Accessibility in the Cinema

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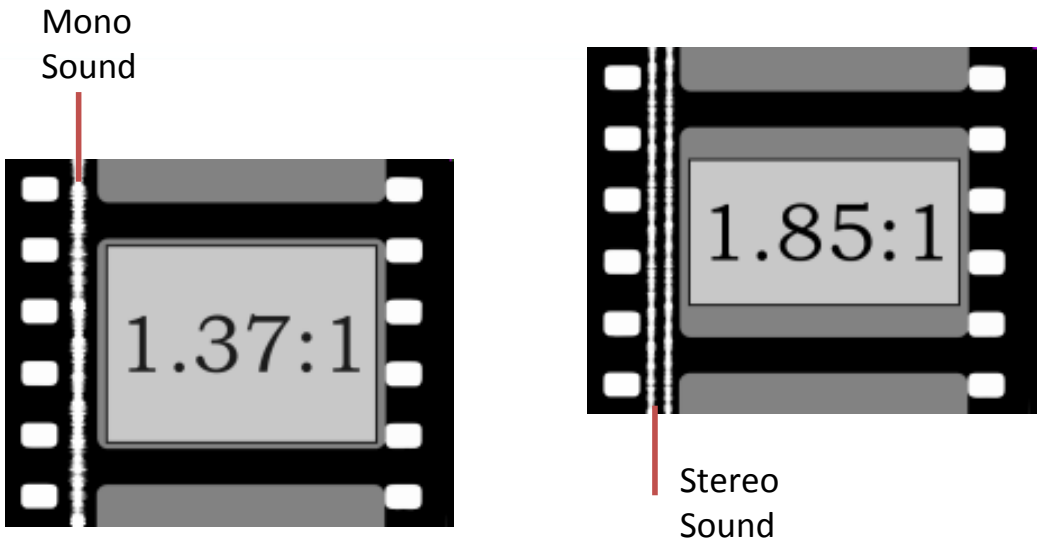
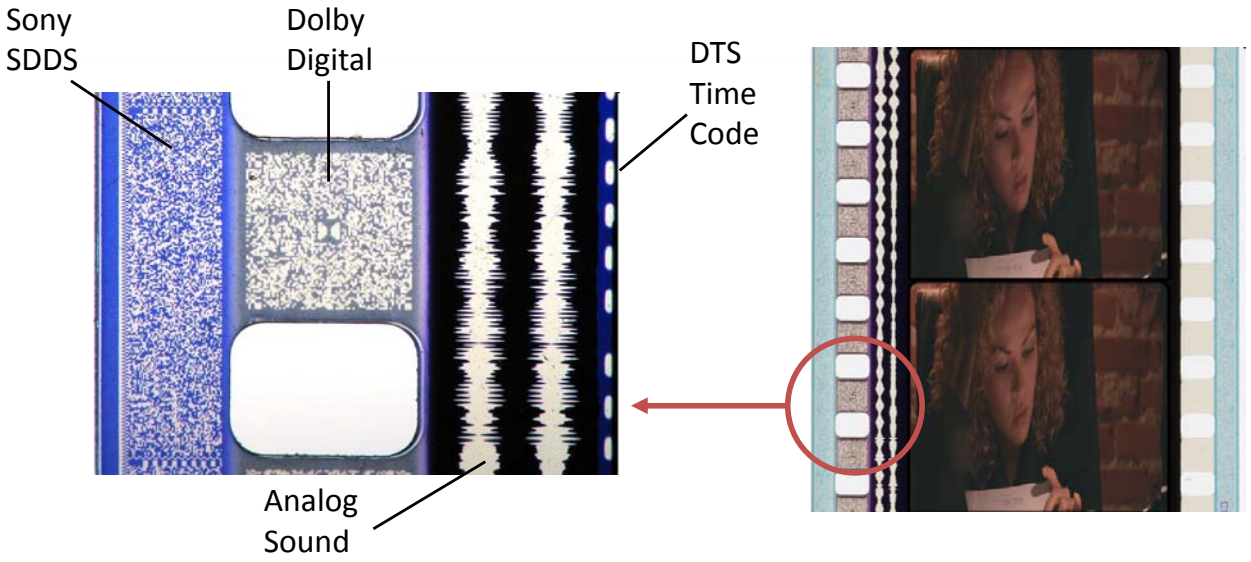
Early Film Sound



Sound on film was introduced as an optically recorded track. The squiggles on the left side of the film frame are the sound track. In the 70's, stereo sound was made popular by Dolby Laboratories. Dolby Stereo was enhanced with a technique called "matrix encoding" that allowed 4 related sound channels to be encoded in the stereo track. Left, Center, Right, and Surround.

