# Desktop Video

## A report to the Advisory Group on Computer Graphics

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**Desktop Video AGOCG Report**

# BACKGROUND TO THE PROJECT

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The present report is the result of a brief evaluation of desktop video (DTV) undertaken by HUSAT on behalf of the Advisory Group on Computer Graphics.

The term desktop video can be applied to at least two different areas. In the first, the computer's desktop environment accommodates a software editing suite, used to control external video recorders. The functionality offered by such a configuration is akin to that of more conventional hardware editing controllers. It is used to control the video players and recorders during the compilation of video clips into a new `programme'. As a half hour programme could have several hundred individual scenes, the computer provides an ideal tool to log the position and duration of each clip in an `edits decision list'.

The second main area incorporates video material, from one of several potential sources, into a desktop display. It can be freely intergrated with digitised sounds and sophisticated graphics. This is the familiar multimedia video-in-a-window approach.

There are now appearing software packages that combine both of these approaches. The original video material is captured to (extremely high capacity) hard disks which allow near instantaneous replay of any part of any video clip in a video window on the desktop of the PC. With the video source in digital form, a variety of mixing, zooming and distorting effects can be applied to it before it is once more written out to video tape.

While both approaches merit serious consideration, the focus of the present report is centred on the multimedia perspective.

The project aimed to produce a survey of existing products, based on the literature and on-line databases, with consideration given to possibilities for the future of the market. It has concentrated primarily on the Macintosh and PC platforms, with a discussion of CD-ROM drives and other hardware components. Software considerations have been discussed at a systems level as support for applications of DTV.

As part of the project a survey has been conducted which aimed to assess the different configurations of hardware and software currently being used in the marketplace and to gauge users' reactions to them.

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# ABSTRACT

The interest in video on the desktop has exploded. Consequently, nearly every computing magazine has featured the use of video, either as a product survey or as a feature article on how to get the best from a particular DTV configuration.

The main area of coverage for this report is the use of video material and how it is incorporated into a desktop display. The source of such video material is unspecified since it could come from a variety of sources. It can be integrated with digitised sounds and sophisticated graphics, thus becoming the familiar multimedia `video in a window' approach. There are a variety of uses for this approach in training and education.

The report begins with an explanation of the technical aspects of DTV, including a consideration of compression techniques and standards and how they relate to networking issues.

There is then a survey of existing hardware platforms and low level software support. This identifies the most common manufacturers and models, with a description of each. The advantages and disadvantages of each are discussed in the context of different applications. Included in this section is a section on CD-ROM.

The next section looks at some of the myriad applications for DTV and multimedia equipment, including videoconferencing, video editing, presentations and the integration of TV into the desktop.

Finally the report presents the results of a questionnaire administered to DTV users, giving an insight into the state of multimedia and its proliferation in the market.

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# INTRODUCTION

Even throughout the duration of this short project, the world of `video on the desktop' has been visibly changing. Every week new products on CD-ROM incorporating video are being unveiled and it seems that every other week another new application hits the market. Numerous trade shows and conferences are being set up to educate the public and exploit the power of desktop video, either as a communications package or as a state of the art presentation tool.

The Apple Multimedia Festival in November 1993 was a precursor to a nationwide attempt to raise awareness of multimedia among prospective customers. Everybody who attended the Festival was given a free pack including a brochure of the Apple product range and a free CD which included, among other things, film trailers and video guides to British cities. Much of the importance of multimedia was sold on the idea of interactivity, a buzzword almost as powerful and ubiquitous as multimedia itself.

The Festival was followed in February 1994 by the Windows Show, which somewhat predictably incorporated a multimedia centre boasting: "What is multimedia and what can it do for your company? Find all the answers in the dedicated [multimedia] centre."

This push toward video and multimedia has been echoed in the computer press, to the extent that almost all computer magazines have featured at least one article on hardware, software or applications of video on the desktop.

The convergence of the computer world and the video world has been proceeding inexorably in recent years, but in many guises. Desktop video means different things to different people. Playback of a simple QuickTime movie is desktop video. Video editing using a Macintosh as an edit controller is also desktop video. To many people the term desktop video conjures up images of PC-integrated videoconferencing, or it could mean putting a computer generated animation onto video.

As a direct result of this, the product market place is now overrun with new software and hardware to fill every available niche. It is, however, a common complaint that there are often many components to a desktop video suite and it is only once all of the contributory hardware and software is used in the right configuration that many of the applications offered by the manufacturers can be achieved in the home or office. This will be discussed in more detail in the section on product overview.

There is a view that as all of the applications of DTV are realised it is easy to gain the impression that too much is happening in the DTV market. There are countless vendors of video products, all contributing to the hazy definitions and consumer confusion created by the video market. One thing on which experts can agree is that when talking about desktop video as a phenomenon, one must first define exactly what the term means.

There is also a firm belief that although the applications of DTV are diverse, they are converging, as equipment becomes more powerful and capable. A Mac can now be used as a videophone, a video editing suite, a tool for multimedia presentations it is no longer just a computer, it is a communications device as well.

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# EQUIPMENT AND CONFIGURATION REQUIREMENTS OF DTV

It is natural that, as a market expands, standards invariably lag behind some would say rightly so since standards can act as an inhibitor to innovation. Hence, there currently exist some fundamental problems with the world of video communications, primarily regarding transmission standards and bandwidth capabilities. We explore some of these problems below.

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# Compression Techniques

It seems that Parkinson's Law applies in all walks of life and hence messages expand to fill the available bandwidth. The obvious solution to the problem of the overloading of the communication links is the evolution of existing compression techniques. The best of today's compression techniques struggle with the challenge of squeezing a TV quality video signal through a 64 Kbps ISDN channel without discarding too much of the data and thereby producing a seriously degraded image.

As a result, desktop videoconferencing systems typically compromise by offering smaller windows (as tiny as 80 by 96 pixels), grainier colour (8 bits per pixel instead of 24 bits) and lower frame rates (5 frames per second or less under certain conditions). These trade-offs reduce the bit stream to manageable levels.

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# Compression in Video for Windows

Video for Windows uses a default compression method called Microsoft Video 1 which guarantees a specified data rate for 8, 16 and 24-bit colour sequences. The data rate is critical since it controls the speed and therefore the amount of video that can be loaded and displayed when a sequence is running.

Run Length Encoding (RLE) is another option and is best suited for storing animations or video with only a few changing areas. When large changes occur between successive frames, RLE reduces colour information so that it always fits the right amount of data into a frame. This can make images blurry in some cases.

One of the more interesting methods of compression is Intel's Indeo, designed to work mainly with hardware assistance from the company's ActionMedia card. With this installed, an Indeo file can be recorded at 320 x 240 pixels and played at 30 frames per second in a window measuring 640 x 480.

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# Compression in QuickTime

QuickTime uses algorithms designed as plug-in coder/decoders (CODECs), with five CODECs as standard: Photo, Animation, Graphics, Video and Compact Video.

The photo compressor is an implementation of the Joint Photographic Experts Group (JPEG) compression scheme for reducing the size of high quality still images and Apple is the first manufacturer to use this as part of its system software. JPEG, designed to compress full colour images, typically gives a compression ratio in the range of 10:1 25:1 with no visible degradation.

Some CODECs require more time to compress than they do to decompress. MPEG (a standard of the Moving Pictures Experts Group, see below) and Cinepak are examples of these asymmetrical CODECs. They are better suited for store-and-forward applications or pre-recorded video on CD-ROMs than for real time videoconferencing.

