This article stems from the Winter DEG Focus panel on advanced sound, provided by Brian Vessa, Director of Technical Audio at Sony Pictures Entertainment.

Sound - Completing the Filmmaker's Vision

Sound is widely recognized as one of the biggest attributes of a great film today. It is the final touch that completes the story and enhances the overall experience. It can be said that sound tells the story subliminally while the picture tells it visually. The film community recognizes the importance of sound by giving Oscars® for sound mixing and sound editing.

Did you ever wonder what it takes to create the incredible sound we hear on today's movies? It all starts with a vision. Let's meet the people who realize that vision and uncover the fascinating process of creating a modern film soundtrack.

The Audio Artists' Palette

The three components of all film soundtracks are Dialog, Music and Effects. These are the basic tools of the audio artists' palette. Within these lie many possibilities, and it is up to the creative imagination to utilize them uniquely for each film.

"Dialog" is not only the dialog spoken by the actors during the performance of the scene ("Production Dialog"), but also includes added dialog that may justify a reaction, explain a story point, or voice a thought. It also includes any dialog that is replaced using "ADR" (Automated Dialog Replacement).

"Music" is the collection of themes and underscore that a composer creates for the movie as well as any popular songs, known instrumental pieces or music performances that are in the movie.

"Effects" come in many different flavors. "PFX" are recorded during the action, "Foley" is footsteps and specific sounds performed to picture by "Foley Walkers", Backgrounds ("BG's") are created to put the viewer into the environment pictured on the screen, and "Hard Effects" are specific sounds added to match action (such as door closes, gunshots, car screeches, etc.). Some of the most interesting types of sound effects are those created specifically for a character or place, which are often termed "Sound Design". These are the sounds that bring comic book and animation characters to life and create spooky places where you can just feel the evil presence.

Meet the Players

The soundtrack for a feature film is collaboration between a number of very creative people. The *Director* shares his or her vision for the movie with a core team of trusted individuals who then work with their teams to create each aspect of the soundtrack. In many cases, this process begins before a single scene has been shot.

The *Sound Mixer* and team record the actors and action during the shoot, which forms the foundation of the soundtrack. The *Sound Supervisor* is in charge of all dialog and sound effects in the post-production process, and works with a team of *Dialog Editors* and *Effects Editors*. The *Sound Designer* creates those cool special "design" effects, and may also act as the Sound Supervisor. The *Composer* pens the original music for the picture, creating identifiable themes and musical effects for characters and situations. The *Music Editor* works with the composer and handles the task of syncing the music to picture and editing it as needed. The *Orchestrator* creates the arrangement and musical parts for each instrument from the master score. The *Contractor* hires the musicians and books the scoring session. The *Conductor* rehearses and conducts the orchestra, and the *Scoring Mixer* mics, records and mixes them. The *Music Supervisor* handles the acquisition and licensing of any additional music or songs to be used in the film. The *Re-Recording Mixers* bring all of this audio artistry and their own to the sonic canvas when mixing the final soundtrack. They are assisted by a *Recordist*, who handles all the sound recorders, patching, and file management as well as a team of *Technicians* and *Engineers* who set up the gear and keep it all running in sync. It takes a lot of talented people to bring a soundtrack to life!

Creating the Theatrical Audio Soundtrack

Production Sound: Capturing the Performance

During the shoot, the actors' dialog and action are recorded using a combination of boom mics and lavaliere mics onto multiple tracks of a portable audio recorder that is running in sync with the camera (hence the name "sync sound"). Musical performances may also be recorded during the shoot if they are part of the action.

The sound for the many scenes and takes is carefully logged so they can be matched back to picture in the post-production process. Between takes or after shooting wraps for the day, the sounds of the different parts of the set and/or from the location are recorded "wild" in order to be used during post-production.

Post-Production Sound: Creating Identity

The sounds recorded during the shoot are handed off to the Sound Supervisor and Picture Editor. The sync sound is loaded into the picture editorial workstation and is edited to match the picture cut, creating a "one to one" set of audio tracks. These are given to the Sound Supervisor, and become the basis of the production dialog and PFX. If there were musical performances recorded during the shoot, these are given to the Music Editor.

Once there is a working cut of the movie, the Director "spots" it with the Sound Supervisor, Sound Designer and Composer, often in separate sessions. They in turn spot it again with their teams. Picture editing continues while the sound crews go to work, and until the picture is "locked" new picture versions happen almost daily-the sound editors must constantly re-sync to new timings and adjust to the addition or removal of scenes throughout the process, sometimes even after the final dub!

The Sound Supervisor and team determine what additional dialog, ADR, Foley and other Effects will be needed and devise a plan to record them if they are not already in the sound library. New sounds are recorded that are specific to things in the movie such as guns of a particular era or sounds from a classic car. All material is loaded into workstations, layered, tweaked and synced to the picture. Cue sheets are created for the mixers so they know where each sound is located.