To make cinemas somewhat accessible, the sound system would emphasize Center channel for listening in headsets. Center channel was emphasized as it became the "dialog" track in most sound mixes.

Digital Sound Tracks Introduced in the 90's



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In the 90's, digital sound on film was introduced. Digital sound could carry more audio channels, and the channels could be completely independent of each other. Three formats became popular: Dolby Digital, Sony SDDS, and DTS. Dolby and Sony sound tracks actually print the digital bits on the film itself. DTS uses a timing track to synchronize an external Compact Disc player that played the actual audio sound track.

When first introduced, only one digital sound track could be printed on a film print at a time, resulting in "Dolby prints," or "SDDS prints." Many studios chose not to license all sound formats and limited their distributions to one or two digital formats. It took many years for film printing technology to advance such that all sound formats could be printed on a single print. In the meantime, theatre owners made their purchasing decisions, resulting in footprints of "DTS only," "Dolby only," or "SDDS only" cinemas.

Film Sound Formats are Limited

- Analog audio
  - 2 discrete channels
  - 4 channels with matrix
- Dolby Digital
  - 6 channels only for 5.1 audio
- Sony SDDS
  - 8 channels for Sony's 7.1 audio
- DTS
  - Time Code allows synchronization of any number of audio channels as well as text

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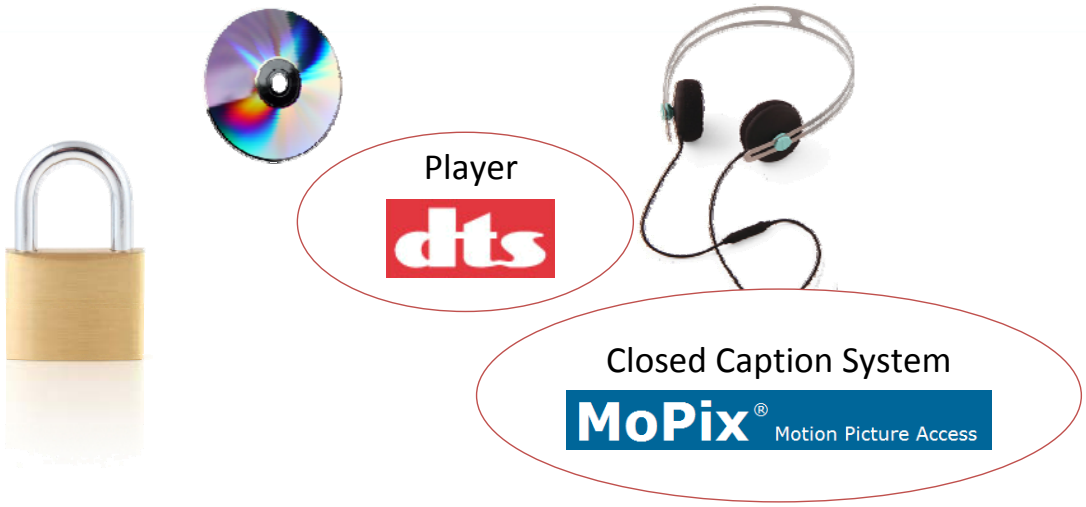
Film was designed for picture and not sound, and so sound formats, when introduced, always carried limitations. Most notable of these limitations is that none could adequately support a specialized Hearing Impaired track, or a Narrative audio track, with the sole exception of DTS.

The Dolby and DTS formats produce 6 channels of sound, commonly called "5.1" audio. The ".1" stands for the bass-only channel. Sony's SDDS format carries 8 channels of audio in what's called a "7.1" format. Each of these formats has 2 surround sound channels and a bass-only channel. The remaining sound channels are reproduced on speakers behind the screen.

Whether with analog or digital audio tracks, accessibility continued to be supported in the same way: the Center channel was enhanced and made available on headphones for the audience.

None of the digital audio formats introduced in the 90's can carry additional channels to support a narrative track. However, DTS has the ability to synchronize an additional CD carrying Narrative Audio and Captions.

