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Is China's DiiVA a Threat to HDMI?

Sept. 21, 2009 Tadashi Nezu

A new high-speed interface is about to appear in the world of audio-visual (AV) equipment: Digital Interactive Interface for Video & Audio (DiiVA), for which specifications were finalized at the end of April 2009. DiiVA combines speed surpassing High-Definition Multimedia Interface (HDMI) with the network functionality of Ethernet. It has been referred to as the "Chinese HDMI" because of support announced by Chinese government agencies, industry groups, etc. Already major AV equipment manufacturers in not only China, but also Japan and Korea, have announced support for the new standard. It may well develop into a serious competitor for HDMI, currently the leading interface in AV applications.

HDMI is used in a diverse range of AV equipment, including televisions, Blu-ray Disc recorders and camcorders. In home decks, HDMI is pretty well established as the interface of choice, and surveys indicate that all digital TVs shipped in 2009 will have HDMI.

A new AV interface standard has emerged that will unquestionably affect the adoption of HDMI, however: Digital Interactive Interface for Video & Audio (DiiVA; **Fig 1**), developed with the support of the Ministry of Industry & Information Technology (MIIT) of China, the industry body China Video Industry Association (CVIA), and others indicate that all digital TVs shipped in 2009 will have HDMI.

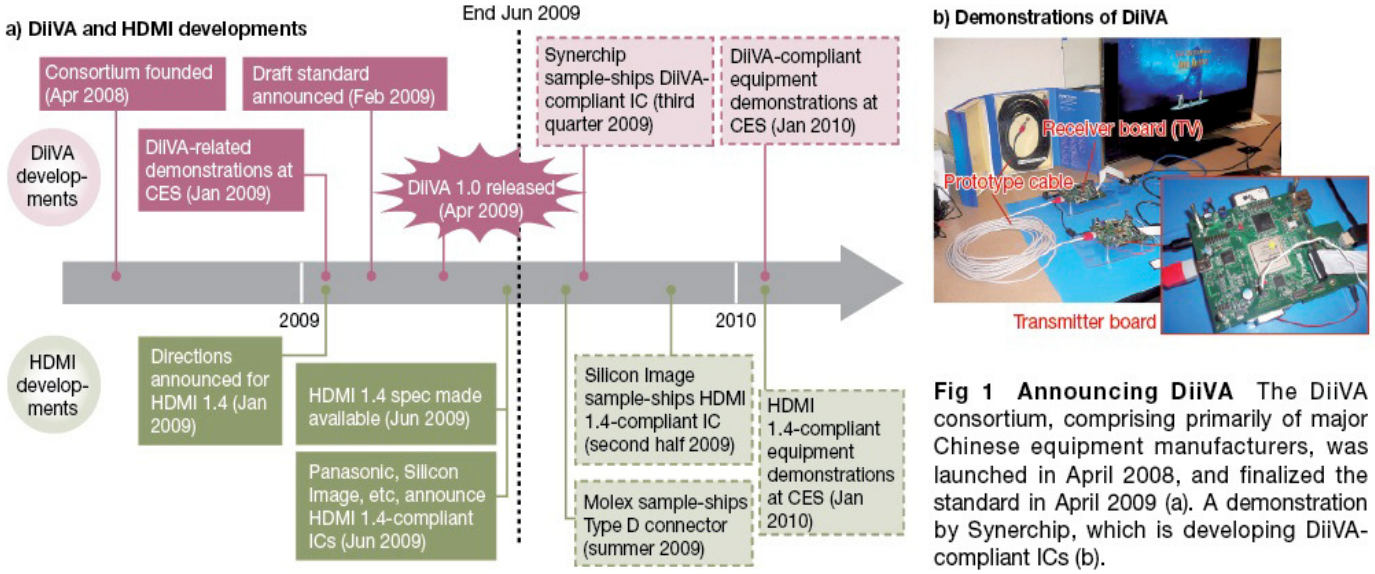

Fig 1 Announcing DiiVA The DiiVA consortium, comprising primarily of major Chinese equipment manufacturers, was launched in April 2008, and finalized the standard in April 2009 (a). A demonstration by Synerchip, which is developing DiiVA-compliant ICs (b).

In terms of functionality, DiiVA surpasses HDMI. It is also faster, with a peak data transfer rate of 13.5Gbps against HDMI's 10.2Gbps. It can transfer uncompressed high-definition (HD) video in the same way as HDMI, and also has network functions to allow it to share the content with multiple other devices (**Fig 2**). It can even transfer Ethernet data.