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# MPEG

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The Moving Pictures Experts Group meets under the auspices of the International Standards Organisation (ISO) to generate standards for digital video and audio compression. In particular, they define a compressed bit stream which implicitly defines a decompressor. However, the compression algorithms are the responsibility of the individual manufacturers and it is here that proprietary advantage is obtained within the scope of a publicly available international standard. MPEG meets approximately four times a year for about a week each time.

The MPEG group usually meet at the same time as the JPEG, JBIG and MHEG groups. However, they are different sets of people with few or no common individual members and they have different charters and requirements. JPEG is for still image compression, JBIG for binary image compression (like faxes) and MHEG is for multimedia data standards (such as integrating stills, video, audio, text, etc.)

MPEG phase 1 has been devised and is in three parts: video, audio and systems, where the last part provides for the integration of the audio and video streams with the proper time stamping to allow synchronisation of the two. Phase 2 will define a bit stream for video and audio coded at around 3 to 10 Mbit/s. The MPEG 1 standard is available as ISO CD 11172.

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# CCITT Standards

In late 1990, the CCITT adopted a world-wide specification for video compression called H.261 or Px64 that made it possible for different systems to interoperate. Unfortunately, many suppliers feel that the specification is poor compared with their own proprietary algorithms.

H.261 defines a scheme for sending video at speeds of from 64 Kbps to 2 Mbps. At the low end of the spectrum H.261 fits into an ISDN channel; at the high end, it needs wider bandwidth dedicated lines. The standard defines a video window of 352 x 288 pixels, known as CIF (Common Intermedia Format). It also supports QCIF (Quarter CIF), a smaller window of 176 x 144 pixels. Related specifications cover still frame graphics, call set up protocols and other issues.

PictureTel, Compression Labs and other manufacturers of large scale conference room video systems offer H.261 as an option, but traditionally rely on their own proprietary codes. In the desktop market it seems that not everybody is happy with the H.261 standard since it requires very expensive hardware. This has led to new proprietary CODECs being developed including MediaVision's MotiVE (Motion Video Engine) and Captain Crunch.

A company called Knex in Fremont, California is developing a radical new compression scheme that can send 320 x 240 pixel colour images at 15 fps over telephone systems with a transmission delay of less than 200 milliseconds. However, this has yet to be realised.

Systems which use video rely on a CODEC to compress the image. When compressing, there is a trade-off between the size, quality and time taken to produce the image. The optimum CODEC used to compress the data will depend on exactly what is required to be displayed. A high level recording with much changing detail will need a more complex compression algorithm than an animation with minimal changes. In the case of Microsoft's Video for Windows, the default compression method is Video 1 which guarantees a specified data rate for 8, 16 and 24-bit colour sequences, as mentioned above.

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# CODECs for Desktop Videoconferencing

It is this lack of standardisation in desktop video protocols and equipment that has led to a relatively slow rate of uptake in the technology and many of the negative comments raised in the survey reported in Section 5 below.

Most of today's compression algorithms are not capable of sending a TV quality signal through a 64 Kbps ISDN channel. In order to do this, the algorithm would have to discard more than 99 percent of the data without seriously degrading the image.

As a result most desktop videoconferencing systems compromise by offering smaller windows, grainier colour and lower frame rates. Many CODECs achieve these levels of compression, but require more time to compress than to decompress. As mentioned above, MPEG and Cinepak are two such asymmetric CODECs which are therefore better suited for store-and-forward applications than for real time videoconferencing.

Even when the CODEC works in real time there may be a network lag, depending on the size and volume of the traffic on the network. A delay of more than 250 milliseconds is considered to interfere with a natural dialogue.

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# Network Requirements

Networking with video raises problems that go beyond bandwidth. Video requires predictable delivery and so unless the LAN is hardly being used, it is almost impossible to conduct a real time video conference. Solutions such as Ethernet and Fibre Distributed Data Interface (FDDI) provide more bandwidth, but the delivery is still unpredictable. Asynchronous Transfer Mode (ATM) will probably provide the solution and hence ATM based switching systems are now being marketed.

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# Aspects of the networks

Until recently, networked multimedia applications have been based mainly on dedicated videoconferencing rooms and video coders/decoders working via high-speed leased circuits or ISDN. However, the movement of multimedia to the desktop means that the applications are beginning to move into networks which were originally designed for more conventional data. This leads to the question of whether it will be packet, cell or circuit switched networks which will be used for the spread of multimedia.

At the heart of this revolution is the dramatic improvement in the price and performance of PCs and technical workstations, with UNIX workstations leading the way. Terminals from companies such as Silicon Graphics Inc., Sun Microsystems Inc. and Digital Equipment Corp. are ubiquitously installed in research and development and engineering environments and these workstations already have sufficient processing power to handle multimedia.

In addition the Windows/Intel based PCs that are widely used in office applications are rapidly catching up. Today's PCs are approximately six times as powerful as they were three years ago. In 1994 this power is set to increase further with the development of Intel's Pentium microprocessor, Apple's PowerPC and IBM's RISC (reduced instruction set computing) offerings. It is likely, therefore, that the multimedia market will now be catered for by dedicated multimedia terminals such as the Indigo workstation, IBM's Ultimedia range and the Macintosh AV range (and their RISC descendents).

Most data terminals are already connected to local area networks (LANs), so it is possible that LANs will be the basis for transmission of multimedia around a single site. These will probably use ATM and a dedicated Ethernet to the desktop.

This means that if the users have LANs, there will not be a need for ISDN which has really been derived from voice communications. The only argument in the favour of ISDN is the unreliability of packet switching of the audio and video bit stream in real time communication, but this concern has been refuted by recent developments in the area.

Most of the early use of multimedia has been on the Internet, due primarily to the availability of public domain software tools that allow video and audio to be coded and decoded for network transmission.

In terms of the network, there have been key developments, e.g., IP Multicasting Protocol (which allows audio and videoconferencing between hundreds of participants) and the Real Time Protocol (which improves the functionality of multimedia conferences on the Internet). Multicasting allows a single multimedia stream to be sent to more than one destination without the need for a dedicated channel to each one.

However, it is a widely held belief that the Internet system does not have the reliability and consistent, guaranteed quality required for business applications of multimedia. As a result, business users are more likely to pursue the ISDN solution with conventional video CODECs.

The link between ISDN and multimedia prompted the formation of the Multimedia Communications Community of Interest (MCCI), which is a consortium of European, North American and Asia-Pacific carriers and vendors including IBM and Northern Telecom Ltd.

The other challenge to ISDN and circuit switching comes from Asynchronous Transfer Mode (ATM) which many regard to be the perfect network technology for multimedia. Once there is a requirement for real time video and bandwidth-on-demand, there is a requirement for ATM because it allows the flexible satisfaction of peaks in bandwidth demand. However, there are many more technical challenges facing the developers of ATM in terms of, for example, interoperability between wide area network (WAN) switches, as well as the reduction in cost per bit of an ATM connection, which at the moment is prohibitively expensive.

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# ATM

Asynchronous Transfer Mode can be used like a phone line by attaching a conventional CODEC that assumes a fixed bandwidth with a point-to-point link. A video server can be implemented in the same way, with a separate circuit for each user.

One of the major incentives for developing ATM technology was the need for a variable-bit rate network. The work on high capacity fixed-bit rate was more or less abandoned five years ago.

In the current ATM/B-ISDN set of standards, it may appear possible to request, as a special case, a fixed bandwidth channel. However, the transmission network knows nothing about this; the transmitter supplies a continuous stream of data cells, rather than a `bursty' one, and it is the receiver's business to even out small variations in transfer delay, to provide a perfectly steady bit rate to the application.

If the transmitter is supplying a varying rate of data cells, the utilised channel capacity may vary, say, from one cell per several days or more, up to more than 500 Mbps (with a B-ISDN 622 Mbps raw capacity interface) if other users do not need it.