If a Sound Designer was hired for the picture, he or she has been busy even before the first cut designing sound concepts for the movie-all of which must be approved by the Director. Pretty much anything goes that works-new recordings, synthesized sounds, pitch shifts, backward sounds, Cougar screams-you name it. It's a labor of love and creativity to create unique sound design that really works for the movie, and great Sound Designers are very highly regarded.

In a feature film, the hundreds of tracks created by the sound teams are far too many to handle at once on the mixing stage, so sub mixes of related tracks are created which are called "Predubs". Dialog, ADR, Background and Foley are predubbed, and the hard Effects will have multiple predubs, one for each type of effect. Each is fully mixed with all reverbs and relative balances for the theatrical soundfield. During this process, the Re-Recording Mixers work closely with the Sound Supervisor, Sound Designer and the Sound Editors to bring the sounds they've created to life. Since most movies are previewed, "Temp" mixes are created along the way to the current cut of the movie. Audience reaction may result in picture and sound changes. It is a very busy time, during which the soundtrack begins to take shape.

Meanwhile, having discussed the Director's vision and concept for the music, the Composer is hard at work coming up with the themes and underscore. Often, a theme is developed for each main character or type of situation. The Composer will usually demo these for the Director prior to the scoring session. As each piece of the score is written, the Orchestrator/Arranger prepares the parts for the musicians in the orchestra. The Music Editor works closely with the Composer and not only syncs the music to the ever-changing cut of the movie, but prepares all of the workstation sessions, timings and metronome clicks that are employed at the scoring session.

Music scoring sessions today are very high-tech and busy affairs. The Scoring Mixer mics and records the orchestra to individual tracks as well as creating multiple 6 or 8 track mixes on the fly-all while the orchestra is playing! Often, there are broadband connections to external locations so the Director and other Talent can remotely approve the music with picture. In some cases, a team of music editors are digitally connected to the session and networked together, cutting in the music and performing edits that Talent requests right after a take. Changes to the score itself may be indicated and must be executed by the Composer and Orchestrator quickly during the date, which in some cases requires substantial modifications. There is an amazing amount of talent, collaboration and effort that goes into a successful scoring session!

The music is generally not predubbed on a dub stage, but the Scoring Mixer will often create multiple sub-mixes that contain different parts of the orchestra or arrangement for maximum flexibility. The Music editor prepares these as well as any "source" music (such as a car radio) and "needledrop" (music from recordings/CD's) for the dub stage and creates cue sheets. The music editor also creates the end credit music out of pieces from the movie. Usually, the first time the mixers and sound crew hear the music is at the Final Mix.

The Final Dub-Paining the Soundscape

The Final Mix (a.k.a. “Final Dub”) is where all the elements come together to create the complete soundtrack. 8 track SDDS® mixes are designed for 5 speakers in front, 2 stereo surrounds and a subwoofer (L, LC, C, RC, R, Ls, Rs, Sub). 6 Track mixes are designed for 3 speakers in front, 2 stereo surrounds and a subwoofer (L, C, R, Ls, Rs, Sub). The choice is made by the mixing team and is generally dependent on content.

One or more mixed “stems” are created for each of the sound components: Dialog, Music and Effects. Each stem contains the approved levels, placement and reverbs for the component it represents. Adding all of the stems together in equal proportion yields the final mix of the movie. The Predubs are used as the primary sources for Dialog and Effects; other materials may be edited in as the mix proceeds. Music is often edited substantially in the final dub to accommodate ideas that may arise once all components of the soundtrack are heard together.

Most Final Dubs today utilize two Re-Recording mixers: One handles Dialog and Music and the other all of the Sound Effects. If a movie is very music intensive, a third mixer may be brought in to handle it. During this final phase, the mixers, sound team, Director, Picture Editor and other talent collaborate to shape the sound for the theatrical presentation. The balance, tonality and placement of the Dialog, Music and Effects are critical, and are determined on a scene-by-scene, minute-by-minute basis. It is a very detailed process with a number of people to please, including the Producers and Studio heads. Each playback yields many change notes, updates, and more change notes. Usually the mix is taken to a local theater to screen, which can help in determining how it will play “in the field”. Finally, each reel is signed off and moved to the printmastering step.

Once the stems are complete, they are mixed together to form various composite Printmasters (a.k.a.“Printing Masters”), which are transferred to a variety of mediums for theatrical exhibition. If the mix is 8 tracks wide, 8 and 6 track discrete printmasters are created in addition to a 2 track Dolby® Surround “SR” printmaster. 6 track mixes get a 6 track discrete and the 2 track SR printmaster. There are 4 formats on each release print: SDDS® carries a 6 or 8 track mix, Dolby® Digital and DTS® carry 6 tracks, and the 2 analog optical tracks have the SR. Each digital format has proprietary codecs which are used to convey the sound. For Digital Cinema exhibition, the same theatrical printmasters are used, but no codec is required as D-Cinema can support fully discrete 24 bit audio.

