Cinedeck File-Based Insert Editing & Live-to-File Recording
The Ultimate "Virtual Tape" Environment

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Files - The Good, Bad and Ugly:

Changes and advances in technology tend simultaneously to push and pull the content production industry in various painful and exciting directions. Sometimes, like the transition from SD to HD, the changes bring improvements to quality and efficiency and at other times (3D for example), new technology can result in complete frustration for the producers, artists and technicians who actually spend their days creating programs. File-based workflows happen to be a perfect example of a change that has been simultaneously, liberating and maddening.

The freedom brought on by the return to non-linear editing (the only way editing was originally done, i.e. - film) and the unshackling from the restraints of linear tape, was nothing short of a miracle. However, current non-linear edit solutions do have a few significant limitations.

For those who were not part of the "tape generation", magnetic video tape, in a cassette or on a reel, was the mainstay of video production, pretty much from the beginning of "recorded" time until the late 1990's. Yes, that technology too, changed and improved over the years but across the various formats and evolutions, the technical parts of a simple but typical workflow for putting together a program consisted of two steps;
1) Gathering the many source tapes which held the content for the final program
2) Accurately re-recording short segments, from a tape player to a tape recorder - shot-by-shot, audio track by audio track, from the beginning of the program to the end.

It was tedious work, which required excellent timing, rhythm, forethought and planning because once you passed a section, you could no longer change the duration of that section. This was complicated by any special effects, as cutting into linear effects could be disastrous; setting the process back significantly and of course, moving a section elsewhere in a program was not easy either.

Non-linear is definitely an improvement however, one advantage to old-fashioned linear editing was that when you got to the end, you were done... There was no additional output phase as there is with a non-linear edit. Yes, typically, copies had to be made, etc. but those tasks could often be handed off to others. Another, often more dramatic advantage, was last minute changes could be completed mere moments before a program had to be delivered or go "on-air". These crash sessions were very upsetting for many of those involved but the real and practical deadline was in-fact, however many seconds it took to rewind a program back to the start from wherever the changes were made. If you have never been in one of those *hot-seats*, believe me, those seconds could be extremely tense.

The advent of electronic non-linear editing certainly made post-production easier and I believe better but if a change to a program is required, even just a simple shot change or audio replacement, it is necessary to go back to the timeline, make the changes and then, re-export the complete program. That process can be excruciating, especially for long-form programming. And then, the resulting file needs to be run through quality control again which, if nothing else, means someone watching the program from start to finish, adding a significant time delay that has prevented shows from being delivered on time and "making-air". As a work-around, some

post-production facilities currently still export edited shows to tape, so changes can be more easily completed and to provide a pathway to delivering file types not directly supported by their particular finishing systems. And while some companies do still accept programs on video tape, it will not be for long and most already prefer to receive files.

Another limitation is that many broadcast programs, especially daily, 'current events' productions, while being essentially produced live, are not actually aired live. These shows can of course be recorded as files and, if no mistakes are made during the session and nothing needs to change after recording is complete, the files might be directly usable. However this is the real world where most of the time some sort of export and or changes need to occur. When something does need changing, it means an elaborate and inefficient non-linear import, edit and export process that is time consuming, especially when compared to delivering a tape directly after a recording is complete. Then the final files of course still need to be checked.

Address all of these limitations with Cinedeck's File-based Editing technology:

Deliverables that need extensive export time, rendering or multiple steps and passes to be consolidated into final file delivery form, no longer need to be completely redone to make a correction and different file delivery versions are easily created.
Simply put, Cinedecks allow you to place or replace video or audio in pre-existing files and you can build shows in pieces, as would be done in assemble editing, all while maintaining fully compatible files.

Cinedeck's revolutionary file-based Editing is not limited to a specific codec or wrapper and all of these procedures work with and produce standard flat compatible files. Editing access to ProRes, DNxHD and AVC-Intra files created anywhere was made available in mid-2015. Recently added to the list of supported codecs are JPEG 2000 and XDCAM HD. This means for example, files created on Final Cut Pro or exported from Premiere as well as files generated on the Cinedeck. Moreover, the content can be wrapped as MOV, MXF OpAtom, MXF Op1A or the more restricted AS-11/DPP MXF Op1A, allowing for the first time, truly tapeless workflows from start to finish.

Several editing modes designed for different requirements:

- **Insert Baseband mode** allows the replacement of content in any selected region of a closed file. Regardless of where the files were created, inserts can be made into ProRes, DNxHD, AVC-Intra, JPEG 2000, XDCAM HD and Cinedeck VMM (Virtual Mastering Media) files. Edits can be video only, audio only or audio with video and are performed channel-to-channel on a Cinedeck or directly from an edit system. To make an insert edit, the user opens virtually any file on the Cinedeck, sets edit points and selects the appropriate video and or audio tracks which need replacing and triggers insert recording to fill in the selected area with whatever is coming into the SDI input. When driven from a non-linear editor, the process is identical to working with a traditional VCR. Channel-to-channel insert edits on the Cinedeck are similar to machine-to-machine tape editing; in fact, edits can also be performed machine-to-machine from a VCR to a file.

A typical scenario:
- o   Legal and the Producer come with a last minute video change
- o   On the timeline, an embargoed shot is replaced with licensed content
- o   When needed, effect(s) etc., are rendered "in-to-out"
- o   Instead of re-outputting the whole timeline, an insert edit of just the changed content is made directly into the previously recorded file.

