Tools

Aside from a digital video camera, all the other tools required to produce your feature are either conventional film equipment, or are in the realm of computer-based non-linear editing (NLE) systems. Just as digital camcorders offer a solution for acquiring images, these products allow for the editing and manipulation of material in a highly efficient and cost effective way.

This section deals with developments that apply equally to those with or without the luxury of a budget, but are probably more relevant to the latter. Either way, by possessing the means of post-production, considerable savings and freedom can be achieved, as opposed to the hire of pro systems. In fact, the purchase cost of a high spec desktop edit system can be considerably less than the cost of hiring a pro system; for the price of a second hand car, it's now possible to have unlimited access to what was previously an expensive, prohibitive process.

Rather than assess the many hundreds of products on offer, the following is a basic explanation of the principles and protocol behind the technology.

Non Linear Editing

Non Linear Editing, or NLE, is a long-established system of editing that developed out of broadcast video. In the last decade, NLE has all but superseded traditional film editing due to its speed and flexibility. The most common system is AVID, which can be run on both a MAC or Windows NT platform, but since the development of FireWire (IEEE 1394) and with improved compression technology, the boundaries between professional and desktop systems are becoming blurred, with prices falling dramatically as a result.

All NLE systems are computer-based and, depending on the type of software and the hard drive capacity of the computer used, involve the 'capture', compression and storage of material inputted from a video or audio source. The material can be from virtually any source, as long as the necessary connections are available and the data format of the digitised material is appropriate to the required end product. Separate hard drives for software, video, and audio are a requirement to ensure fast, reliable data access - the size of working files can be considerable.

In order to capture material, it's essential to have an appropriate video capture card installed in your computer. With dozens of capture cards on the market, the choice ultimately depends on the computer platform used and in consideration of the following:

- The type of analogue video input/output supported
- The type of digital video input/output supported
- The type of video compression supported
- The type of software installed
- The requirement for 'real time' operation
- The type of audio supported

Inputs and Outputs

Inputs and outputs are the connection setups between a computer and play-in or recording device that allows material to be captured and played out. Analogue connections are commonly 3xBNC for component video, and S-Video. The most common digital connection is IEEE 1394 (also known as FireWire and i-link) for DV material. Increasingly SDI as the highest quality transfer protocol is becoming affordable.

Compression

As defined in the glossary, compression is a process which reduces the size of a datastream, allowing for efficient use of data storage in a computer's hard drive. Lossless compression enables the data to be fully reconstituted. Lossy compression removes data, some of which may be considered redundant. Good video compression causes a minimum apparent loss of information to the viewer.

Different systems, during digitisation, may or may not employ compression. Those which do not, and which support component video, are naturally termed 'uncompressed'. Native DV systems do not employ compression, since DV is inherently compressed 5:1. In addition, systems employing lossless MPEG-2 coding can be considered uncompressed, as there is effectively no loss of video information.

For compression, MJPEG and MPEG-2 are the two most commonly used routines.

Whether or not the inputted video is compressed, the information is then written to the drive in a system dependent format, frequently AVI files (Windows) or QuickTime files (Mac). Or else, particularly in the case of native DV, a proprietary format.

Fundamentally, what must be considered is the number of coding stages between tape and drive as each, whether or not involving compression, alters the original video image, however slightly. Since we are considering only the use of video for cinema projection every potential loss of information could be very noticeable.

Ultimately, there are three options:

1. For reasons of cost, shoot DV and edit on a native DV system, effectively as a single stage, on-line process.
2. For higher quality, shoot Digibeta or DVCPro50, do a compressed off-line edit on a low cost system and then on-line edit on a high-end system.
3. If you can afford an uncompressed system with sufficient storage, shoot Digibeta or DVCPro50 and edit as a single stage, on-line process.

Cutting to the chase

Advances in computer power and the drop in the price of hard drives has resulted in a phenomenal growth in sales of desktop NLE software. These products all perform pretty much the same task - to enable video and audio to be captured, organised, then trimmed to the desired length. Clips can then be placed on a timeline in any given order - the beauty of NLE is the freedom to edit and re-edit at any point in a sequence. The finished cut can then be outputted directly to tape, or exported as timecode information for on-lining, or even copied as raw data for further processing.

Editing of a feature length project does however place requirements on a system that short form work does not. Principally, there is the need to ensure that the system will remain stable and will hold video/audio synchronisation for the length of the work. It is worth assuming that SCSI drives are needed for absolute reliability. There must naturally be sufficient storage to support not just the length of the finished cut but a minimum of 50% in excess for additional working. See data rates for a comparison of storage requirements for different formats.

