



Making it Big with HDTV

HD Video:

Real World B2B Applications Right Now

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Introduction

When we initially hear the word “HDTV,” the first thing that comes to mind is television broadcasting. But HD or high definition is not just for broadcasters. Communication agencies, businesses and professionals have found their niche in the technological advancement of displaying lifelike pictures with digital sound. The corporate sector is ready to invest their money in achieving high contrast and excellent color through the use of HDTV in diverse applications.

What type of applications are we talking about? Look for HD to appear in point of purchase displays, museum and art kiosks, medical applications, corporate communications, military demonstrations and “D-Cinema” in creation of digital dailies and movie distribution. The concept of ‘storefront’ applications in retail, fashion, cosmetic, automotive, theater and travel, are ‘real’ business implementations to date.

How did we get to this point? Clearly, HDTV began within the broadcast industry. But, it is still a long steady climb for commercial broadcasters to fulfill their obligation to broadcast solely in HDTV. Aside from that, consumers are not quite ready to receive the transmission signals required from HDTV. Both the corporate world and Hollywood entertainment industry are ahead of the game and receiving the signals loud and clear. And, fortunately for them, there is a solution ready for them to receive.

How it all began

HDTV Impact - FCC Mandate

Most everyone knows that the FCC has placed a mandate on commercial TV stations to convert their transmission signals from analog to digital by May 2002. The implications of this mandate are clear to those in the broadcast industry as they scurry about to convert their TV programming to digital. In fact, CBS already broadcasts 17 of their 18 shows in HDTV. But HDTV is not just for the broadcast industry. There are many other uses for HDTV or HD other than commercial broadcasting that will be discussed further into this paper. But first, let us briefly discuss the differences between analog TV and HDTV.

Analog? HDTV? What does all this mean?

Simply put, HDTV or high definition television is a high-resolution digital television combined with Dolby Digital surround sound. Currently, we watch TV programs on an analog TV set with approximately 420 lines of interlaced resolution. This picture is created via transmission of roughly the equivalent of 300,000 pixels. To put this in perspective, most computer monitors used today have a resolution of 800x600 or 1024x768. If you compare the clarity of today's monitors to the clarity of most television sets, you'd quickly realize the technology of analog is rather passe.

HDTV on the other hand transmits a picture in a totally digital format. The picture is also much clearer than its analog counterpart. HDTV transmits more than a million pixels. This equates to more than six times the detail of analog or regular TV. The difference between the two types of resolution is amazing. But, as mentioned earlier, HDTV is more than an amazing picture. Aside from the pristine image clarity obtained from the larger picture ratio is a rather amazing sound created through Dolby Digital.

This sound is achieved through an audio encoding process that creates CD quality sound when used with a surround sound speaker configuration (front speakers placed left, center and right; two back speakers to the left and right, and one subwoofer.) It's like having a movie theater in our own homes. Sounds like a dream come true, doesn't it?

Yes, but it's an expensive dream come true.

While it all sounds good, the cost associated with receiving HDTV transmission is still extremely high. HDTV sets run as much as \$10,000 per TV. The only other option at this time is to acquire a moderately priced converter box for each television set in a consumer's home. Needless to say, the average consumer is not quite ready to justify such an expense when they can still watch analog

transmission on their current TV sets. Clearly, the demand for HDTV in the home is still weak and it will be some time before Joe Consumer puts his cash on the barrel.

So, what can I do with HDTV right now?

With the broadcast industry and consumers out of the picture, what can we do with HDTV now? Communications agencies and businesses wishing to move beyond the quality of image constraints imposed by a forty-year old technology are ready and waiting. They are more than ready to achieve the new high contrast, high brightness and excellent color rendition through the use of HDTV for diverse applications. And, fortunately all this is available to them in a variety of formats, applications and price options.

First, let's address the formats available.

HDTV formats

Of the eighteen DTV formats, six are HDTV formats. Five of those formats are based on a progressive scanning system while only one is based on an interlaced scanning system.

In an interlaced format, the screen displays every odd line with one scan of the screen followed by even lines in a second scan. That equates to one half of a frame every 1/60 of a second. On a small screen, it is not very noticeable. However, the larger the screen, the more it shows a "flickering" effect.

A progressive format on the other hand, shows the entire picture every 1/60 of a second. This provides a much smoother picture, but uses slightly more bandwidth.

Currently and in the United States, the most popular resolution HDTV formats are:

720p - 1280x720 pixels displayed in a progressive format.

1080i - 1920x1080 pixels displayed in an interlaced format.

With the formats defined, we can now address the applications being used in the corporate and professional sectors.