In order not to risk lost data cells at saturation conditions, it is possible at call set-up time to request a certain rate of "protected" capacity; the network should then do whatever is possible get those cells through without loss. More than the protected data may be transmitted, but if the net is loaded to full capacity some may be lost. Far less than the protected amount (or nothing at all) may be transmitted and other users can therefore utilise the `spare' capacity but must stop and wait when protected traffic arrives. A plain PCM phone channel will request 64 Kbps protected capacity, will make use of exactly that much never more, never less. However, that is a peculiarity of phones and other devices developed for fixed bit rate networks. It does not imply that every underlying network is fixed bit rate.

For video applications, ATM has clear advantages. When a scene changes rapidly, a very low resolution new image can be immediately transmitted as a series of `megapixels'. Immediately thereafter the megapixels start cracking into smaller pixels, adding more detail, in multiple steps. At the same time, the colour rendition improves gradually as the channel capacity permits the palette to be updated. If the change affects the entire picture and it contains a lot of detail, the picture is not perfectly stable until after half a second or more. If a new large change occurs before the update is complete, the remaining details are skipped and a new (initially) coarse image, or partial image, is started.

For video, therefore, an ATM channel can be opened with sufficiently high guaranteed bandwidth to ensure a "satisfactory" picture quality. This of course depends a lot on application for videophone, 64 Kbps is the minimum even under high network load. If network capacity allows, there is a great benefit in going temporarily to, say, 200 Kbps this will reduce the delay before all details are in place from somewhere below a second to a few milliseconds, but is not essential. For broadcast quality, 384 Kbps would be a suitable minimum (384 Kbps was the only bit rate in the first edition of H.261), for HDTV perhaps 2 Mbps. Furthermore, the loss characteristics of an ATM channel are quite favourable for video compression. The transmitter may choose which data to protect (up to the guaranteed capacity), for example those cells carrying coarse image data, while unprotecting detail information.

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# OVERVIEW OF EXISTING PRODUCTS

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# Introduction

What follows is a broad overview of the state of the art in desktop video. It is based on a literature review of journals, on-line databases, magazine and newspaper articles.

From this it is possible to assess the possibilities for the future shape of the market. This will also be derived from an examination of recent research developments in multimedia and desktop video (notably the CEC-funded ISSUE project).

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# Hardware configurations

This section will mainly focus on the Apple Macintosh and IBM PC compatible platforms with a brief mention of more sophisticated systems based on high end workstations (e.g., Silicon Graphics machines). Other key aspects of hardware are considered, including CD-ROM drives.

Hardware add-ons will not be considered since they are too numerious. For a recent review of seven desktop video cards, see Personal Computer Magazine, February 1994 issue, pages 136147.

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# Macintosh

Virtually from its launch in 1984 the Apple Macintosh has been a machine most suited to multimedia application. Third party hardware developers have created a wide variety of NuBus cards to handle video I/O, while the Macintosh has always had built in sound support.

The new breed of AV Macintosh not only consolidates new features into a desktop computer but also provides new ways for the user to both work in the office and collaborate with other people, whether they are down the hall or across the country. Telephone services enable the Mac to call people, act as a speakerphone, send and receive faxes and operate as a modem to access on line services. Built in live video hardware lets the user record and play back video and, with the telephone services, handle videoconferencing over a network or an ISDN line. Sophisticated speech recognition technology allows the user to direct the Mac by voice command, while a text to speech engine enables documents to be read out loud with 16 bit CD quality stereo sound, freeing the users to do other tasks as they listen. They can also record QuickTime movies from a camcorder or other video source, or send the screen image to a video recorder or a TV set. These AV Macs treat live video as just another data type that is manipulated by the system and applications.

Apple firmly believes that for multimedia production, as a low cost platform for delivery of multimedia information, as a platform for telephony or video conferencing applications, or for applications requiring speech recognition or text to speech technology, these machines provide a price/performance trade-off that is unrivalled by any other product from any other PC vendor. At the time of writing it is hard to dispute this claim.

There are two new Macs in the vanguard of these developments: the high end Quadra 840AV, with a Quadra 800 hard drive and a 40MHz 68040 processor; and the low end Centris 660AV with a Centris 610 hard drive and a 25 MHz 68040 processor.

Several new hardware and system software components work together to give the AVs their capabilities. There is an analogue to digital (A/D) converter circuit which converts continuously varying signals, such as sound waves, into digital data which the computers can process, and a digital signal processor (DSP), a microprocessor designed to manipulate, convert and modify streams of digitised sounds and video signals. The DSP has the advantage over a traditional microprocessor in that it can do this in real time.

The new AVs can be connected directly to any TV set with a composite video or S-Video input. The Mac's video signal can then be routed to the television set. This means that a conventional television set can be used to show presentations using any of the multimedia authoring tools. This is advantageous, particularly since a 35 inch TV set is much cheaper than a 35 inch monitor. The AVs can also be attached to a video recorder and the Mac's microphone can be used to record a voice over, or mixed in with the QuickTime movie's sound track. Two people with AV Macs can use them as videotelephony machines.

The DSP chip doesn't play a direct role in the video input/output capabilities. These features are provided by a new subsystem located on the computer's logic board. However with appropriate CODEC, the DSP chip could handle video compression in order to reduce the storage requirements of QuickTime movies.

At the time of writing there is talk of Apple releasing the MacTV, which is essentially a Mac LC520 with a TV tuner. It is currently being made in a limited quantity and test marketed. As yet there is a scarcity of information on the product and hence no details can be included in this report. Also, the Power Macs have AV potential by the addition of a low cost board.

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# PC

In comparison with the Macintosh, PCs have come to the DTV/multimedia arena only recently. The sudden upsurge in PC based DTV systems is due to the arrival of Microsoft Windows (mainly versions 3.0 and 3.1) and the concomitant explosion of improved resolution graphics cards and accelerators to support this GUI. Now many manufacturers have produced a dedicated Multimedia PC (MPC), while there is also an abundance of third party add-ons to upgrade existing machines. From the questionnaire reported in Section 5, a variety of PC hardware is being used in the field of desktop video including Viglen, OPUS, Elonex, Dell, Mertec, Compaq and DEC machines. It is not practical to go into detail about each particular piece of hardware since they are best regarded as IBM PC compatibles, but comments for each of them is incorporated into the survey report where appropriate.

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# Silicon Graphics

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The Silicon Graphics company is attempting to redefine the user interface with what it calls digital media communications. Its latest workstation, the Indy, provides all of the hardware and software needed for capturing and communicating with sound and image over a network or over a digital telephone line. The digital media capabilities of this machine are particularly valuable to work groups that need to share images and film clips over wide geographical distances, for example, medical teams, distributed engineering groups and so forth.

The Indy is SGI's low end system. Video can be input via the integral `IndyCam' video camera, or from a camcorder, videodisk player, or video camera directly into the NTSC/PAL video or S-video port. The IndyCam provides video input for videoconferencing and can capture images to attach to mail messages. It has a high enough resolution to capture text from a typewritten page, but the level of detail can be set, obviating the need for decompression with every image capture.

The SGI Indy can work on UNIX, MS-DOS, Windows, NetWare, Macintosh and Apple networks and can read both MS-DOS and Macintosh disks. The serious drawback with the SGI machine is its expense, not only in the initial purchase but also in the acquisition of software. The live videoconferencing software is currently being released and is sure to be orders of magnitude higher in price than the equivalent Mac or PC integrated software.