Most importantly, the NLE software chosen must support good file organisation, in particular the freedom to rename, move, and delete individual files as required. Not all systems allow this. Some allow renaming of clips on the timeline but assign fixed alphanumeric (and hence unidentifiable) file names at the drive level. This makes it very difficult to control the material and make best use of space.

MiniDV does not support useable timecode. All other formats mentioned do. If going to an on-line from a low quality off-line it is essential to know that the EDL (Edit Decision List) exported will be readable on other systems. The EDL is a list of the clips in the edit expressed as their start and end points on the timeline,

related to their associated timecode. It controls matching of the master tapes to the on-line cut. Whilst most NLE software will claim to support a number of different EDL formats, they can't all be relied upon. In addition, whilst Firewire claims to be able to deliver frame accurate tape deck control, there is some doubt about this. For absolute reliabilty in an off-line it might be necessary to consider using an NLE system that supports the 'pro' standard deck control protocol RS-422. This uses an additional cable to the deck to control its operation.

Real-Time

Many of the 'prosumer' desktop NLE systems now make varying claims as to their ability to perform 'real time' effects. Effects in general are any processes applied to the original footage to edit or manipulate it. These can be transitions (such as dissolves or wipes), distortions (such as cropping and scaling), titles, and colour correction. All of these processes involve calculation of new pixels to replace those in the original image. This is known as 'rendering' and, historically, could be very time consuming. With the development of MPEG-2 coding for video, render times can now be reduced to the point where they are negligible. Hence they can be considered as happening in 'real time'. Generally, though, only the simpler effects can be accomplished in real time. In addition, the results are not necessarily available for export and are used only to give a quick low quality impression of the results of an effect. Rendering may still be required to produce a full resolution image.

Audio

As with video, many 'experienced' film people will tell you audio cannot be processed successfully on a desktop system. Not true. Ultimately, time in a studio is probably necessary, but the bulk of the work can be done cheaply, almost as an off-line. Again, like video, what counts is the quality of the original recordings.

Video capture cards of any quality will incorporate audio processing and connections. As for video these can be very variable, particularly as most design effort is put into the video not the audio aspects. It is probably necessary to install a separate high quality sound card for audio processing. Unfortunately, not all video cards or NLE software will accept this.

The reason for attempting this is that, once audio has been captured with video, all processing should be done outside the NLE program, as these programs are very limited when it comes to audio, both in the tools available and in the finesse with which mixes can be produced. Finished mixes can then be dropped back into the NLE program for export.

As with video digitization, audio depends on input and output connections. The most common of these are IEEE1394 (audio is bundled with video, then separated within the NLE program), RCA or balanced XLR connectors. The requirement for these will depend upon the decks being used. As with video, inputted audio will be converted into one of several file formats, such as WAV, AIFF, or SDII, depending on the type of computer platform and NLE system used. It is necessary that, whichever format is used, it should be exchangeable with other audio tools.

Effects software

Alongside desktop NLE systems, there is now a range of affordable software that enables the creation of sophisticated effects which previously were only available in high-end facility houses. Some basic effects will be built into the NLE software itself, others, from specialist suppliers, may come bundled with it, or can be bought separately assuming compatibility.

One of the more interesting plug-ins to emerge is film replication software, such as FilmFXII or Cinelook, which if used judiciously can produce some convincing results. It works by electronically emulating the image qualities of standard 8, 16 and 35mm film stocks or, more generally, by allowing the user to customise settings such as gamma, hue, saturation, and contrast to create their own look. They also offer synthetic 'grain'. Do not use this when anticipating going back to film.

A wide range of programs also exist which purport to offer the low-budget film-maker modelling, motion tracking and general CGI effects. There's no denying that, whilst limited, they can be useful if employed judiciously. But whether they help to make a cheap movie better is debatable, when even the most spectacular FX-driven Hollywood blockbusters barely impress an increasingly savvy audience. Our very firm belief is that story is what sells.

The last word

Post production is one area which is under-budgeted at the best of times, so it makes sense to consider the alternatives. For anyone thinking of buying into desktop 'prosumer' systems, approaching the technology can seem daunting. However the benefits of owning a dedicated facility can't be emphasised enough, particularly when working on limited budgets.

By using desktop systems, not only can film-makers acquire new skills, they can also spend more time on the edit, ultimately improving the quality of their product. More importantly, the savings made can be used in other areas, such as more time in the master grading at a high-end facility house.

Of course, as with anything that challenges the industry wisdom, it takes a whole new mindset to overcome the prejudice that comes of a fear of technology and the complacency of believing there's only one prescribed way to accomplish a cut. Frankly, if you care enough about your work, you owe it to yourself to investigate the possibilities.