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Video standards and the end-user

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This paper will examine the issues that are relevant to end-users when choosing digital video technology. In particular it will focus on Intel video technology and its Indeo video algorithms, presenting their development and position within the digital video spectrum.

It will include the background and current status of Intel's digital video products. Their relationship to Microsoft's Video for Windows and the .AVI file format. A look at Intel's plans concerning MPEG and the Px64 teleconferencing algorithm, and an overview of the kind of standards that have an impact on end-users.

It will then examine the needs of end-users as relevant to multimedia application development and use, what the possible options are, and how companies such as Intel, Apple, IBM and Microsoft are incorporating digital video features into their hardware and software products.

1. What is Indeo video?

Indeo video is an algorithm for the capture and compression of digital video. It offers single-step real-time capture of scalable video files that can be played across computer platforms.

Using Indeo video any PC can play back motion video without special hardware – all it requires is a 386 or better microprocessor, audio capability, and Windows 3.1. In addition, faster CPUs produce higher quality, and bigger window sizes. Furthermore, motion video can be captured on this same PC in real-time, and played back at full screen, full motion (24/30 frames per second for PAL/NTSC), by adding a video board based on Intel's i750 chipset. Indeo video achieves this by being scalable – the playback quality is directly related to the power available in the system playing the video (see Table 1).

2. Cross-platform capability

Indeo video technology is also cross-platform – the same video file can be played on different platforms and using different operating systems. Indeo capability is incorporated in Microsoft's Video for Windows software, which gives Windows applications the ability to use digital motion video. IBM is incorporating Indeo technology into MMPM for OS/2, and Apple is doing the same for QuickTime and QuickTime for Windows. UNIX software is also due to be announced. In other words, Indeo is the first digital video with true cross-platform compatibility potential.

Table 1
Scalable video capability

	386 PC	486 PC	Pentium PC	i750 playback board
Screen size	1/16	1/4	3/4	Full-screen
Frames per second	15	24	25/30	25/30
Capability	play*	play*	play*	play
	edit**	edit**	edit**	edit**
				capture**

In order to capture and play audio a sound card supporting WAV files is required.
* Playback is free with Indeo video runtime software
** Editing and capture requires Video for Windows ($200) or alternative.

3. Single-step capture

To begin using Indeo video, all an application developer needs is Video for Windows, an i750 capture card, a sound board and a camera. The application makes calls to Video for Windows to play Indeo video clips, synchronised with audio. To include Indeo video clips into the application, the clip must first be recorded (a one-step process that converts the analogue video to digital format, compresses it, and saves it as a file to hard disk). Audio can be recorded at the same time.

Video for Windows runtime software is then bundled with the application (no licensing fees). This allows an end-user to play back Indeo clips with no additional video hardware.

Indeo video uses single-step real-time capture. This means that, unlike systems where the video is digitised, stored on the hard disk and then compressed, Indeo is digitised and compressed in real-time removing the need to store large uncompressed files on very large hard disks (Figure 1).

4. What does Intel offer?

At present there are three products from Intel that offer different capabilities for capturing and playing Indeo video (Table 2). Some also support other Intel video compression algorithms such as PLV – Intel's quality algorithm that requires offline compression (compression for Europe is currently offered by Teletota in France).

5. Future developments

Intel's future plans include improvements in video capture resolution, a high quality algorithm that uses the Video for Windows .AVI file format, higher data rate desktop video, ISDN optimised video and over-the-weekend non-real-time compression for higher quality published applications.

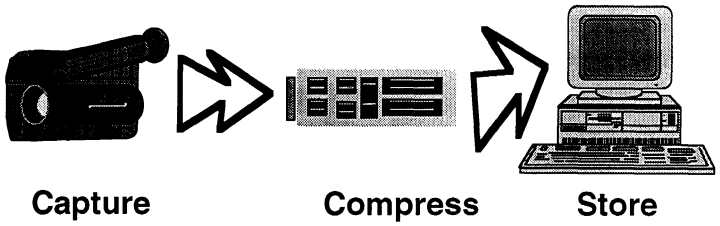

Figure 1. Video is not stored in an uncompressed digital format, removing the necessity for large amounts of hard disk storage.

Table 2

	Captures	Plays	Cost incl. VFW
ActionMedia II	Indeo	Indeo PLV	$ 2,190
RT Video Kit	Indeo	Indeo	$ 1,495
Smart Video Recorder	Indeo	–	$ 699*

* As well as Video for Windows, the Smart Video Recorder comes with Compel a presentation package from Asymetrix; MediaBlitz, a media organiser from Asymetrix; and a CD-ROM of clip video and audio for use in presentations. It also incorporates Indeo software that enables users to capture video at 15 frames-per-second at 320 × 240 (previous versions could only capture at 160 × 120).