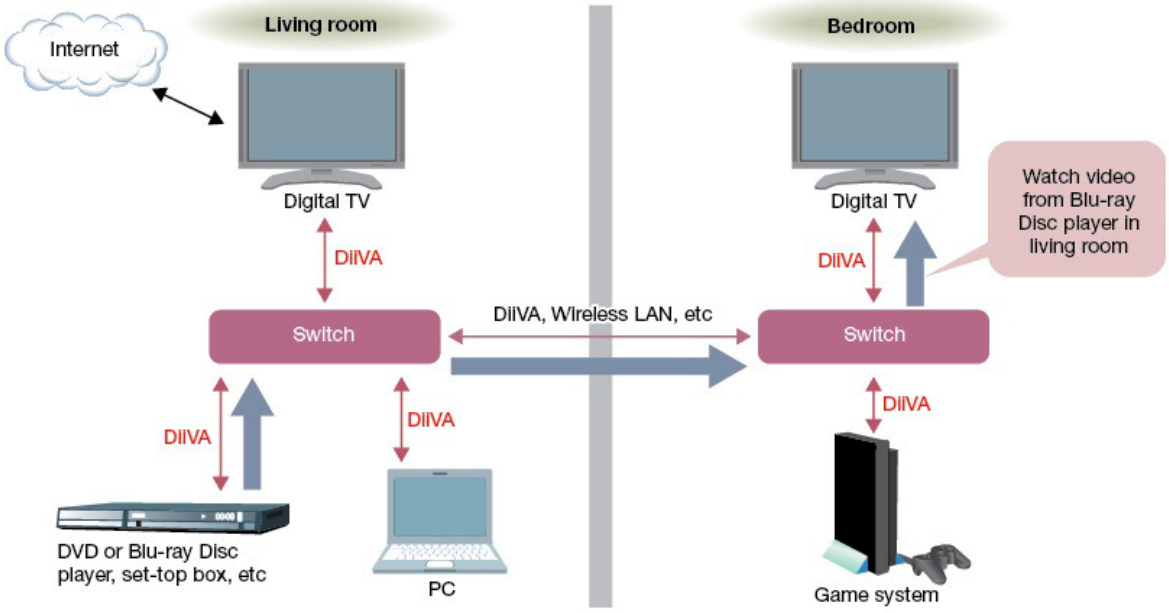

Fig 2 Swapping Uncompressed HD Video between Rooms With DiiVA it will be possible to view content from the Blu-ray Disc player in the living room on the TV in the bedroom, or operate a game from the bedroom using the TV in the living room. (Diagram by *Nikkei Electronics* based on material courtesy Synerchip)

In addition, it has advantages when it comes to component cost. Usage royalties may end up lower than HDMI, and cables are inexpensive Category 6 (**Fig 3**). These characteristics have led many people in the industry to believe that DiiVA may develop into a serious competitor for HDMI.

	DiiVA	HDMI
Industry support	Main driver for HDMI is in charge of DiiVA, and has support of Chinese government, industry bodies, etc	Thought to be implemented in 100% of digital TVs shipped in 2009, including China
	Participation by not only major Chinese equipment manufacturers, but also major manufacturers in Japan, Korea, etc	Adopted by at least 850 firms
Cost	Compliant ICs currently available only from Synerchip	Several firms manufacturing compliant ICs
	Can use inexpensive Category 6 cabling	Requires relatively expensive special cabling
Other functions	Functions for high-speed duplex communication, up to 4W power supply, etc	HDMI 1.4 offers enhanced networking functions and smaller connectors, improving support for 4K2K, 3D imagery, etc

Fig 3 Differences between DiiVA and HDMI DiiVA and HDMI have differences in cost, functionality, industry support and other points. For example, DiiVA is supported by organizations including the Chinese MIIT and CVIA. HDMI, on the other hand, is believed to be implemented in 100% of the digital TVs shipped in 2009.

Support from Japan, Korea

Even though the standard has only just been finalized and no compliant integrated circuits (IC) have even been announced yet, many major Chinese manufacturers including TCL Corp and Nanjing Panda Electronics Co Ltd have already announced support. In addition, leading Korean and Japanese manufacturers including LG Electronics Inc of Korea, Samsung Electronics Co Ltd of Korea, Panasonic Corp of Japan and Sharp Corp of Japan announced they are joining the DiiVA promotion group in April 2009. A source at Allion Japan Inc of Japan, involved in interface standard verification and test, agrees that "Many major Japanese equipment manufacturers are extremely interested in DiiVA."

