

Connection Tech: 3 Common Interfaces Explained

By: The Maximum PC Staff

Wires. Cords. Cables. Coils. Lines. Connectors. Whatever you call 'em, you've probably got plenty of them running between various pieces of beloved hardware. In this wired, wired world of ours, we rely on various cables and connectors to get our technology working in sync, to provide us with internet, with data, with everything from a picture on a display to power. But how many of us really know what's going on in those twisted strands?

To that end, we present to you three common connection technologies - explained, unveiled, and detailed so that you're well verse with the inner workings of your interfaces.

Read on to get the goods on HDBaseT, USB 3.0 and Light Peak!

HDBaseT

A single Ethernet cable can provide HDMI, power, and data across 100 meters

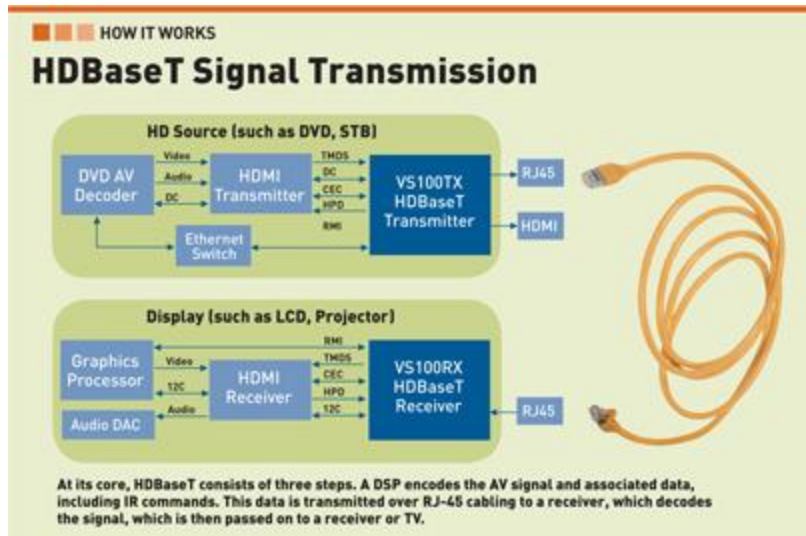
HDBaseT could replace many of your electronics connectors—HDMI, 100BaseT Ethernet, USB, and power—using a single, lowly Cat 5e or Cat 6 Ethernet cable. The technology streamlines your wiring, permits connections to multiple displays/receivers, and greatly extends your reach with no signal degradation. With this emerging technology, an HDBaseT Blu-ray player can sit 100 meters from a connected TV.

How does HDBaseT fit so many signals into an Ethernet cable? We'll explain the technology and how it can simplify electronics connections while enabling new features.

Signaling the Future

Like Intel's Light Peak, HDBaseT passes data through established electronic signals instead of creating its own. Unlike Intel's fiber-optic take, HDBaseT uses standard Ethernet cables, so it's cheap. An added bonus is that many buildings and homes already possess the necessary infrastructure.

Home theater devices such as Blu-ray players rely on a traditional HDMI chip to encode the video. An HDBaseT digital signal processor takes this signal and modifies it to run over Ethernet. The process uses pulse-amplitude modulation (PAM), which encodes and rapidly pulses data at varying levels of voltage. A decoder on the other end turns the information back into a native HDMI signal.



While the PAM technique functions in the same basic manner as in gigabit and 10-gigabit Ethernet and uses the same cables, HDBaseT follows a proprietary modulation scheme. Only the physical cables are used, not the underlying Ethernet packet structure. Even HDBaseT's 100Mb/s Ethernet gets encoded in this way, although an HDBaseT port can revert to plain Ethernet, skipping HDMI and other features, if you accidentally (or deliberately) plug into a traditional Ethernet network. HDBaseT uses its own physical switches, too, although hybrid versions that interface with standard Ethernet are in development.

Version 1.0 of the HDBaseT specification has already been locked in, and specifies a data rate of about 8Gb/s. Even though HDMI requires 10.2Gb/s, the process still works and leaves room for other signals because it is more selective. Micha Risling, marketing committee chair for the HDBaseT Alliance, says, "More than 3Gb/s for HDMI is for error correction.... We don't need that because the modulation that we're using is stronger than that specific error correction." So, HDBaseT skips the standard HDMI error-correction process.

HDBaseT is capable of an even greater data rate, allowing for gigabit Ethernet or future bandwidth added to HDMI. The process would use the same cables but modulate the signal at a faster rate, requiring a more expensive DSP. The HDBaseT Alliance is planning for that in future iterations of the specification.

Even though the HDMI error-correction overhead isn't used, the full HDMI 1.4 list of uncompressed video and audio formats are supported, including HDCP and the methods of handling 3D frames. However, the first HDBaseT devices omit a few features that require an HDMI 1.4 chip, such as audio-return channel. Risling says chip provider Valens Semiconductor (where he also works) has new HDBaseT chips ready for consumer electronics companies that are compatible with all HDMI 1.4 features.

While HDBaseT is built around HDMI, its other signal capacities add versatility. Data and control channels include support for USB, IR, HDMI's CEC, and RS-232. This means that even though your TV and Blu-ray player may be in different rooms, your IR remote can still pause,

play, and do everything else. Just like HDMI, these signals are passed from their processors and encoded into the HDBaseT PAM signal.

HDBaseT also layers power into the mix, based on the Power over Ethernet standard (PoE+). Unlike that method, however, which tops out at 25.5 watts, HDBaseT can supply up to 100 watts of power.

The standard was designed to span 100 meters because that's already the established limit for Ethernet networks. HDBaseT can go farther in some situations, or you can add up to five switches to jump additional 100-meter lengths. Content providers also get a say in your distance; an optional setting could keep you to 100 meters total so you don't broadcast Blu-ray movies to the neighbors. The HDBaseT Alliance says hardware could activate the restriction based on a DRM flag embedded in the content.

Device Manager

We're used to consortiums forming, discussing standards for years, then finally shipping hardware. HDBaseT is on a faster track since Valens designed the chip first, and then formed the consortium with LG, Samsung, and Sony Pictures Entertainment in June 2010. Valens started selling the HDBaseT chips to its vendors in almost the same step.

HDBaseT devices from AMX, Crestron, and Gefen already exist, and the HDBaseT alliance hopes that consumer devices such as TVs and Blu-ray players with an all-important built-in connection will come soon. Risling says, "We do expect to see consumer electronics products using HDBaseT in 2011 by more than one vendor."

The biggest challenge facing the emerging technology is price; currently available signal extenders can cost \$700 or more. Valens didn't detail its specific chip costs, but hopes the costs will quickly come down to a few dollars per device. Risling says, "One of the reasons we have companies such as LG and Samsung and Sony [Pictures] joining the alliance is because they believe it's doable."

Our wallets ache whenever a new standard takes hold. But if HDBaseT becomes popular, its added features might make home theater component upgrades worthwhile.