Accessibility for Film is Limited



Recognizing the unique flexibility of its format, DTS produced a special player that would support accessible audio and captions. To take advantage of these features, the theatre owner had to have a DTS system, regardless of whether it was already playing Dolby or SDDS sound tracks. It was a proprietary system.

The closed caption system was produced by WGBH, called MoPix, or more commonly known as Rear Window. The Rear Window system is also proprietary. No other closed caption system is allowed to use the Rear Window closed caption content on the DTS distribution disc.

The lack of competition was a hindrance to widespread use.

Digital Cinema Was Made for Accessibility

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Digital cinema is a very new format. The formalization of this new technology began in 2000, and continues today. A specially designed high quality digital projector replaces the film projector, and the content is distributed digitally, often on a hard drive.

The digital cinema format offers more colors and better depth of contrast than that available in consumer technology. It also offers more sound channels. Digital cinema is an "unlocked" format. There are no technology-based royalties to be paid for distributing digital cinema content.

Most importantly, digital cinema is designed to support accessibility in a manner not possible with film.

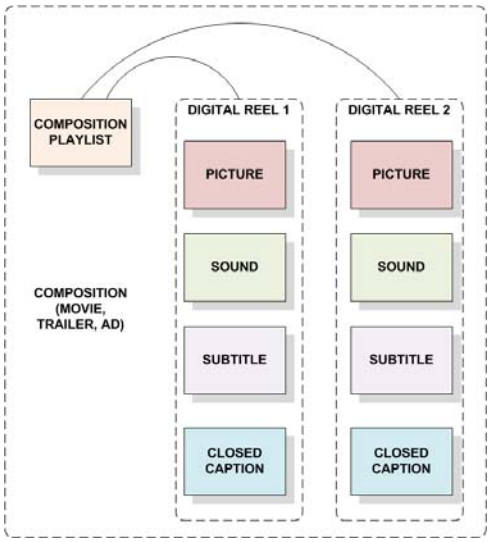
Digital Cinema Invented and Standardized

- Digital cinema was invented from the ground up for flexibility and security.
- Standards effort began in 2000 with the Society of Motion Picture and Television Engineers, and continues today.

Digital cinema was invented from the ground up beginning in the year 2000. Unlike consumer video, digital cinema was designed for the highest quality presentation, flexibility to accommodate growth, and the highest security possible for the content. Unlike film, digital cinema can accommodate all colors visible to the human eye. In addition, it can support many more sound channels than film. It has taken many years of collaborative effort by over 100 engineers to conceive and establish this new format.

Composition Concept allows Growth

- Unique to Digital Cinema
- The Composition is a collection of digital files
- The Composition Playlist instructs the system how to play the digital files
- By adding new file types, we can extend the system to support new features, such as future accessibility systems



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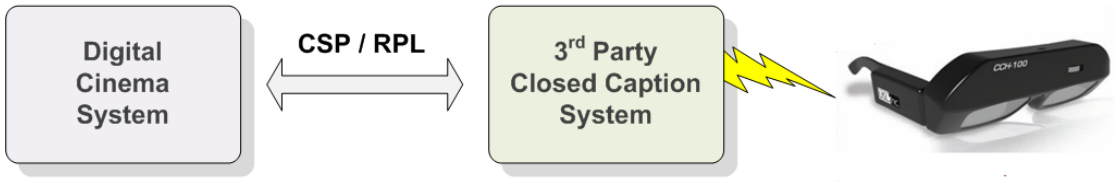
The key to digital cinema's flexibility is the concept of Composition.

A digital cinema Composition is a collection of files, each file providing one specific element of the movie. The files are organized temporally as Digital Reels, similar to the temporal way that film reels are used.

Thanks to the flexibility of this file structure, digital cinema can support multi-channel sound of up to 16 audio channels. It can also support caption content, including closed captions. In fact, digital cinema is capable of supporting closed captions in up to six languages. By standardizing the distribution format for captions, digital cinema has ensured that a royalty-free distribution format exists.

Support for 3rd Party Systems

- A common “plug” for 3rd party closed caption systems: CSP / RPL
  - Content Synchronization Protocol / Resource Presentation List



For closed captions, a standardized output is also available. Requiring several years to develop, a special protocol called CSP / RPL was standardized by SMPTE for use in digital cinema. Using this protocol, a closed caption product can simply plug-in to any compliant digital cinema system.