The industry was especially interested to see Panasonic, a key driver of the HDMI interface, join the group.

The first DiiVA-compliant equipment may hit the shelves as early as spring 2010 (**Fig 1**). Synerchip Co Ltd of Taiwan, now developing a DiiVA transceiver IC, plans to sample-ship in the third quarter of 2009. As a result, a variety of DiiVA-compliant equipment is expected to be displayed at 2010 International Consumer Electronics Show (CES), in Jan 2010.

From China to the World

The many industry people who warn that DiiVA will threaten HDMI all mention the same factor as a key reason for their belief: the founder of Synerchip, which drives DiiVA interface development, is David Lee, formerly chief executive officer (CEO) of Silicon Image Inc of the US.

Lee was deeply involved in the development of the HDMI standard, promotional activity, etc, and is well known for his political and other influence. One source in the industry explains that Lee was the prime driver for widespread adoption of HDMI in the market, and knows everything there is to know about HDMI.

The DiiVA specification was so good, apparently, that Lee left Silicon Image for it. And precisely because he is so familiar with the strong and weak points of HDMI, many industry people are sure he already has a solid strategy for introduction, a business model, and more. At the same time, others in the industry warn that DiiVA could be ignored as "just another Chinese standard," leaving him in the dust (Note 1).

Note 1: Some people in the industry point to past cases where new, Chinese-originated standards vanished without widespread adoption, and suggest that DiiVA will follow the same path. Examples include the Chinese EVD optical disc standard and the AVS video encoding scheme.

When Synerchip discusses DiiVA, it avoids claiming that it is a replacement for HDMI, and instead adopts the position that it does not directly compete with HDMI. Apparently, the DiiVA team is trying to avoid unnecessary conflict with HDMI promoters.

Deciding the Winner

The Chinese AV market is expected to show major growth in the future. China is expected to become the world's biggest market for digital TVs, for example, in 2012 (**Fig 4**).

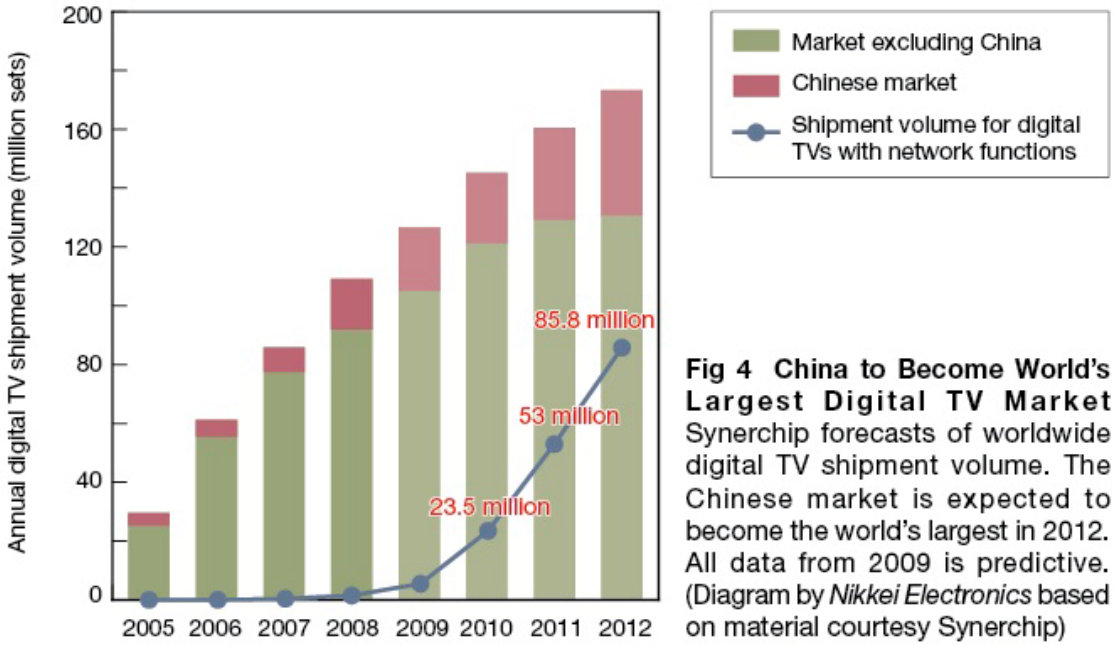

Fig 4 China to Become World's Largest Digital TV Market Synerchip forecasts of worldwide digital TV shipment volume. The Chinese market is expected to become the world's largest in 2012. All data from 2009 is predictive. (Diagram by *Nikkei Electronics* based on material courtesy Synerchip)

The market for network-capable digital consumer electronics, primarily TVs, is also expected to surge. According to Synerchip forecasts, digital TVs with network functions will jump from about 1.5 million sets in 2008 to about 86 million in 2012. No doubt Lee strengthened network functions and started work on increasing Chinese market share with an eye on this timing.