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# Sun

In October 1993, Sun announced a new range of multimedia products, introducing new video capabilities for conferencing and communication. Users can now plug in a camera and create a digital video for storage on their disk or for broadcast over the network for face to face videoconferencing. This functionality is a result of the new SunVideo SBus Card. This is designed to be used with the range of `ShowMe' software products including `ShowMe Audio,' `ShowMe Video,' `ShowMe Whiteboard,' and `ShowMe SharedApp'. In addition the Sun can be used in conjunction with RasterFLEX-TV to accept video images from a variety of sources including TV, VCR and camcorder.

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# Software Configurations

There are many software packages suitable for DTV applications, with more being launched each month. Rather than attempt to review this expanding field in its entirety potentially the subject of another whole report attention in this section will focus on the low-level provision of integrated video and audio support, virtually at the operating system level.

The two major contenders in the field of low level DTV control are Apple's QuickTime and Microsoft's Video for Windows. QuickTime has been around for nearly two years and has evolved to version 1.6 on the Macintosh.

Apple have also produced a QuickTime Player for Windows which will allow Windows users to play back QuickTime movies created on either platform. In addition Apple have licensed QuickTime to some UNIX manufacturers in order to establish it as a true cross-platform standard. Video for Windows grew out of Microsoft's Multimedia Extensions made up of the Media Player and Sound Recorder, both of which have now been included with Windows 3.1.

Software used in videotelephony will be considered, including commercially available systems such as CLI's Cameo Personal Video System as well as an examination of the implications for future videotelephony displays inferred from the ISSUE project prototypes.

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# Microsoft Video for Windows

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Microsoft's attempt at setting a digital video software standard is Video for Windows, which enables users to record and play back sequences on any suitably equipped PC. The minimum configuration officially required is a 386SX with VGA, a sound card and a large capacity hard disk in short the base MPC specification. In reality, this will allow only limited playback because adding video to a computer is a complex process. A capture board is required to record images and a fast processor such as a 386DX is required in order to be able to play them back at a rate approaching 25 frames per second with software alone. The Video for Windows package comes complete with a CD-ROM containing Microsoft's own video clips.

The software is split into five small programs: two main applications and three utilities for editing and viewing images. The first of the main applications is VidCap, which handles the job of getting pictures and audio from a suitable source into the machine and onto the hard disk.

The second, VideoEdit, is the most important since it lets the user edit, compress and store sequences for replay. Compression is crucial to digital video and is handled here by plug-in, specially written routines.

When Video for Windows stores data it uses a method known as Audio Video Interleave (AVI), which lays down video with corresponding audio information in an interleaved format. This makes for quick loading, as playback applications need only access a few frames of video and a portion of audio at a time, thus eliminating the need for complex synchronisation routines.

The standard method for playing back Video for Windows files is through the Windows Media Player, which boasts Microsoft's standard 3D tool-bar interface. The other small utilities supplied are WaveEdit, BitEdit and PalEdit, for editing sound, still images and colour palettes respectively. All are basic in comparison to the two main programs, but equally useful for developing video clips.

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# Apple QuickTime

QuickTime is an extension to the Mac's system software which provides system-level support for dynamic media types, such as video animation and sound. Its most obvious and appealing feature is the ability to use a Mac to play video clips, but there is more to QuickTime than that. The real aim of QuickTime is compatibility between hardware and software. QuickTime provides a series of ways for any software package to address and use specialist video hardware, such as a video capture board. With QuickTime the user can employ a standard editing package like Adobe Premiere with a video capture card, from a budget priced 400 VideoSpigot to 5000 cards designed for professional quality video production on the Mac.

QuickTime is a set of protocols that allow a Mac or a PC running Windows (or any other computer in the future, hopefully) to use a single interface to create/display/manipulate movies that contain digitised video, sound, text, etc. The standard output is a QuickTime "Movie" that can be a file or one of several different formats. An important aspect is that the user has no need to know what is in the file or what format it is.

What makes QuickTime so special (and therefore arguably better than most other solutions) is that (a) it keeps the video and sound in sync on any machine, (b) in theory it runs at the same speed on all machines,1 and (c) it is to some extent hardware independent, meaning it can run on any Mac from the Plus to the Quadra 840AV or any PC using Windows and will run to the best of its ability on those machines.

However, the real power behind QuickTime is the ability of so many applications to work with the same files in exactly the same way as well as the ability for QuickTime to be upgraded at any time by any company. Apple ships QuickTime with a certain set of compressors. In the future, other companies will be able to ship additional compressors (either free or licensed with software) that will be made available via QuickTime to every single program that accesses QuickTime.

For example, a 10 fps 160 x 120 movie will run well on an LC machine and better, but on a Quadra 840AV it is possible to run a 15 fps 320 x 240 movie; with an extra video board, or potentially with a PowerPC, 30 fps full-screen video is possible. Add to this the fact that it runs under Windows as well, while Video for Windows does not run on Macs, and it is an attractive prospect.

QuickTime is the Apple system for handling the multimedia concept and differs from Video for Windows in that it is a standard architecture for linking video, audio and animation along with other dynamic data types into applications. It gives users a standard way to display, copy, paste and compress time-based data, which makes it easy for anyone to create multimedia documents.

QuickTime is composed of three major components: the Movie Toolbox, the Image Compression Manager and the Component Manager. The Movie Toolbox provides routines that allow applications to control all aspects of movies in Macintosh applications. There are Movie Toolbox routines that provide basic operations for opening and playing movies as well as more complex routines for the creation and manipulation of the data that make up the movie's media.

The Image Compression Manager (ICM) provides applications with image compression and decompression services that are device and algorithm independent. As with Video for Windows, the algorithms are designed as plug in CODECs and QuickTime can use them to read and perform compression `on the fly'. The ICM also manages display details such as clipping, crossing screens, scaling and fast dithering and provides a common compression interface for all compatible software.

The last main part of QuickTime is the Component Manager, which allows external resources such as digitisers, VCRs and accelerator cards to register their capabilities with the system at run time. Once registered they can be made available to all compatible applications, without the programmer having to know which devices the user may have available.

Just as Video for Windows uses the Media Player as a standard interface for viewing AVI clips, QuickTime has a standard `human' interface for dealing with movies. Apple's is similar to Microsoft's in appearance, with controls for playing, stopping, fast forwarding and rewinding data, but the QuickTime controller features a sliding volume control.

In mid December 1993, Apple began to demonstrate a further advance in video technology. This was the integration of MPEG into applications using QuickTime. Apple announced that MPEG would become the digital video standard for compact disks, cable TV, direct satellite broadcast and High Definition TV (HDTV). Future devices which use MPEG technology with QuickTime will become more powerful. MPEG by itself only allows playback. With the addition of QuickTime, devices that use MPEG will additionally be able to edit, search for and interact with video information. In a related announcement, Apple stated that Fujitsu had joined (among others) Silicon Graphics and KALEIDA, in adopting the QuickTime standard. QuickTime for Windows is available for customers who use Microsoft's Windows/DOS operating system.

At the Tokyo Multimedia conference, Apple publicly demonstrated the Apple Media Kit for the first time. This is based on QuickTime and is a digital publishing tool facilitating the creation of multimedia titles to multiple platforms.

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**Desktop Video AGOCG Report**

# Comparison

At the time of writing QuickTime seems to have the edge over Video for Windows in terms of what it can offer the user. It is technologically more advanced, offering excellent system services, slightly better compression and larger sequences without hardware. As might be expected, Microsoft is working on a more advanced video product of its own entitled ClockWorks.

Desktop Video AGOCG Report

# CD ROM

CD-ROM is an important enabling technology for DTV. New PCs are increasingly being sold with their system software and documentation on CD-ROM and it is becoming the norm to sell PCs with a CD-ROM drive as part of the package.

