

# VIDEO/IMAGING Design Wire

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[Video/Imaging DesignWire](#) > [Home-entertainment](#) > HDBaseT: Uncompressed HD Video, Ethernet and Power over CAT5/6 Home Networks

## HDBASET: UNCOMPRESSED HD VIDEO, ETHERNET AND POWER OVER CAT5/6 HOME NETWORKS

*HDBaseT is optimized for video applications and can connect all the entertainment devices in a home by providing the "5Play" convergence of uncompressed full HD digital video, audio, 100BaseT Ethernet, power over cable and various control signals.*

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Page 1 of 3  
Video/Imaging DesignWire  
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With the shift towards digital television (DTV) and increasing use of large-scale high definition (HD) displays, the home entertainment market is expanding at an astounding rate. With this growth, the average living room has amassed a huge collection of cables and connectors for multiple devices, such as Blu-ray players, AV receivers, game consoles, set-top-boxes, PCs and many more. Understandably, consumers are looking for a better way to provide point-to-point connectivity and multimedia distribution in the home entertainment environment.

Additionally, the introduction of flat panel displays that can hang on the wall like a picture frame has created a need to reduce the number of cables and connectors to a minimum. Once the TV is on the wall, it is no longer necessary to place the different entertainment devices right next to it. In fact, the majority of consumers, especially women, prefer these devices to be hidden.

So how many cables are really needed today?

First, one HDMI cable is needed for uncompressed video and audio. To support full HD content, the HDMI cable should be HDMI1.3 CL2 rated to handle uncompressed 1080p, 60Hz, 48 bits per pixel, which stands for 10.2 Gbps.

Video and audio are important, but what about Internet? You surely would like to use the full capabilities of your new Internet-enabled TV to access favorite music, enjoy YouTube on the 50" display and receive constant updates with RSS feeds. So for Internet, add an additional LAN Cat5e/Cat6 cable.

And what about gaming? Imagine playing Guitar Hero. You will need an additional cable to carry your signals/controls to the game console that is also hidden, or even located in a different room. USB can do the work for you, but it is limited in terms of distance.

And how about power? Imagine powering your Blu-ray without connecting it to the external power jack. Wouldn't it be great? Why not drive the power from the TV? Well, for that we need another cable.

So you now have four cables. If that seems like a lot, imagine what it takes to install these cables and connect them to a Blu-ray player or game console located 10 to 100m away. In that case you are dealing with the issue of installation which is a different topic and not an easy one to handle.

When it comes to Installation, there are a few elements to be aware of, such as cost of installation, maximum distance, ease of installation, the ability to do an in-wall installation, as well as the ability to work with passive connectors and to use field terminated connectors. When the cables are in place, you would like to ensure that the installation is highly robust since you don't want to redo it.

You need a solution that is robust enough to handle environmental interferences such as EMI. Standard cables and connectors that are widely available are the answer. Whether you do the installation yourself or hire professional installers, you better look for a cable that is reliable, cheap and easy to work with.

So you know what it takes to connect your Blu-ray player to your new 50" display. We need between two and four cables and a way to install them. Think you are done? Not so fast. There are other limitations to consider.

Thinking of using HDMI? Well, think again. HDMI is limited to a few meters, it is very expensive especially when considering HDMI cable that is 3m long or more, and very hard to install due to its thickness and soldered connectors. Is there any other alternative?

### **HDBaseT Technology**

Valens Semiconductor, a fabless semiconductor company, is introducing its HDBaseT technology, enabling a single LAN cable to replace multiple cables and connectors in the home entertainment environment. HDBaseT is optimized for video applications and can connect all the entertainment devices at home by providing the 5Play convergence of uncompressed full HD digital video, audio, 100BaseT Ethernet, power over cable and various control signals.

Currently, consumer electronics (CE) devices in the home require multiple cables connected to multiple connectors to enable the critical elements of 5Play convergence - uncompressed video, audio, Internet, power over cable and various control signals. For end users, installing four or five cables can be costly. From the CE manufacturer standpoint, the market is shifting towards thin displays and the burden of supporting multiple connectors is significant.

In addition to reducing the number of cables required, HDBaseT uses low-cost single standard Cat-5e/6 cable - the easiest cable to install with the highest reliability and robustness. HDBaseT also connects equipment that is up to 100m/328ft apart and uses the existing RJ-45 connector that is widely available.

Each individual element of 5Play convergence is crucial to delivering multimedia in the home, but it doesn't make sense to require one cable for video and audio, one cable for Internet, another cable for power and an additional cable for the different controls. HDBaseT is revolutionary because it makes it possible to offer each element in every CE device, replacing multiple cables with a single LAN cable that saves money, provides higher reliability and enables longer distances

Valens' HDBaseT is the first technology to enable 5Play convergence that consists of the following elements and their importance in the CE multimedia distribution.

### ***Full HD Uncompressed Video***

CE devices must be able to send uncompressed 1080P, 60Hz, 48bits/pixel digital video that is characterized with high throughput over long distance using a single cable that is cheap, easy to install, reliable and standardized. Uncompressed content is important because it supports all video sources, including legacy products, accurately renders gaming graphics and features such as Electronic Program Guides, and does not degrade video quality or add latency.

### ***Audio***

Audio is an essential part of every CE device.

