

ENCO at NBC's  
*Saturday Night  
Live!* for HDTV

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## What You Hear is Changing the TV Viewing Experience

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*Saturday Night Live* Audio Team

Surround sound is becoming much more than a vehicle for delivering cinema productions to your audience. It will become standard, and expected, just like color came to dominate broadcast in the 70's. Surround sound may be relatively new to TV, but ironically it was TV that was largely responsible for the introduction of multi-channel, directional sound over 50 years ago.

In the early 1950's, a slumbering demon suddenly awoke. Television, which had "premiered" at the 1939 New York World 's Fair and had been effectively stalled in its tracks by World War II, was making serious inroads into

American living rooms—and eroding the profits of movie studios. Early TV images were small, often fuzzy, and in glorious black and white, but they came into your house for free.

Hollywood fought back with a multitude "you-can't-get-this-at-home" weapons: widescreen formats, more production in color, and stereophonic sound. Introduced in 1952 Cinerama had seven channels of magnetic sound with five behind the screen and two surround channels. Audiences accustomed to mono optical sound were stunned by the clarity, frequency response, and directionality of the soundtrack. But the three-camera (and projector) technology was quite cumbersome and expensive, and it required a full-coat 35mm mag dubber running in perfect sync. Simpler formats such as CinemaScope and Todd-AO had four (and six) channels of magnetic sound striped directly on the prints. Numerous films were produced in these systems, but the magnetic prints were fragile and expensive to manufacture. Eventually, stereo soundtracks were few and far between, relegated to large spectacles or extremely limited print runs.

In the mid- 1970's Dolby Laboratories developed a matrixed optical system called – naturally -- Dolby Stereo. It effectively combined four discrete channels: Left, Center, Right and Surround into a stereo variable-area optical soundtrack, Although an upgrade of theater sound systems was required, it was not nearly on the scale required by earlier systems. Many theatres, already wired for stereo from the 4-track mag days were able to use existing wires and speakers.

Dolby Stereo really entered the consciousness of the movie going public with George Lucas' blockbuster hit *Star Wars*. *Star Wars* had audiences lining up around the block for their chance to "strap themselves into a starship" and "live" the movie. Dramatic surround channel effects truly brought the audience into the movie like no other had before.

The next logical step was the application of digital audio to film. In the 1990's, Dolby Digital introduced a digital audio system on release prints and increased the number of audio tracks to six. This system, called Dolby Digital (Dolby AC-3 is the consumer version of this system), consists of five full-range channels (left, center, right, left and right surrounds plus a sixth "effects" channel for low frequencies. This is commonly referred to as 5.1 (with the ".1" designation indicating the low-frequency - LFE - channel.) Multi-channel sound technology has continued to advance with additional channels (6.1, 7.1, Surround EX®, SDDS®) further enhancing a 360-degree sound field.

Television's adoption of audio technology has been far more constrained by the availability of affordable consumer level sets, and by regulatory requirements particularly in the area of bandwidth. Rapid market development and the availability of VCR technology helped drive the demand for movies to be viewed at home. As in the theater, better and more realistic sound produced an enhanced viewing experience. Dolby introduced surround technology designed to reproduce the cinema's surround soundtracks from VHS cassettes at home in 1982. This system, refined to Dolby Pro Logic®, (which closely resembles the original Dolby Stereo cinema system) continues to be the standard for VHS recordings today.

As stereo films became more commonplace for a wide variety of genres, broadcasters began looking for a way to improve their programming in light of advances found on film and VHS videos. The FCC approved broadcast stereo television (MTS) in 1984 and soon MTS capable television sets became hot sellers. Furthermore, in 1987 the FCC set out to define the future of HDTV in light of developments in cinema and emerging HDTV technologies in Japan. By 1993 an alliance was formed of organizations competing to establish a standard. An all-digital approach meeting the FCC's bandwidth requirements was defined and included AC-3, 5.1 surround sound as the HDTV audio standard. In the next few years all television broadcasting is scheduled to be in the digital HDTV standard. Not only does HDTV establish a rich viewing experience, but it is also poised to provide a platform for the next generation of computer-based multimedia applications that will blur the lines between computers, televisions and programming.