A CD-ROM can hold about 650 megabytes of data, the equivalent to hundreds of floppy disks. The data on a CD-ROM is accessed much faster than a tape, but they are 10 to 20 times slower than hard disks. However, the use of software cache techniques can improve apparent access rates. Most CD-ROM drives have internal RAM caches which buffer data to boost the throughput, but they also benefit from system level caches (e.g., on a Macintosh there is a system RAM cache controlled by the Memory Control Panel).

For some years CD-ROM has been reasonably stable. Recently, however, there has been a spate of developments, spawning terms like CD-ROM XA2, Mode 1, Mode 23, dual speed, MultiSpin4, and multi-sessional capability. There has been a consequent explosion of titles, further encouraged by the fact that Apple has launched the AppleCD 300, which it is selling at cost price in order to seed the CD-ROM drive market.

Now that much CD-ROM based software contains a lot of sound, graphics and animations, the CD-ROM drive hardware has had to catch up. One of the ways this has been done is by introducing dual speed technology, which spins the CD at twice the normal speed to boost how fast some data can be read, while retaining a slower speed to play audio.5

While it might be thought that higher speed was advantageous, this is not necessarily the case. Certainly, dual speed capability helps with operations such as copying and opening files, but access time (such as that taken searching for files) is not significantly decreased. Also, some QuickTime movies do not benefit much from the doubling of data transfer rates because they have been optimised for the standard single-speed 150 K/sec CD-ROM drives. However, as movies begin to be developed for the faster drives, greater frame rates will mean better video motion.

Desktop Video AGOCG Report

# ISSUE

The ISSUE project (IBC Systems and Services Usability Engineering) was a RACE I6 Usability project. The primary goal was to provide designers of future IBC systems and services with usability information in terms of factors affecting acceptability and uptake of video communication and multimedia retrieval systems.

ISSUE aimed to identify the best way to match the output of the designers and providers of services to the real needs of the users in order to introduce and maintain new services successfully.

The project developed simulations and experimental prototypes on which human factors experimentation was carried out. In parallel, user surveys were conducted assessing user needs and requirements in relation to IBC technology. This information has been collated and supplemented by human factors data from all over the world in an effort to compile a series of guidelines which accurately reflect human factors practice.

ISSUE developed its human factors guidelines in a modular form as a series of books supported by short videos. There are four different information packages available; videoconferencing, videotelephony, multimedia, and usability evaluation, each of which is a self contained unit which can be obtained from The HUSAT Research Institute.

RACE I has been followed by RACE II which will run until the end of 1995. The whole programme is investigating aspects of video communications and multimedia for future broadband networks. Projects have been set up to address the more technological aspects as well as the user aspects being addressed in trials. The trials take the form of application experiments in specific business sectors (for example, publishing, banking, tourism) and many of these incorporate terminals with desktop video windows.

**Desktop Video AGOCG Report**

# APPLICATIONS OF DTV

According to the Business Research Group in Newton, Massachusetts, more than 30 percent of the multimedia applications are already being used for the general-business purposes like storing and retrieving multimedia data, sales support, business administration and information, imaging and even software development. Computer based training represents 24 percent of multimedia use, according to the survey.

Desktop Video AGOCG Report

# Introduction

A precise meaning of DTV is unclear, primarily as a result of the plethora of applications for what is intrinsically the same technology. The report has already covered the idea of a single workstation accommodating all of the different requirements of video, the videophone, the video editor, the multimedia workstation. Grass Roots Research identified five market applications of multimedia; corporate training and presentations, desktop videoconferencing, education, consumer and sales support (kiosks). This report will focus on video communication, videomail, presentations/education and video editing.

Video communication is not primarily being packaged as a standalone, phone-like device, but rather on the back of personal computers. The integration of video into PCs offers much more than the ability to see the person on the other end of the line: content rich video will enable all kinds of collaborative work.

New products from Apple and Silicon Graphics exemplify the trend to support motion video in desktop systems. As mentioned earlier, the Silicon Graphics Indy and two Apple Macs the Centris 660AV and the Quadra 840AV include hardware for input and output of analogue video, video digitisation, digital signal processing for image manipulation and compression and software support for handling video data. The Indy even includes a tiny video camera as standard equipment. This means that a system is now available to handle video straight out of the box. This is in preference to relying on third party vendors such as SuperMac, RasterOps and Creative Labs, running with system level software support like Apple's QuickTime and Microsoft's Video for Windows and having to purchase additional hardware.

Video will be incorporated into existing software such as presentation packages; word processors, databases and even spreadsheets will support video clips and annotations. Electronic mail packages will add support for video attachments to messages. Multimedia titles will become richer, more dynamic and more widely distributed. However, perhaps the most significant potential of DTV lies with video communication.

Desktop Video AGOCG Report

# Video Communication

Users can now turn their PC into a videophone by sending pictures captured with the computer's camera in real time across a high speed telephone line or over a LAN. Alternatively, a video messaging system could be employed by sending pictures to a central repository for retrieval or delivery at a later time.

Such systems works by inputting the video image from the camera or other source and passing it to the framegrabber. Frames are then compressed in the computer before they are sent. Audio may also be compressed at this stage, but many systems rely on a telephone being used in conjunction with the videoconferencing equipment. On reception of the image, it is decompressed. Then the video circuitry in the receiving machine, such as the video card, displays the image from the remote system.

Most systems use an ISDN connection since it provides a cheap, high speed (64 Kbps) digital phone line, without digital information from the computer having to be encoded into analogue data using a modem. As ISDN lines are digital, they provide a more reliable way of transferring data. An expensive alternative is the X.25 standard packet switched stream wide area network. Internally within a company, an Ethernet network could be used, but with this the frame rate may not be consistent.7

Real time videoconferencing is less demanding of the host system than videomail because the video typically passes through the machine without taking up CPU resources or system-bus bandwidth. Because it is live, the data neither comes from nor is saved to a hard drive; users who want to save any videoconference are able to do so onto a VCR.

One of the earliest desktop video conferencing systems was the CLI Cameo Personal Videoconferencing System for the Macintosh, announced in January 1992. This uses compression technology developed jointly by CLI and AT&T. Cameo is designed to work over ISDN lines only and employs a scaled-up version of the algorithm that AT&T uses in its analogue based consumer videophone. The system transmits 15 frames per second of video, (about half the rate of TV video) and requires an external phone to transmit audio.

More recently, PictureTel, in association with IBM and Lotus, has announced the PC based PictureTel Live PCS 100.

Although the first videoconferencing systems appeared in the 1970s, the technology is still bogged down by conflicting standards and constricted electronic pathways. Before desktop videoconferencing can become effortless and ubiquitous the problems of inter-connectivity and bandwidth have to be solved. (See the earlier section on compression techniques.)

Assuming a full screen image of 640 x 480 pixels in true colour (24 bits per pixel) and NTSC standard 30 fps for full motion video, it requires a transmission rate of almost 27 Mbps for an uncompressed picture the quality of a TV broadcast, without sound and in one direction only. This will therefore require an increase in bandwidth or considerable progress in compression techniques.

The quality of the picture displayed depends on a number of factors including the frame rate. Some systems can now provide up to 30 frames per second, but at a compromised quality. Ten frames per second is considered acceptable.

The idea of seeing and speaking to someone who is not in the same room is now a reality in a primitive form with video phones for domestic use. A true video conferencing system should provide a full meeting metaphor with facilities for many people to interact visually, exchange documents and work with shared resources. Nowadays a personal computer is sufficiently powerful to provide the backbone for a desktop videoconferencing system. Recent advances in technology have led to cheap and fast hardware to implement compression algorithms. Added to this there is the increasing availability of ISDN lines that cost little more than a normal telephone line. These three factors mean that desktop videoconferencing can become an affordable reality.