If the Chinese government recommends DiiVA as the standard interface for AV equipment, it vastly increases the chances that it will spread like wildfire. For companies manufacturing components like transceiver ICs and connectors it will mean a huge market. The DiiVA group, including Synerchip, hopes to use the Chinese market as a foothold to get into the world market in a big way.

HDMI shares their belief that networked consumer electronics are spreading fast, and already the latest version of the standard, HDMI 1.4, provides support for data transfer via Transmission Control Protocol/Internet Protocol (TCP/IP) over HDMI. HDMI is also getting serious about boosting its share of the networked consumer electronics markets.

HDMI, which is already extensively used worldwide, including in Japan, Europe and the US, versus DiiVA, which is just taking off in the Chinese market: developments in China over the next few years will play a big part in deciding the ultimate winner.

8B/10B Encoding

DiiVA has finally been revealed as an AV interface, and if it were to be summed up in a phrase it would be "HDMI with enhanced networking."

The signal line configurations of DiiVA and HDMI are quite similar. HDMI, for example, uses three pairs for video signal transfer, with duplex data lines controlling the interconnection between two devices via the Consumer Electronics Control (CEC) function. DiiVA has adopted the same configuration (**Fig 5**), with the Video Link (3 signal pairs) for video transfer, and the Hybrid Link (1 pair) for duplex control of interconnected equipment, just as in HDMI.

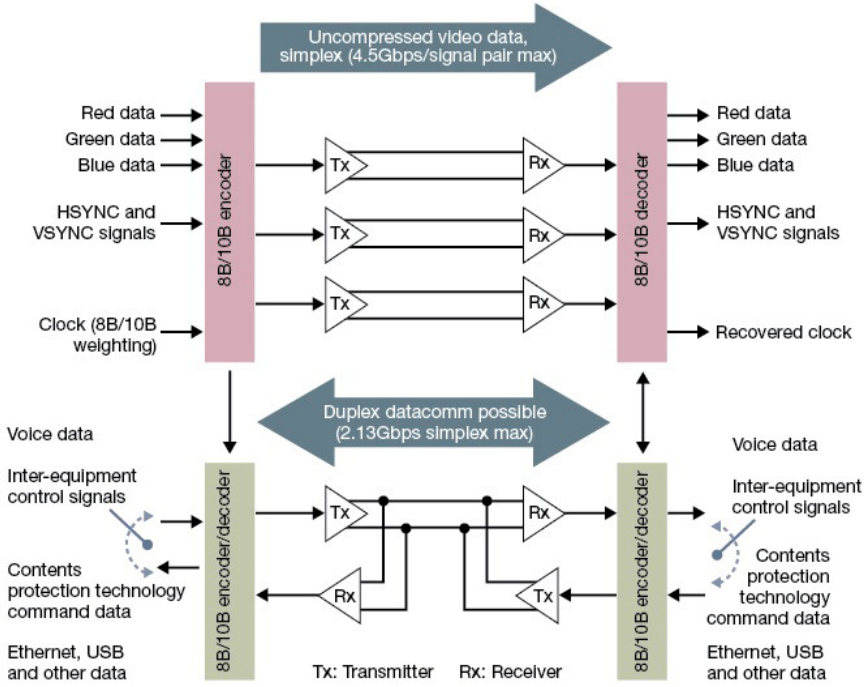

Fig 5 Signal Lines for Video Transfer, Duplex Communication DiiVA has lines for both video signals and duplex communication signals. The duplex communication signal lines handle control signals between interconnected devices, contents protection technology, and Ethernet, USB and other data swaps. (Diagram by *Nikkei Electronics* based on material courtesy Synerchip)

The differences are the presence of a clock line, and the data transfer rate (**Table 1**). DiiVA weights the clock signal and transfers data using 8B/10B encoding, eliminating the need for a clock signal line. HDMI, on the other hand, uses a dedicated clock.