Last but not least, a Music and Effects (“M+E”) track is made for the International markets. Not only is the original dialog removed, but new sounds are added where PFX were lost in order to make it “fully filled”. Certain sounds that may or may not be replaced by a foreign territory are placed on an optional track or unit for flexibility-examples include TV’s, actors’ efforts and native speakers. As there is a huge International market, great care is taken to provide an M+E that can make a foreign dub track sound as good as the original version.

The Home Theater Experience - Next Generation Sound

Home Theater equipment has grown by leaps and bounds in the past few years. With quality HD monitors and high resolution sound systems becoming more available (and affordable), the Home Theater Experience is definitely State-of-the-Art. The new Blu-ray and HD DVD disc formats have the highest picture and sound quality ever provided to home entertainment enthusiasts.

Even with this quality of equipment, audio as mixed for the theatrical environment does not necessarily translate perfectly to the home. In the theater the sound is played at a high volume, often approaching or exceeding100 SPL. The speakers are large and behind a screen, and there is a lot of air to absorb and disperse the sound. This allows for a very wide dynamic range to be played while still being able to hear the subtleties. Typically in the home there is lower playback volume, smaller speakers, smaller room volume to fill, and the speakers generally are not behind a screen. Since the listening environment is substantially different, our psychoacoustic perception of the sound balances and tonality are different. Therefore, at Sony Pictures we create a Home Theater Printmaster, which is the source for Blu-ray, DVD and Video releases.

The goal of the Home Theater Printmaster is to translate the original intent of the film soundtrack to the home. It is made from the same final mix stems as the theatrical printmasters and is handled by the same mixing team, thus insuring continuity. It is monitored using small nearfield speakers, typically 5 db lower than in the theater. The dialog level and its balance with music and effects is addressed as needed to make sure all primary dialog is heard easily. Dynamic range is considered and reduced where necessary-subtle sounds can be raised, loud areas may be brought back a bit to prevent the “remote control syndrome”. Nearfield monitoring is quite revealing compared to theatrical monitoring-technical issues such as edits and punch-ins may be noticed and can be improved. For an in-depth discussion of this process, see the article available at http://mixonline.com/internet/newformats/audio_mastering_dvd/ or http://digitalcontentproducer.com/dvd/video_serving_two_masters/

From Home Theater Printmaster to Disc

Once the Home Theater Printmaster is complete, it is conformed to the HD and SD video masters and delivered to the disc authoring facility. In the authoring process, the audio may be utilized as discrete linear PCM or conveyed with one or more codecs depending on release format, disc profiling and the bit budget. Codec technology continues to evolve, and the new disc formats support the recent Dolby® True HD and DTS-HD® Master Audio codecs. Legacy codecs that are used on DVD are also supported, such as Dolby® Digital AC3, Dolby® Digital Plus and DTS® Digital Surround.

Codecs fall into two basic types: Constant Bit Rate (CBR) and Variable Bit Rate (VBR). A CBR codec produces a known file size for a given input and bit rate. With VBR, the codec will give more bits to dense content and less to sparser content. A maximum bit rate is generally specified in order to make the throughput manageable for the medium and playout devices. VBR gives a superior result to CBR, but requires more space in the bit budget and requires testing to determine the best encoding parameters for a desired file size.

Legacy codecs are “lossy”-they throw away whatever content is determined to be unnecessary by the encoding algorithm and parameter values, which is not recoverable. “Lossless” codecs will carry the removed content in a companion package that can be added back in a lossless decoder, theoretically providing a perfect reproduction of the original content. If the decoder is not lossless, it will decode the primary package only, thus producing similar results to a lossy system.

Quality is King

In today’s world of multiple mediums, content may be encoded and distributed a number of different ways in order to reach the consumer. Regardless of the carriage mechanism, the quality of the original content is key. I hope that this article has served to demonstrate what it takes to create a modern movie soundtrack, and the next time you see a movie you will have a new appreciation of the amazing sounds we hear.

SHORT BIO

Brian Vessa is a 30 year audio veteran in the entertainment business, having worked in many capacities from music recording to sound editing and film mixing. He is a SMPTE and AES member and currently sits on the SMPTE DC28 Digital Cinema standards committee. Brian is the Director of Technical Audio at Sony Pictures Entertainment in Culver City, CA and has supervised over 200 Home Theater Printmasters. Brian can be reached at brian_vessa@spe.sony.com