There are a number of software applications which can now enable videoconferencing. A review article comparing six such applications can be found in MacUser issue of 20 August 1993, pages 61 65.

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Desktop Video AGOCG Report

# Video Mail

The advantage of video mail is that it allows the users to send and receive whenever they are ready. This is especially useful when crossing time zones or dealing in foreign languages. Store and forward messaging is much easier to accommodate than is real time communication, because packets can be deferred for later delivery. Unlike video conferencing, video mail does not require vast amounts of synchronous bandwidth. However it will require large amounts of processing power and hard disk space on both ends of the communication link and so may take a while to really prove successful as frequent video mail file transfers could clog LANs.

Desktop Video AGOCG Report

# The Harnessing of New Media

Built in video capabilities will be harnessed in a variety of ways. One of the most prominent of these will be the delivery of prepared content in either analogue or digital form, e.g. analogue video signals (NTSC or PAL) directly from cable, a VCR or a laser video disk and displayed in a window. Hence, the user could watch the news or a film while working an a spreadsheet, or a company with networked, video equipped computers could deliver informational videos to all of their employees.

Desktop Video AGOCG Report

# Presentations and Education

Video is a dynamic and dramatic medium for conveying information, both in the field of marketing and in education. In the introduction the report mentioned how video and interaction seem to go hand in hand. It is in these applications where that premise is at it's most powerful. People retain information at a much higher level when they become involved in the process. In a truly interactive presentation the user can feel an integral part of the process and be more engaged.

This appears to be the most promising short term application for DTV, especially if the materials are interactive and customisable by the user. For example, hypertext links can allow you to go through a lesson in the order and at the pace to suit you.

Now that multimedia technology is steadily filtering into most institutions of higher education, there are three ways in which the technology can be applied: at the front of the classroom as a more flexible update of traditional audio visual media; in student groups for collaborative learning; and for an individual student for independent learning. Applications now available include Mathematical MacTutor, medical software and music CD-ROMs.

A more adventurous educational use of the technology is the creation of the `virtual classroom' currently being researched, for example, in De Montfort University. In such an application, the students need not be in the same physical location as the lecturer but could still interact, ask questions and so forth.

Desktop Video AGOCG Report

# Manipulation of Video Images

In addition to playing pre-recorded content, a user can also capture still frames and video clips with the Indy and Mac AV systems. Once the video is digitised, it can be attached to a mail message. Alternatively, an editing package such as Adobe Premiere 3.0 can be used to alter images, rearrange frames and sequences and add titles, music and voice overs.

**6.6.1** - Video Editing

**Desktop Video AGOCG Report**

# Video Editing

For years people have had to rely on traditional production houses to create high quality video, dismissing desk top equipment as incapable of producing the same effect. Today, however, users of desktop equipment can produce the kinds of effects which would have been impossible only a few years ago. Several factors have contributed to this, including improved links to high end video formats, enabling a professional standard end result. Programs for image editing and morphing, for example, have now made impressive effects commonplace.

Computers have been used in the video editing process for many years. Their rôle has primarily been to store Edit Decision Lists (EDLs) and to facilitate subsequent changes to the list, recalculating start and stop times of individual clips of video automatically. The source material itself is still held on video tape and the output, whether it be rough-cut or final programme, has also to be recorded on tape. The addition or extension of a video clip to the middle of an existing compilation would require all material that follows the new clip to be re-recorded as well. To avoid this costly re-editing process it has previously been necessary therefore to plan carefully the hundreds of independent shots that go in to an average programme and assemble them in sequence. This is called linear editing.

Desktop video editing can free the programme maker from this constraint. Non-linear editing is achieved by digitising all of the source video material to high capacity high speed disk drives then compiling the various segments of the programme from this new digital source. Clips can then be assembled in any order, re-ordered, shortened lengthened or deleted. Professional transitions, special effects and titles can be added easily in the digital domain. The completed programme can then be written back out to video tape for duplication and distribution in the conventional way.

The Mac has stolen the march on PC's in this field. The plethora of video composing programs for the Mac e.g. Adobe Premiere, Videofusion and CoSA's After Effects, has put impressive effects within the reach of any Mac User.

The desktop video revolution has been for many somewhat of a disappointment. The problem is that no one vendor has yet produced an architecture that allows a range of software and hardware products from different suppliers to work together seamlessly to create a fully functional professional video production system.

The launch of Apple's QuickTime in 1991 was hailed by many as finally providing just such a unifying architecture for video on the Mac. However, in practice, QuickTime has only addressed a part of the problem. While it has made it possible for software and hardware products such as video capture cards to work together, it fails to provide ways to integrate video devices, such as camcorders and videodecks, into a fully functional video production system. As a result very few of the products on the market today have the same plug-in-and-play ease of configuration that has been a common feature of the Mac environment. This has not stopped manufacturers from bringing products into the market. Many of these use QuickTime and third party device control systems, such as VideoMedia's widely supported V/LAN system, to provide desktop video systems based on the Mac.

There is a definite demarcation of high and low end video production. The low cost end of the market is where users want to record PC produced animations and presentations to video, so that there is no need for broadcast quality images, where S-VHS will do. Sony Umatic is the standard in low to medium budget productions and gives excellent results. Many people now believe that Hi-8 will replace Umatic in the medium term, as many news crews are moving to this format. At the top end is the broadcast videographics, where there is a wealth of software for graphics creation, colour imaging and animation. Here the Mac is competing head-to-head with suppliers such as Aston, Quantel and Silicon Graphics.

A video digitiser card like SuperMac's VideoSpigot or the Radius VideoVision is the basic component for QuickTime movie making. These cards vary hugely in price and offer different levels of image manipulation. To add sounds, one needs either a card with built in sound capabilities (e.g., RasterOps MediaTime) or a separate audio card (e.g., Audio Media NuBus)

There are a number of advantages of the Mac platform over the Silicon Graphics machines, not least of which is the flexibility of the systems afforded by the relatively high availability of software and add ons. To equip the SG machines with comparable software can sometimes be as much as a factor of ten times the cost.

Several hardware and software products have been released which effectively move desktop video production in the same direction as that taken by desktop publishing (DTP), that is, moving it from a professionals-only operation into the hands of a much wider audience. Hopefully some of the lessons learned during the proliferation of DTP will transfer to the video editing sphere.

A useful review of several video editing products can be found in the MacUser issue of 1 October 1993, pages 55 63.

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Desktop Video AGOCG Report

# Integration of TV into the desktop

The Electric Media multimedia PC, is one of a new wave of PCs which can integrate TV onto the desktop. It is a 486sx25 with a fairly standard configuration with an important addition a WIN/TV card and aerial. This allows it to receive transmissions and present them live inside a window in Windows. The card is actually a TV receiver in miniature and a genlock at the same time (which synchronises the scan rate of the monitor with the TV image). A crucial element is the installed software which allows the TV picture to be used as the input. The moving image from the television window can then be captured and used in different multimedia applications.

Desktop Video AGOCG Report

# Further Applications

CD-ROM has brought about a revolution in information provision for computer users. Educational applications seem almost endless: databases for historical information, leisure applications (Microsoft's Musical Instruments), on line encyclopædias to name just three. Almost weekly, a new use is dreamt up for the storage and access capability of the CD-ROM. There is, however, greater potential for DTV outside of the confines of the CD.