HD Applications in the Corporate Environment

As mentioned, in order for this intended market to fully realize the defining resolution they are looking for, they must have a high definition display. Several options are already available. Among those options are LCD, Gas Plasma, Digital Micro Mirror technologies applied to flat panel displays,

projections systems, PC monitors and digital theaters. As a result, significant growth among communication agencies and businesses is expected to take place over the next several years using the following applications:

- Point of Purchase: HDTV applications playing from high quality HDTV plasma monitors and PCs with HDTV tuner/playback cards.
- Museum and Art Kiosks.
- Broadband ASP Models: Service bureaus and associated broadband providers that provide HDTV encoding services for streaming HDTV in specific corporate intranet environments.
- Medical applications (i.e., arthroscopic and laparoscopic video).
- Mall Kiosks and Mini Theaters: As offered by companies such as EBC for malls around the country for distance learning as well as alternative marketing medium for intangible service-based companies.
- In-flight Movies: Several companies are already working on offering in-flight movies in a HD format.

How do I get from the point of shooting the film to displaying it in HD?

The HD video production process is a camera to desktop to display process. It's really that simple.

It's a five-step process

(Shooting, Editing, Encoding, Transferring and Displaying):

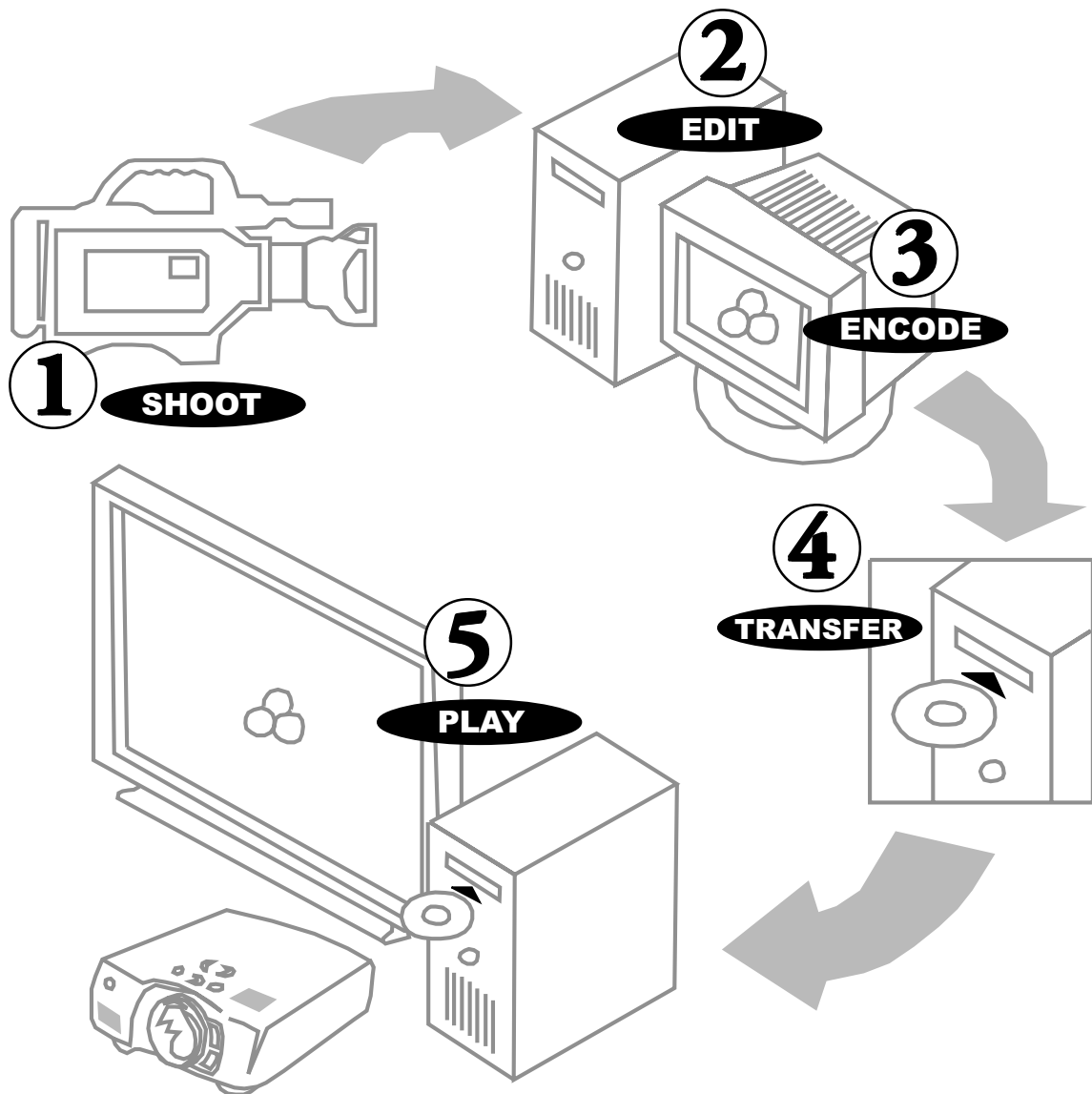
The process described below is only one path available. But, it is a tested path that is known to work. Other paths are possible. For more information on other equipment that provides a slightly different path, please refer to the Appendix of this paper.

Step #1—SHOOT

The process begins by shooting film on a HD ready camera with HD format tape, (such as Panasonic's AJ-HDC27V variable frame rate HD Cinema camera).

