HANA is redundant. However, HANA’s members believe that DLNA, by attempting to address everything over a single network based on PC-networking concepts, risks exporting PC-like complexity to the family room. Everything will indeed be connected. But will watching TV get easier or more difficult than it is today?

HANA and DLNA both address Layer 3 (the IP layer) and above, meaning that they do not explicitly specify physical and MAC (media-access-control) layers. However, both groups have made some assumptions about the underlying network technology based on their needs and the world from which they evolved. DLNA assumes that Wi-Fi, Ethernet, and USB will carry both content and control information. HANA, recognizing that the network must be invisible to the user,

has focused initially on IEEE 1394, also known as FireWire.

WHY 1394?

IEEE 1394 provides both isochronous transport of AV content and asynchronous delivery of data. It also offers other services that asynchronous, best-effort networks, such as Ethernet and Wi-Fi, lack. These services include automatic device discovery, a systemwide clock to synchronize audio and video content (for lip-synching and multiroom audio applications), and guaranteed QOS (quality of service) using bandwidth reservation.

Ethernet and Wi-Fi require additional protocol layers and therefore complexity to even begin to approach these capabilities. This scenario is fine in PCs and other devices that have ample memory to buffer content, processing horsepower to execute complex software stacks, and the ability to accept upgrades in the field. But AV products lack these luxuries. So, HANA’s approach dictates that any entertainment device should contain everything it will ever need the day the manufacturer ships it from the factory. It should be able to connect to future products—in one year or in five years—without software upgrades. And, most important, it must be absolutely reliable: no hiccups, no blue screens, no rebooting.

HANA achieves these goals by letting every device send its user interface, including control menus, play lists, and other information, to the display. The TV does not need to know much about the connected device; it simply displays the information it receives and lets the user make selections. Want to watch a movie stored on your DVR? Select the DVR as the source and you will see its play list. Select the program and hit “play.” Want to finish watching it in the bedroom? Simply pause the program, go to the bedroom, select the DVR, and hit play again.

What happens in the background to support this scenario? When a user plugs a 1394 device into the network, every connected device immediately and automatically receives notification that a new device has joined. That notifica-

tion describes the new device and the types of commands it supports. These steps all happen at the 1394 layer. Next, the device obtains an IP address using standard IP discovery. Thereafter, the systems employ Internet protocols such as HTTP, xHTML, and others for command and control and to establish and dissolve logical connections between devices. However, whereas DLNA specifies HTTP as the transport protocol, HANA uses isochronous transport as defined in IEEE 1394/61883, which guarantees low-latency delivery of content using bandwidth reservation.

When a consumer selects a device, such as a DVR, a browser in the TV reads a predefined URL in the DVR, which then serves up a Web page containing its top-level menu for the TV to display. The consumer selects the desired function using the TV's remote control, and the TV sends that selection to the DVR, which executes it. The TV does not need to know what the action is. If the user chooses to play a movie, for example, the DVR simply establishes the isochronous connection with the TV and starts streaming the

movie. If an action involves multiple devices—such as changing a set-top box to a given channel at a specific time and recording that program on a DVR—one of the devices, which the HANA design guidelines define, acts as the coordinator and orchestrates the activity.

HANA also defines proxies that allow non-HANA devices to participate on a HANA network. For example, if a user plugs in a legacy FireWire camcorder that is unable to serve up its own menu, the TV will display a generic user interface with standard playback and recording functions.

Meanwhile, a HANA-DLNA gateway will provide the necessary proxy between UPnP, which DLNA uses, and HANA, enabling rich interaction between devices. Critically, such a gateway will also isolate traffic that does not need to, or should not, travel between the two networks. This feature is important not only because the QOS capabilities of 1394 far exceed those of asynchronous networks, but also because commercial content may carry restrictions on its use.

Finally, HANA is working with cable companies and the 1394 Trade Association to enable high-definition cable set-top boxes to connect using the 1394 ports they already have, thanks to an FCC (Federal Communications Commission) mandate, but are not using (see sidebar “The case of the unused 1394 ports”).

FIRST THINGS FIRST

HANA sees the work of the DLNA and the UPnP Forum as crucial if we are to get to a point where everything connects to everything else in and beyond the home. However, HANA members and many others believe that, at least initially, it is more important to simplify the entertainment experience than it is to connect more things to the entertainment system.

HANA is neither about networking, 1394 or otherwise, nor about any particular physical medium. It is about letting everyone enjoy high-definition entertainment, anywhere in the home, anytime they want, without having to read instruction manuals or employ their own IT departments. The network is simply a means to an end. And, if Ethernet, Wi-Fi, USB, HomePlug, HomePNA (Home Phoneline Networking Alliance), MoCA (Multimedia over Coax Alliance), or some other technology can provide the connections with the necessary reliability and simplicity, HANA will embrace them, as well. **EDN**

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Bill Rose, president of WJR Consulting, is also the chairman of the Consumer Electronics Association's R7 Home-Networking Committee. He participates in all of HANA's technical and business working groups and task groups and leads the technical working group.

THE CASE OF THE UNUSED 1394 PORTS

Thanks to an FCC (Federal Communications Commission) mandate, all high-definition cable set-top boxes include a 1394 port. However, most of these ports remain unused.

There are two reasons for this situation. First, cable set-top boxes render a rich GUI (graphical user interface), which they then send in uncompressed form to the TV in one of three ways: over DVI (Digital Visual Interface), over HDMI (High-Definition Multimedia Interface), or as an analog signal. No current home-networking technology, including Gigabit Ethernet, can cost-effectively support uncompressed high-definition signals.

The second reason that cable companies have ignored the 1394 port is that they do not install Category 5 or 6 UTP (unshielded-

twisted-pair) wire. They pull coaxial cable. Faced with the choice of training thousands of installers to install thousands of miles of UTP cable in homes or placing a set-top box at each TV, they have opted for distributed set-top boxes.

The HANA (High-Definition Audio-Video Network Alliance) is working with member companies and cable companies to enable the networking of an OCAP (OpenCable Application Platform) GUI over 1394. And the 1394 Trade Association, in partnership with HANA member companies, is developing 1394 over coaxial cable at 400 Mbps. These developments will allow cable companies to finally employ those 1394 ports. And, from the consumer perspective, these changes would allow a single set-top box to drive displays throughout a home.

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