Information superhighways open the way for a range of new services; long distance learning, home shopping and banking, video games, interactive television and advanced telephone services. The end user of these new services is sure to be a demanding one. Having grown used to high quality television pictures from around the world and advanced video games, the demand will require:

"the full range of electronic information technologies, with mergers forming between, telephone companies, cable operators, computer manufacturers, programmers, movie makers and television producers, as well as the network suppliers."

Van Cullens Siemens Stromberg-Carlson

**Desktop Video AGOCG Report**

# QUESTIONNAIRE

A questionnaire has been designed and administered to users of a range of current products. Perhaps not surprisingly, the most effective response was from questionnaires sent from DTV related mailing lists. In all over 35 responses were received, of which 22 were usable in the context of the project. There was a very disappointing response from multiple postings to Internet news groups and to mailshots.

Desktop Video AGOCG Report

# Questionnaire Design

The questionnaire addressed both technical and usability issues. It attempted to capture the range of functionality of each package and the users' perceptions of the ease or difficulty with which that functionality can be employed.

Issues covered included the best/worst aspects of the system from a usability standpoint; aspects which cause the user confusion or irritation; the common sources of error; quality of documentation and on-line help; ease of set up; adherence to relevant standards (e.g., MPEG and JPEG); system response times; the degree of flexibility afforded to the user; and cross platform compatibility.

Desktop Video AGOCG Report

# Initial questionnaire results

The results of the questionnaire are presented in summary form below, representing a total of 21 usable responses. The questionnaire blank is presented as Appendix 1.

1.How often do you use desktop video as a medium?

2.What uses do you have for desktop video?

The `other' responses included `software testing' and `image capture of various kinds'.

3a.What platform(s) do you use? (If more than one, could you please complete the questionnaire for each.)

3b.If your platform has in built video capabilities, have you experienced any problems related to this? If so, what are they?

No equipment with in built video capabilities had any problems with this feature. The machines offering this as part of their intrinsic functionality were the Macintosh and the Silicon Graphics machines. The PC compatible machines do not have in built video capabilities.

3c.Would you recommend your computer to other users, and why?

No users would actively not recommend their platform and configuration to other users, but the degree of support varied. Macs are considered to be good entry level machines because they are easy to use, reliable and flexible. The speed of the processor and amount of memory appear to be the most important issues in selecting a platform rather than the manufacturer.

4a.What other DTV related hardware do you use? (Tick as many as appropriate)

A variety of ancillary equipment is used with this hardware, particularly audio capture and replay boards and video digitisation and display boards. Soundblaster and Videoblaster appear to be the most commonly used of these.

4b.Have you experienced any limitations with this hardware? If so, what are they? (e.g., flicker, lines etc.)

Problems are varied across different configurations of equipment and sometimes without any obvious reason. Smeared frame grabs, speed and frame size, flicker were all cited as problems, some of which are intrinsic to the QuickTime format. Problems like reliability are a little harder to diagnose with any confidence. Support for colour is also a limitation for some add-ons.

4c.Would you recommend your hardware to other users, and why?

Macintosh users seem very happy with their hardware in terms of cost and ease of use. Only one user would definitely not recommend his hardware, a Sun user who felt that the set up was too expensive. Users are often reluctant to speak disparagingly about the equipment that they have invested in, hence the low number of negative comments. Also it appears that most users have not used their equipment to an advanced level and so limitations may not have manifested themselves at this stage. VideoBlaster and SoundBlaster work competently, and cost has come through as a major consideration value for money is the key.

5a.What software do you use for DTV control?

5b.Have you experienced any limitations with this software? If so, what are they? (e.g. window size, frame rate, colour)

Many users had experienced all of the example problems of window size, frame rate and colour. It seems that most expected this and are simply tolerating the problems at this relatively early stage in the development of DTV.

5c.Would you recommend this software to other users, and why?

Nearly all users were happy to recommend their software as it usually came free with the machine they were using, and so again cost becomes a principal factor. Video for Windows and QuickTime users were happy that these would become the standard software for DTV control.

6a.What software do you use for videotelephony, if any?

Only six respondents use videotelephony software, of which one uses ESF2F, one uses CUSeeMe (Shareware), one used DEC in house software, and the remainder used bespoke software written to fit their requirements.

6bHave you experienced any limitations with this software? If so, what are they? (e.g. window size, frame rate, colour)

Problems with this software were of a technical nature, including interoperating with ISDN and working with different CODECs.

6c.Would you recommend this software to other users, and why?

No one piece of videotelephony software stands out as particularly recommended. The DEC software is rated highly by the DEC employee, but its availability is a limitation.

7a.What authoring software do you use, if any? (indicate as many as appropriate)

7bHave you experienced any limitations with this software? If so, what are they? (e.g. window size, frame rate, colour)

No problems were recorded for any of the specific authoring tools.

7c.Would you recommend this software to other users, and why?

Every respondent was happy to recommend the software which they were using on the grounds of price, power and ease of use. Authorware Pro is particularly recommended for non programmers but it is expensive.

8a.What software do you use for other DTV uses? (e.g. watching TV, training, presentations, surveillance, etc.)

The only other software used was an internal research tool at DEC, Video Monitor and Timbuktu.

8bHave you experienced any limitations with this software? If so, what are they? (e.g. window size, frame rate, colour)

The DEC software is not available outside of the company, the frame grabbing is poor with VideoMonitor, and Timbuktu has a slow screen refresh rate.

8c.Would you recommend this software to other users, and why?

Video monitor was considered excellent for watching video images on a Macintosh desktop. Timbuktu was very useful for remote training as it is possible to control another person's machine from one's own while issuing information via telephone.

9a.Is the video image generated locally or remotely?

Of all the respondents, 11 generated their images locally, one remotely, and five had the capability for both. Four did not answer this question.

9b.If remotely, then what telecoms link is your computer on?

Every single respondent used Ethernet, in conjunction with another telecoms link. These included, existing telecoms network, ISDN, ATM and FDDI.

9cOver what area? Dedicated lines, Local Area Network, Metropolitan AN, Wide AN

Of the 10 respondents to this question, three had world wide connections, three had wide area network connections, two had local area networking.

10.What is the source of the video image?

11.Which type of connection is used to input the video?

12.How easy was it to get the equipment configured to your requirements, both in terms of hardware and software? (Who did it?, manufacturer, distributor, on site technician, etc?)

Most respondents installed and configured the equipment themselves; question 15 reveals that many of those who returned the questionnaire were in fact the local gurus of their site. Reactions varied markedly to the question of how easy or difficult it was to do. Two users of Sun Sparcstations had quite differing views, one replied "Easy to install and configure, I did it myself," while the other felt that it was "Tricky." Support from manufacturers and distributors appeared to be scarce.

13.How do you feel about your overall set up, in terms of achieving your tasks?

Most respondents were happy with their configuration and set up as it stood at the moment, but everybody was aware that further advances would soon be made. The anticipation of more complete standards is evident, and one respondent described his system as `Pre Model T Ford'. In terms of achieving current goals, all systems were up to the tasks even if, in some cases, video quality could be improved.

14.Do you have any intentions of buying other related hardware/ software? (Please specify)

Most respondents were looking to develop their systems further by the addition of software and hardware. Some respondents are looking to upgrade their video quality, moving to digital Betacam, while others want to improve the flexibility of their authoring tools, moving to, for example, Avid MediaSuite Pro or Adobe Premiere.

15.What is the source of help for using the equipment?

16.How do you rate the user support/ help for the equipment that you have used?

One of the key points to emerge from this questionnaire is the lack of user support for DTV set ups. There was a strong feeling of disappointment with the degree of user support offered only two users didn't express dissatisfaction with it. Other comments included `On the whole rather poor', and `Adequate but would have to pay for complete Authorware help'.