### ***100BaseT Ethernet***

Across the CE industry, leading players are revamping audio and video equipment for a future centered around the Internet. This is critical for enabling a world in which televisions, stereos, computers and other CE devices can communicate with each other and access all sorts of multimedia content, such as video, pictures and music stored around the house.

### ***Power Over Cable***

When it comes to installing CE devices, it is essential to have the flexibility of placing equipment without worry over the power source. HDBaseT uses existing Power of Ethernet (PoE) technology and the next generation PoE+ to source low consuming CE devices, such as low-power Blu-ray players or low power monitors, and eliminate the need for external power cables.

### ***Various Control Signals***

At the center of every multimedia distribution system, from basic point-to-point connectivity to a multi-source/display system, is the ability to send control signals. Different types of control signals have different purposes, starting from CEC that operates basic functionality such as power-on, power-off and play/stop with a press of a button, to RS232/USB and IR that operate remote equipment even when it is located in a different room.

### ***The Technology Behind HDBaseT***

HDBaseT is designed to meet the needs derived from the nature of the application and the target market price. Although the technology is based on data communication techniques taken from the LAN domain, it is exploiting the differences between the nature of the multimedia transmission and LAN transmission to provide a cost effective solution.

HDBaseT is using an a-symmetric method, sending Video, Audio, Ethernet and Controls from source to sink, but only 100Mbit are transferred back (Ethernet and Control). Unlike conventional data communication which is a symmetrical application by nature with required BER of at least  $10^{-12}$ , the a-symmetric nature of HDBaseT is based on an innovative DSP engine and an AFE architecture. A special line coding scheme was developed to provide a better transfer quality to some kinds of data (Audio, Controls, Ethernet) without the need to "pay" the protecting overhead for the video content which consumes most of the BW.

HDBaseT is also dealing with video control signals and the reconstruction of the video clocks. These elements are not part of the conventional LAN communication and required deep understanding of uncompressed video interconnect.

The barrier of transferring Full HD over UTP cable is high by any standards with the additional aspect of video specific expertise, which doesn't usually exist in classic UTP transceiver vendors. When combined with the special architecture required to achieve the target product cost, this creates a significant barrier for competitors.

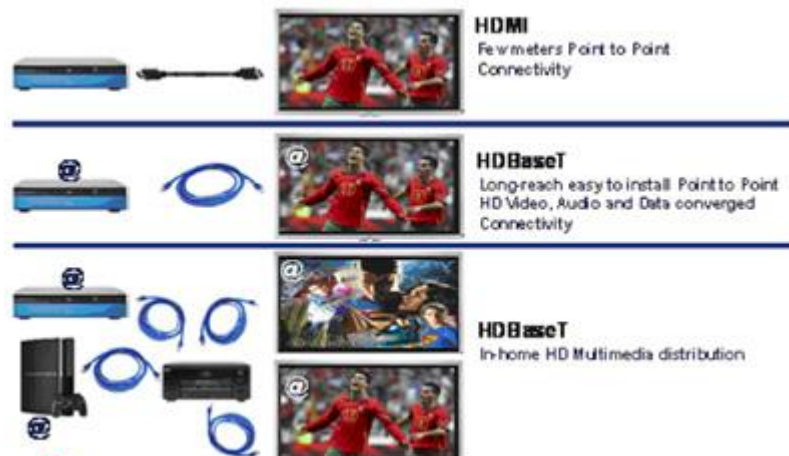


Figure 1: Different usage cases require different solutions

#### Different Usage Cases, Different Solutions

It is almost impossible to define one connectivity technology that can perfectly address the different usage cases. HDMI is still a valid technology when it comes to providing a few meters of only video and audio point-to-point connectivity where no fancy installation is needed and the cost is affordable.

Uncompressed wireless technologies, such as WirelessHD and WHDI, can be considered as an alternative for short HDMI cable assuming that the cost, power consumption and reliability will be improved over time.

When it comes to long-reach connectivity, clearly neither HDMI nor the existing wireless technologies are the answer. HDBaseT 5Play convergence via 100m LAN cable has the perfect match. Its benefits are even clearer in the case of in-home multimedia distribution, as HDBaseT solves the complexity involved with connecting multiple entertainment devices to multiple display devices.

As the consumption of and demand for high quality HD content continues to evolve and increase, so will the interest of the end user in enhancing his entertainment experience. The need for easy access to premium content increases together with the desire to easily distribute, control and consume the content and enjoy a home entertainment experience with an improved look and feel.

HDBaseT answers these needs and delivers significant value to the entire home entertainment ecosystem, from CE/PC equipment manufacturers and audio/video connectivity product suppliers, through systems integrators and retailers, to installers and consumers.

Valens is working towards creating HDBaseT as the new digital connectivity standard for multimedia distribution. With support from consumer electronics manufacturers, content providers and organizations such as the Motion Picture Association of America (MPAA), HDBaseT is revolutionizing the multimedia distribution of uncompressed HD multimedia content in the home entertainment environment via a single LAN cable.

While overcoming the limitations of existing wired connectivity technologies such as HDMI, MOCA, HomePlug and the emerging wireless technologies such as 802.11n, WHDI and WirelessHD, HDBaseT is the answer to all of today's and tomorrow's usage scenarios.

#### About the author:

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