As far as peak data rate is concerned, DiiVA beats HDMI for both video signals and duplex control signals. The peak data rate per signal pair for video is 4.5Gbps, and the total for all three pairs 13.5Gbps. The control signal is a high 2.13Gbps simplex.

Table 1 Comparison of DiiVA 1.0a and HDMI 1.4

Interface		DiiVA 1.0a	HDMI 1.4
Component max colors		16-bit (RGB, YCbCr 4:4:4)	16-bit (RGB, YCbCr 4:4:4)
Audio		Transferred	Transferred
Copyright protection technology		DTCP, HDCP	HDCP
Transfer method		8B/10B	TMDS
Video signal lines	Data rate per pair	4.5Gbps peak	3.4Gbps peak (estimate by *Nikkei Electronics*)
	Signal line quantity	3 pairs	3 pairs
Duplex signal lines	Data rate per pair	2.13Gbps (simplex)	1kbps (estimate by *Nikkei Electronics*)
	Signal line quantity	1 pair (Hybrid Link)	1 line (CEC line)
Clock signal line		No	Yes
Connector specification for mobile equipment		Yes	Yes (Type C, D)
Connection with automotive equipment		Not defined	Defined (Type E connector, dedicated cable, etc)
Connectors	Pin count	Standard 13, mobile equipment 6	Type A, C, D and E are 19, Type B is 29
	Aperture size (for receptacle)	About 12 x 3.8mm (for standard specification)	About 14 x 4.6mm (Type A), about 10.5 x 2.5mm (Type C), about 6.5 x 2.9mm (estimate by *Nikkei Electronics*) (Type D)
Power supply		Yes (max 4W)	No

Home Networking

DiiVA and HDMI are different when it comes to networking functions, too.

DiiVA supports daisy chains, stars and other topologies, making it possible to transfer uncompressed HD video through multiple devices on the network. For example, the HD video content output by a Blu-ray Disc player in the living room could be transferred, without high-efficiency coding, to the digital TV in the bedroom (**Fig 2**). The max range is a long 25m, which means the home network can span multiple rooms.

HDMI 1.3a, the current HDMI specification, can control two interconnected devices using the CEC function, but cannot handle a multi-device home network.

The newest HDMI 1.4 standard, however, offers enhanced networking functionality. A single HDMI cable can now handle Ethernet data as well, thanks to the new HDMI Ethernet Channel (HEC) function, and this makes it possible to share content among multiple devices.

The peak data rate for the HEC function is 100Mbps. If content needs to be swapped between devices using the HEC function, it is implemented via LiquidHD (developed by Silicon Image), Digital Living Network Alliance (DLNA), etc. This approach assumes that the HD video data has been high-efficiency coded, however.

Dedicated Connectors

DiiVA is also working to keep the cost of introduction low. As mentioned above, inexpensive Category 6 cabling, already used for Ethernet, can be used. The price difference increases with the length of the installation. A comparison of a 3-meter cable, for example, shows that an HDMI cable is about Yen1,000 to Yen2,000, while a Category 6 cable is only a few hundred yen. The price difference rises sharply from five meters.

Some potential problem areas have also been cited for DiiVA, however. First, while the cables themselves are general-purpose items, the connectors are a special design. This will boost the cost above common Category 6 cables using standard RJ-45 connectors.

The supply of DiiVA transceiver ICs is limited to only Synerchip, which could make price competition difficult and prevent component prices from dropping. The firm is thinking about making the intellectual property (IP) core available to other semiconductor manufacturers, but does not appear to have actually done so yet.

A number of IC manufacturers are offering HDMI transceiver ICs, with the result that prices are continuing to drop.

Many of the major AV equipment manufacturers are integrating HDMI transceiver circuits into system ICs, pushing HDMI component costs lower every year. Some AV equipment manufacturers market compliant ICs. Panasonic, in fact, began sample-shipping a transceiver IC compliant with HDMI 1.4 at the end of June 2009. And the more progress HDMI makes in the market, the harder it will be for DiiVA to establish a cost advantage.

Other industry sources point out that DiiVA could make measurement instrumentation more expensive. The higher data rate, they explain, demands more expensive oscilloscopes with wider bandwidth. A source at Tektronix Japan Ltd explains, "With HDMI most oscilloscopes used have an 8GHz bandwidth, but you'd need 12.5GHz with DiiVA."