6. Standards – What is a standard?

Of all the data carriers listed in Table 3 only CD-ROM has any relationship to an ISO standard and even then it is not adhered to – ISO 9660 differs from the High Sierra format originally intended and Apple uses HFS (hierarchical file structure) for its CD-ROMs. As if this weren't enough we now have double and quad speed CD-ROM drives. All in all CD-ROM has numerous permutations both in data structure and physical capabilities. So even when a standard exists – it is not always standard.

In reality, few standards are formed by committees. The market dictates when the choice between innovation and standardisation is made. Enforcing standards too early stifles a products development, while leaving it too late stifles its market development. All to often standards come about when one manufacturer aligns itself with a standard (usually its own) and achieves market acceptance because of the standard.

As Table 3 shows many standards are in fact proprietary and have achieved the name standard through accepted usage – de facto standards.

Table 3
Data carriers

CD Audio	Proprietary	Philips/Sony
VHS	Proprietary	Philips
PC	Proprietary	IBM
Videodisc	Proprietary	Philips
MS-DOS	Proprietary	Microsoft
CD-ROM	Maybe	ISO 9660

7. Video standards

Things are not very different in the area of video and it is important to understand how many elements are required in setting a video standard. If we ignore the audio portion of video – something that a great many systems and standards do – we are left with two elements the bitstream and the file format. However, we are often confused by other terms and that ignoring the audio cannot be ignored – at some point the audio must be linked to the video images and synchronised.

Algorithm The "equation" that performs compression/decompression
Codec The software that carries out compression/decompression
Bitstream The data that is produced when video is decompressed.
File format The format the file is saved in. This tells the computer what kind of file it is, which codec can decode the data, where the codec might be and basic information about the video.

Video files can use different file formats. The file format does not affect the video data itself, although it may hold information about the audio and synchronisation. File formats can also be changed – Intel's PLV currently uses an .AVS format, but Intel is moving to the .AVI format in recognition of Microsoft's standard.

Similarly, many of the forms of MPEG video currently being made available use the .AVI file format – Xing's Scalable MPEG. However, this is not a given, MPEG does not specify a file format so MPEG video can use another file format that would make it incompatible with a system that played MPEG .AVI video files – file formats should always be verified to ensure playback capability.

Although Video for Windows comes with codecs for Indeo and Microsoft Video 1, codec and / or hardware manufacturers whose drivers and codecs are not included in Video for Windows are not excluded. They will bundle their own drivers and codecs with their products so that end users can simply add them to Video for Windows to enable playback of video files regardless of whether the codec used is proprietary or not.

Consequently, the key to success is not based on the data format but on the file format and on the adoption of standard file formats – .AVI / Movie – and the widespread use of software – Video for Windows / QuickTime - to enable codec and hardware manufacturers to insert their own drivers and codecs for video playback.

Table 4

	Cost	Data rate/bandwidth	Quality
Indeo Video	–	CD-ROM/Hard disk	OK–Good
PLV	££	CD-ROM	Good
TrueMotion*	££	4×CD-ROM	Very Good
MPEG 1	££	CD-ROM	Good
MPEG 2	?	up to 5 Mbits/second	Very Good
P × 64	?	64 Kbs	??

* TrueMotion is a proprietary algorithm developed by The Duck Corporation and marketed by Horizons Technology Inc. It uses Intel's i750 chip and be played back using an ActionMedia II card. Compression is carried out offline and at quad speed CD-ROM data rates results in broadcast quality video. In addition to the higher data rate TrueMotion also uses a different method of compression which has less digital artifacts – pixelation etc. and degrade much more like an analogue signal.

This fact has been somewhat ignored to date, and people have concentrated on the issue of the data itself, which is in fact less important. Meanwhile standard file formats have arrived – Microsoft's .AVI and Apple's Movie. The only possible battle for standards that can really be considered at present is between those two.

8. Where does that leave developers?

It leaves them free to choose the video algorithm and codec that is most suitable for their own application. Given this developers can make judgements based on data rate and available bandwidth, the required video quality and the application itself (Table 4).

Overall, the choice of algorithm depends on the final application:

- High-quality kiosks with quad speed CD-ROM drives . . . *TrueMotion/ MPEG 2*
- Online help needing maximum access . . . *Indeo video*
- Desktop presentations needing better quality . . . *Indeo video with accelerator card*
- Quality CD-ROM publishing . . . *PLV 2.0/MPEG 1*
- Desktop videoconferencing . . . *P × 64*

Providing the file format works, developers should choose their video codec to meet the needs of their application. That way video will be used and we all stand a better chance of seeing realistic standards develop – without media materials no standard will develop.