Visual Accessibility: Closed Captions

Several methods are now being shown that can deliver closed caption text to individual audience members. One method employs wireless devices that mount into the seat's cup holder. The user positions the display for comfortable reading of the caption text.

Future Visual Accessibility: Eyewear

- Closed caption text displayed on high technology eyewear

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Display technology is an area where tremendous research and development is taking place. An advanced means to deliver caption text to the audience is now being developed through the use of specialized wireless glasses. The glasses display text in front of the wearer's eyes while watching the movie. The photos you see are of experimental devices.

Audible Accessibility

- HI: Hearing Impaired channel
  - Focus on dialog
- VI-N: Visually Impaired Narrative channel
  - Narration of the scene
- Digital cinema audio formats have 2 channels reserved for HI and VI-N

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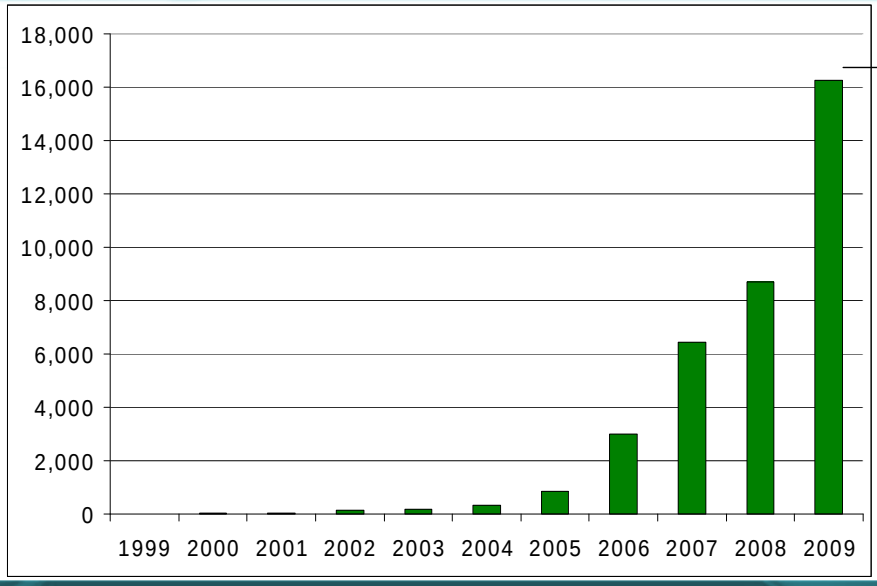
Digital cinema supports up to 16 channels of audio. Included in SMPTE standards is support for Hearing Impaired (HI) and Visually Impaired Narrative (VI-N) audio. HI and VI-N audio are delivered by means of wireless headsets to the audience.

Digital Cinema Growth



15% of global modern screens

Data & Graphic Source: Screen Digest

These new capabilities for cinema are dependent on the transition from film systems to digital cinema. Thanks in large part to the popularity of digital 3-D movies, the number of digital cinema installations are growing worldwide.

Digital cinema is in a nascent stage. Current systems utilize a less-capable, temporary format called Interop. The more capable and standardized format developed within SMPTE has yet to be fully established in equipment.

However, the new capabilities of the digital cinema format can challenge the workflow for producing movies. Accessible content such as captions and narrative audio cannot be produced until the movie has completed final edit, often making it difficult to ship these elements on opening day. Many smaller movie producers will delay work on accessibility for the home release, if produced at all.

Summary

- Film technology was not well suited for accessibility.
  - Accessibility technology for film is proprietary, with no competition.
- Digital cinema technology supports open, competitive applications for accessibility.
  - Royalty-free distribution of accessible content.
  - Competitive devices for the cinema are emerging.

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In summary, film technology is not well suited for accessibility. Only one technology provider is able to provide accessible audio and closed caption text. The lack of competition in this area has kept prices high, and adoption low.

Digital cinema, on the other hand, is an open technology and readily supports accessibility. Accessible content can be distributed in digital cinema free of technology-based royalties. The openness of digital cinema technology also allows competitive closed caption products to emerge and evolve. These factors are expected to contribute to the wide adoption of accessible technology for cinema.

- http://report.mkpe.com
- Published Monthly On-Line

Those interested in learning more about digital cinema technology are invited to visit http://mkpe.com. In addition, a monthly publication is also available for those interested in deeper analysis of the issues behind the introduction of digital cinema.

Thank you

Business Development for
Entertainment Technology

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