17.Please add any further comments which you feel may be of interest but have not been covered in the questionnaire.

A number of points were raised by this last question, giving a general impression that people are awaiting rigid standards before DTV will really take off. The extended comments are included in Appendix 2

**Desktop Video AGOCG Report**

# Appendix 1 Questionnaire on the use of Desktop Video

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Introduction

I am researching the use of video on the desktop (DTV) for AGOCG (the Advisory Group on Computer Graphics). I would like to know about the equipment that you are using and your opinions of that equipment. The questionnaire will cover aspects of a technical and usability nature. It is intended to capture not only the range of functionality of each package, but also the users' perceptions of the ease/difficulty with which that functionality can be employed.

This questionnaire is an attempt to collate data on the current use of video on the desktop. Please note that it does not include animated sequences, digitised images, or simple graphics originated on the computer. It does not cover CAD, VR, slides or simple Macromind Director type presentations (unless a QuickTime sequence is included).

I am not using the term multimedia as this project is confined to the use of video images and is looking at the equipment used, methods used, reasons for using desktop video and assessment of different configurations for different purposes.

The questionnaire should only take about 10 to 15 minutes to complete, so I hope you can find the time to help with this research.

Please add further comments at the end if you do not feel that the questionnaire has covered other issues which you consider to be relevant.

Link to questionairre form here.

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**Desktop Video AGOCG Report**

# Appendix 2 : Free form responses to Question 17

1. We're doing multimedia conferencing over packet-switched networks and ISDN. Don't believe in "stand-alone" videoconferencing systems which aren't integrated in the workstation you are using for your work.

2. There is a perceived resistance to introducing video hardware ideas. e.g. HP are still ".. waiting for the technology to stabilise..". There is also the problem of dealing with the temporal dimension that this new data source provides. That coupled with the problems of data volume and therefore cost I suspect are the main problems with the wider introduction of the technology. When a major player introduces a really cheap (newly packaged) idea- say for video-telephony or some such, then I suspect the idea may take off. At present it seems to be mainly the home video market and spin off from it.

4. From my personal experience DTV is still relatively new and as such is in its infancy. Many of the things I would like to use DTV for require considerable investment in hardware at this moment in time. I suspect that in 10 years time your average Desktop Computer will be able to offer DTV facilities that can only currently be realised using hardware costing many 10's of 1000's. The uses to which I could put DTV currently outstrip my resources and as such leave me in a situation where I would like to do more but am frustratingly unable to progress much further.

5. Sorry if this distorts your survey - feel free to delete it since the Atlas Video Facility (as documented above) is rather more than a DTV system, taking up a whole large room!

9. Whatever emerges as the DTV `standard' ,(if ever), I would be very cross if it doesn't make maximum use of current and emerging standards i.e., MPEG, JPEG, Mime, etc.

14. MPEG is definitely going to eclipse everything else. It (MPEG 1) will come at us from the home video games market (80% of all computer sales!) and via cable and satellite (MPEG 2), and in videotelephony (MPEG 4). The only problem is that MPEG compression is currently expensive. That will probably change within 12 months. We anticipate buying MPEG playback cards, such as ReelMagic (although it has its limitations), as well as Motion JPEG.

For recent reviews on authoring packages see the following: a) Windows Sources, June 1993. (IconAuthor is Editor's Choice.) b) Personal Computer Magazine, December 1993

For a recent review of video solutions for PCs and Macs look at the article in Personal Computer Magazine, February 1994. They have another relevant article due to appear in March 1994. (VideoLogic's MediaSpace is rated the best PC solution currently available.)

A paper on our Multimedia Information System is to be published in the first issue of the new UCISA journal `ACCIS' in April (?) 1994. I shall probably be giving a similar paper at the MediaActive Conference in May 1994 at Liverpool Moores University.

I'm a little frustrated by your questionnaire as it doesn't have any questions relating to whether or not we investigated a range of products before purchase, how long we have been using digital video, nor does it have any questions on compatibility with graphics cards and monitors.

We have spent some time researching the platforms, digital video hardware/software and authoring software. The products we use were selected after considerable investigations. We also looked at graphics cards and monitors, which are an integral part of the whole system - and after all that's what the user will see! So, please do not infer from the fact that we use few products that we either aren't aware of the others or haven't tested them. This may well be true for others who reply, but it may not!

I've also looked into purchasing some Indys from Silicon Graphics, for desktop videoconferencing, but I'm afraid the video quality was nothing like we can get on our PCs using VideoLogic's MediaSpace cards. Since then I have been following closely PC videoconferencing developments. I suppose I should add here that we feel that the Mac is no longer the most appropriate platform for multimedia. There are many reasons for this including cost, but the main reason is Windows.

I am also looking into some networked digital video solutions. I hope to establish a pilot site here for the Starlight system from the USA, in collaboration with a local computer supplier.

In conclusion, I would have included either a lot more questions or would have very few. I have issued a number of specific requests for information similar to yours before and found that the shorter the questionnaire the more replies you get. I appreciate that in this case you need a lot of answers - so I would have asked a lot more questions!

Best of luck with the survey! I look forward to reading the results.

17. I hope this information is of use - as mentioned before my department is concerned with support for CBT. Please contact me if you feel I can be of further assistance,

20. It'd be nice to have our products (DEC) included in the standard list of options if you do another ballot in the future, rather than being a `write-in' I'd be interested in a compilation of your survey when it is complete.

Other Comments Can't fill any more in ... the problem here is that before we can make any case for spending any money we have to show demand. You can't show demand if you don't have the kit because folk don't know what they might want to do, and how much ... therefore no kit ...

Also, as one of the smaller Universities, capital expenditure on such equipment, divided by the number who would use it means that it is not cost effective to do it. This is also the case for expensive software, we simply cannot afford it unless everyone in the University needs it (by expensive, I mean more than 3k or 4k per annum recurrent, such as the AVS deal)

We have NO AV services at all except technicians who will set up 35mm, OHP and VHS stuff for display, so there is NO video capability at all, no studio, no editing facilities etc.

We have enquiries about making video, but cannot support it, therefore it just does not get done.

The only video equipment in departments is an S-VHS recorder hooked up to an SG Indigo with video out in the Molecular Modelling Group (which is effectively autonomous and others don't have access)

1 In practice this is not really the case. QuickTime movies have a 30 fps structure and so players will attempt to play back movies at 30 fps. Whether or not a particular machine can play all 30 frames each second depends on the speed of the machine and also on how often individual frames are repeated. What people commonly call a 10 fps QuickTime movie is actually 30 fps with each frame played 3 times. 2 XA stands for eXtended Architecture, a format which allows publishers to produce disks running on computer platforms and on consumer players. 3 The Mode 2 standard offers a number of advantages over the original CD-ROM Mode 1, particularly for playing time-based applications like QuickTime movies. Mode 2 support also allows the reading of multi-session disks which have been written at different times such as Photo CD disks and also supports interleaving which is important in running movies from CD since it means the video signals can be interleaved with the audio soundtrack on disk to give better playback. 4 MultiSpin is what NEC calls its dual speed capability. 5 Transfer rates for audio remain at 150 Kbps even on dual speed drives because increasing the audio-speed standard would simply result in high-pitched voices. 6 RACE is an acronym for the CEC Research Programme `Research and technology development in Advanced Communications technologies in Europe'. For further details of the programme, contact RACE Central Office, European Commission, DG XIII B Advanced Communications Technologies and Services, BU 9, Rue de la Loi 200, B-1049 Brussels, Belgium. 7 Novell have recently announced NetWare, server/client software which claims to optimise the transfer of video and audio information across a local area network. A review of the software can be found in PC User issue 922 March 1994, pages 6162.