Step #2—EDIT

The next step is to get the video into the computer. Typically this is done via a PCI card installed in the computer such as Pinnacle's CineWave® card. A SDI cable is then run directly from the camera to the card and the video is imported into the computer. Once the data is in, you can edit in any nonlinear editing (NLE) system that can handle HD format such as Apple's Final Cut Pro®. Once you're done editing, you can move on to the next step.



Step #3—ENCODE

Once you've finished editing your video, you'll probably end up with a giant QuickTime, AVI, or Avid OMF file. This file is at HD resolution but will be somewhere between 100 Mb/s and 1 GB/s—far too large to play back in most environments. So the next step is to encode the video to MPEG-2 at a reasonable bitrate. That's where HEURIS' MPEG Power Professional HD comes in.

This software allows you to convert from AVI, QuickTime or Avid OMF to MPEG-2 at 720p or 1080i in a low-cost software-only solution that runs on a Mac or PC. Encoding with HEURIS' new MPEG Power Professional-HD software significantly compresses the original file to an average 19.2Mbps HD stream for easy playback from a DVD-RAM. And it's very easy to do. You simply select your input source file (an AVI, QuickTime or OMF), select the destination for your output file, select the appropriate HD template and click go.

Step #4—TRANSFER

The next step is to get the encoded video into your playback system. You can accomplish this in many different ways including various networking protocols or “sneaker-net” (moving the files manually.) One of the simplest and most direct methods is to simply move your files via the rewritable DVD-RAM format. Most DVD-RAM discs will hold well over one half hour of video at HD resolutions. So you simply write to DVD-RAM on your encoding system, and put the DVD-RAM into the drive on your playback system.

Step #5—PLAY

Now you need to play the video. Typically you do this via an internal DTV decoder card (by Panasonic) in a PC. You can then use the output of this card to drive a large format HD resolution display such as a plasma screen, digital projector, or for the use with D-Cinema.

While this process involves a few hardware/software elements to complete, it is a complete HD video solution. And the best part is rather than spending more than \$500,000 in high-priced equipment usually associated with HD video production, all that is required here is the use of moderately priced PC cards, cables and software. Now, this is a dream come true.

Why use software for MPEG Encoding?

You could use a software product like MPEG Power Professional to do your encoding, or you could use a hardware encoder. There are several advantages to using software instead of hardware for your MPEG encoding needs.

1. Software is more flexible than hardware. Because you are not constrained by the need to produce a stream in real-time, you have greater control over the encoding parameters. With the software, it takes as long as is necessary to produce a beautiful MPEG video.
2. Software has a better upgrade path than hardware. Developing hardware is typically slow and expensive. While a software update can be tested and distributed in a matter of weeks, hardware updates typically take 12-18 months per revision. In addition, hardware upgrades are generally much more expensive to produce than software upgrades. Often you need to throw your board or system away and start over in order to upgrade your hardware. This means that software is generally upgraded more frequently and far less expensively than hardware. With software you can upgrade not biodegrade.

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3. Software is more economical than hardware. If you compare a typical software encoder to a typical hardware encoder with equal features and capabilities, the hardware product costs more. In fact, in the HD market, hardware currently costs over **10 TIMES** as much as software!

Most hardware encoders currently work faster than software encoders. If speed is your only requirement, then hardware is probably for you. But if price, flexibility, and image quality are just as important to you, software encoding is probably the way to go.

HEURIS' MPEG Power Professional-HD

HEURIS' new MPEG product is the world's first software product to encode AVI, QuickTime and OMF files directly to ATSC HDTV resolution at 19.2 Mbps. This latest encoder developed by HEURIS operates in either 720p or 1080i format.

With the help of a few business partners (Panasonic, ATI, Hauppauge and others) MPEG Power Professional-HD helps fill the gap in the HD content development process from shooting to editing to viewing HD materials.

Conclusion

HDTV as a technology has a long way to go. It will take several years before major networks and consumers are transmitting and receiving the same digital signal. In the meantime, there is a technological path that is cost effective and ready to be utilized. HEURIS' MPEG Power Professional-HD (along with other business partners) provides a path for businesses and professionals alike to demonstrate their products and services in a remarkable way—HD with digital sound.

HDTV, it really isn't just for broadcast anymore...it's the DTV solution for the rest of us.

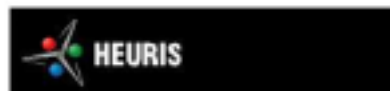
Appendix

HD PCI Digital Input Cards

Manufacturer	Product	URL
Digital Voodoo	D1 Desktop 128HD	www.digitalvoodoo.net
Eyeon	Digital Fusion HD	www.eyeonline.com
Pinnacle	CineWave Card	www.pinnaclesys.com
Viewgraphics	Video Pump HD	www.viewgraphics.com

HD Decoders

Manufacturer	Product	URL
Telemann	HiPix DTV-200	www.digitalconnection.com
Ravisent Technologies	CinePlayer DTV	www.ravisent.com
Hauppauge	WinTV-HD	www.hauppauge.com
InterVideo, Inc.	WinDTV	www.intervideo.com
ATI	Radeon	www.ati.com
Panasonic	PC DTV	www.panasonic.com



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