This improved viewer experience available from HDTV is obvious for pre-recorded programming and movies. Many advances have transitioned the modern television studio with powerful computer-based video production and editing equipment. But what does this technology promise for live content such as news, sports and variety shows? What implication does it have for production and engineering? Broadcasters are just now beginning to consider the opportunities.


And what about multi-channel audio? While HDTV offers exciting new possibilities for program enhancement, it will require broadcasters to re-think how they record, edit, distribute and playback their 5.1 audio. HDTV and its support of 5.1 (and potential 7.1) sound opens the door to a broader range of creativity, and complexity, in this process. PC (i.e. hard disk)-based technologies for digital audio recording, preview and multi-track editing will become the norm. It remains to be seen how far producers will be willing to take the technology. Several are poised to bring their live-recorded programs into our living rooms with surround sound this fall (see below).

Live TV shows do not normally offer opportunities to create elaborately edited audio tracks, but 5.1 surround sound can now offer a more involved viewing experience. Audio engineers now have the ability to create a near 360-degree sound field for their productions. Producers have developed creative science in the placement of microphones and the audio mix for sports venues to bring viewers right into the action. Combined with dynamic visual effects introduced with computer graphics, the days of simple static presentation of stats and scores are gone. Everything is moving—including audio. With rich sounding productions of live content, producers are beginning to look at their approach to standard station identification breaks, jingles and sound effects.

Traditional devices such as cart-decks or digital carts can play library cuts, but their sources might be stereo or even mono, creating a discernable shift in the sound field. Some producers are addressing this issue by placing multi-channel



Live Room for *Saturday Night Live* at NBC Studio 8H in New York record, edit and playback systems in their live studio and EFP units. For example, NBC's "*Saturday Night Live*" recently began their 31st season in HD and full 5.1 surround sound. DAD audio workstations from ENCO replaced multiple digital cart



systems to allow their audio engineers to load sound effects into a multi-channel editor and create moving sound effects even with mono cuts taken from an existing library. Once quick modifications are made, the now multi-channel audio clip is automatically loaded for playback.

Finally, there are a number of infrastructure issues to be considered when preparing for 5.1 sound productions. Generally these are in the area of production, distribution and transmission.

5.1 audio can represent a tremendous increase in the amount of data being stored and manipulated, demanding more from your production systems. The good news is that costs have dropped just as dramatically as storage capacities and bandwidth have increased. However, basic studio systems must be updated to support the increasing file sizes realized with inclusion of 5.1 audio and HD video. Many existing facilities were not designed with the extra channels associated with surround sound; most are limited to stereo. A complete rewire to support each discrete channel would be a mammoth and costly undertaking.

Dolby Laboratories has provided a means to use existing plant infrastructure for 5.1 audio distribution through a codec known as Dolby E®. Dolby E is optimized for the distribution of 5.1 audio through existing digital two-channel postproduction and broadcasting infrastructures and is supported by a number of vendors. Dolby E encodes the 5.1 audio and associated meta-data for distribution via standard digital stereo (AES/EBU) infrastructure. The Dolby E stream is decoded back into the appropriate digital audio form (typically 5.1) prior to final HDTV transmission and is not broadcast to the consumer.

New technologies are also coming on-line that enable distribution and interconnection using standard IT components such as Ethernet routers. Since the HDTV audio spec is a digital data stream, standard computer interconnects using CAT-5 cable can be used with these new digital technologies.

Another important consideration is the control of the overall audio level when transmitting surround broadcasts that may be received by stereo and mono sets. The consumer of your surround sound broadcast may be receiving it on their little kitchen television with a single 3 inch speaker. Some effects that work well in surround may produce undesirable results in stereo or mono. This makes it necessary to regularly monitor and test surround sound effects with mono and stereo receivers.

As HDTV gains a foothold in the consumer marketplace, the use of surround sound is even more critical. It is an aesthetic and technical journey that is only just beginning.