This procedure results in a double time savings... The change process is much faster and if the file has already been run through a quality check, all that needs to be confirmed is the changed portion. The rest of the file has not been touched.

- **Total Confidence Recording** is not a separate editing mode; it is an important additional feature of Cinedeck's Insert Baseband mode.
  High end VTRs provide a layer of assurance with their confidence record mode, the ability to display an off-tape playback signal while recording. During insert recordings on a Cinedeck, Total Confidence Record allows you to shuttle, play and scrub, any portion of a file on any player while still recording. The master file can be loaded into software players such as QuickTime or VLC as well as files can be loaded into another Cinedeck channel that provides SDI to a display. While recording you can check and double check, any part of a file, anytime from anywhere, making the QC process much more efficient.

- **VMM – Virtual Mastering Media** are an extension of Insert Baseband mode. Similar to tape, VMM are blank files; pre-striped or blacked with format, codec, timecode, audio tracks, etc., providing a clean standard flat file container for freely inserting content. Creating VMM can be significantly faster than real-time but similar to tape, you can have a library of VMM on disk and simply copy one to your workspace, which lends even more efficiency and accuracy is enhanced because VMM also act as a preset for the file specification.

- **Digital Cut/Print to Tape Recording** creates new files using any codec and wrapper, directly from a non-linear editor, using the same procedure as recording to tape. The Cinedeck masquerades as a Sony SRW-5500 so the user sets things up on the editor as they normally would for a Digital Cut to tape while on the Cinedeck, the appropriate codec, wrapper and a file destination are selected.
  The typical steps:
  - o   Edit 1 hour show
  - o   Complete all required renders, etc.
  - o   Digital Cut to file (instead of tape) via Cinedeck to codec of choice (ProRes, DNxHD, etc.)

  After the Digital Cut is completed, the file is done.
  This functionality is available for editing platforms such as Media Composer, Final Cut and Premiere.

- **Cinedeck's "Pause & Seek" mode** is the closest to what many know from tape as assemble recording or assemble editing, with the unique addition that with Pause & Seek, multiple record channels can be

simultaneously controlled. Two examples for this are building a show master while keeping a few ISO channels in sync with the master or creating multiple masters with different codec and wrapper combinations so for example, two ProRes masters, a DNxHD master and an AVC-Intra master.

Operation in this mode is straightforward:

- o Put the channel(s) in gang record mode and start recording
- o Pause the recording(s)
- o Put the channels into gang play and cue one of the channels to a starting point in the recorded content
- o Take the channel(s) out of pause to continue the recording(s)
- o After multiple pause and record events, stop is pressed to finally close the file(s) and recording is complete.

It should be noted that for Live-to-File sessions not requiring simultaneous file creation, Cinedeck's file-based insert editing into Virtual Mastering Media may be more desirable.

Pause & Seek does not have a pre-roll. You can easily count down to the start but insert can pre-roll like tape, which will be familiar to studio personnel. In addition, when using pre-striped VMM, you can start and stop your work anytime, while Pause & Seek requires the deck to stay on and the file to remain open. Using Virtual Mastering Media means a production can be built over many hours, days or weeks. Lastly, because insert edit offers Total Confidence Recording, quality control can occur during recording, assuring fast and error free show deliverables.

New features, now part of Cinedeck's virtual tape environment:

- **32 channels of audio in MOV and MXF files**

  SDI only carries 16 audio channels but using insert edit, controlled by a non-linear edit system or channel-to-channel on the Cinedeck, the user can record video with 16 tracks and then go back and insert up to an additional 16 channels of audio.

- **Pro Tools control in chase mode and standard 3-point edit mode**

  Instead of passing audio files back to a video editor for insertion, with Pro Tools control, audio tracks can be directly inserted into a file to accompany the video.

- **Timecode re-stripe**

  It is occasionally necessary to change the timecode in a file. This may be to reset a deliverable to start at 10 hours instead of one hour or perhaps to change a file from non-drop frame to drop frame. Whatever the reason, re-exporting is not necessary. A utility built into Insert Baseband mode provides a simple interface to instantly change file timecode, based on the play head position or by setting a new starting timecode.

- **File Trim**

  It is also sometimes a requirement or just desirable to trim a file. Perhaps a completed VMM is too long or a file has unnecessary content at the start. Using familiar timeline in and out points; File Trim can set new metadata playback start and end positions in an existing file header or create a new file with the undesirable content removed.

A last clarification:

Unlike the process of editing the metadata of an AS-11 file to point to content newly added into the package, when an insert is done using insert edit on a Cinedeck, you are writing directly into and replacing parts of the original flat video and audio essence which means several things:

- The process is not limited to AS-11 files. The Cinedeck system can make changes in many file types, AVC-I, DNxHD, etc., and they can be wrapped as MOV, MXF OpAtom, Op1A or the more specific DPP Op1A.
- Because changes are being written into the flat audio and video essence, file compatibility is maintained. The resulting file after the insert is the same file; it's just that some audio or video frames have been replaced.

With all of these editing capabilities, (like on tape) when you get to the end you are done, there is no export, render, consolidate, etc... This is absolutely a game changing solution for the real problems of late fixes and the many programs that need to be produced "Live-to-File".