V

V.1   A standard covering power levels for telephone networks.

V.21   A standard modem speed capable of transmitting and receiving data at 300 bps.

V.22   A standard modem speed capable of transmitting and receiving data at 1200 bps.

V.22bis   A standard modem speed capable of transmitting and receiving data at 2400 bps.

V.32   A standard modem speed capable of transmitting and receiving data at 9600 bps.

V.32bis   A standard modem speed capable of transmitting and receiving data at 14 400 bps.

V.32terbo   An upgrade to the V.32bis standard introduced by AT&T.

V.34   A CCITT standard modem speed capable of transmitting and receiving data at 28 800 bps.

V.42   An international error correction standard for modem-based communications. MNP2-4 (Microcom Networking Protocol) and LAPM (Link Access Procedure M) provide error correction.

V42bis   A standard for compressing asynchronous data. It uses LZW compression.

V.90   An official designation for the 56.6 Kbps modem standard. 56.6 Kbps = 56 600 bps.

(See Modem.)

Vapourware   An intangible software product featured in a misleading software announcement. For instance, company X might announce an upgrade to a software product that features exceptional features, when in actual fact there is unlikely to be such a product.

Variable   An entity which is not constant, and which may change in terms of its value and type. An integer variable stored using a byte (eight bits) may vary from 0 to 256. Its type could change from being numeric to being a character string or string variable.
(See C++ and Java.)

VBScript   A scripting language that is a subset of Visual Basic and which may be used to deliver functionality gains to applications. VBScript may be used to enhance Web pages through the addition of:

- event-driven objects
- ActiveX controls
- interactive content
- Java applets.

VBScript does not harness:

    OOP methodologies (1998)
    DLL calls (1998)

The VBScript syntax is similar to that of Visual Basic, and includes statements for loops, events, procedures, functions etc.

VBScript `For . . . Next` **loop**   A means of repeating statements based on a true or false condition

```
For pointer = first To last [Step step]
' statements
' statements
Next
```

VBScript `While...Wend` **loop**
```
While condition
'statements
'statements
Wend
```

VBScript procedures   VBScript has `Sub` and `Function` procedures; the latter should be used to return values (in accordance with definition of a function).

VBScript   The `Sub` procedure has the following form:
```
Sub Subroutine_Name([parameter])
   'statements
End Sub
```

VBScript function   A `Function` procedure is of the form:

```
Function FunctionName([parameter])
   'statements;
End Function
```

(See Visual Basic.)

VBXtras   An object factory which specialises in Visual Basic controls and add-ons.

(See Object factory and www.vbxtras.com.)

Vertical market   A specialist or niche market. Until the late 1980s multimedia was considered a vertical market.

Very Large-Scale Integration   (*See VLSI*)

VESA Media Channel connector   A connection standard backed by VESA (the Video and Electronics Standards Association). The VESA Media (VM) Channel connector is an alternative to the VGA feature connector. It is bus- and processor-independent, so even the simplest system can accommodate 16 bit and 32 bit devices. A cost-effective gateway to upgradability, a VM Channel-based graphics card can be connected to MPEG decoders, Video CD cards, video capture cards, videoconferencing adapters and any other motion video decoders/decompressors as and when they emerge. Compatible with VRAM and DRAM display memory, it can be implemented using VL bus, PCI, MCA, EISA and ISA systems. It works using a packet-scheduling system that allows up to 15 real-time video and audio streams to share the same VM channel simultaneously.

(See Local bus.)

VGA (Video Graphics Array)   An IBM PC graphics controller standard released in mid-1987 by IBM as part of its PS/2 range. Like all add-ins for PCs, graphic controllers (adapter cards) plug directly into expansion slots.

(See Graphics card.)

VHS (Video Home System)   A standard ½″ video cassette developed by Matsushita and JVC. It was successful in forcing the BetaMax standard out of VCR market.

ViaVoice   An IBM speech recognition program for desktop computers. Speech recognition has been high on IBM's agenda for over 25 years, and is part of an on-going multi-million dollar research and development program that yielded the VoiceType family of products. This high level of interest

indicates that speech recognition is an application with great potential. IBM's research program has also led indirectly to some impressive offshoots, including the DragonDictate program from speech recognition specialists Dragon Systems, which was founded by husband and wife James and Janet Baker, whose combined experience includes research at IBM. DragonDictate competes directly with the VoiceType packages and with IBM's latest offering and the subject of this entry, ViaVoice. The mentioned speech recognition programs differ from voice-dependent programs like the Microsoft Windows Sound System, which requires the user to train it to recognise each and every word. The process of training ViaVoice does not involve recording an acoustic model for every word or phrase; rather it is a process of teaching it to understand your voice characteristics. The training also teaches users to speak in a manner likely to be understood by ViaVoice, which means speaking clearly and leaving a noticeable pause between words. If we were dealing with the interpretation of musical notation, we would mean staccato and not legato; staccato means that each note ends suddenly and is detached from the next, while legato joins notes together using smooth phrases. The first port of call following installation of ViaVoice is the Dictation Trainer, whose Basic section must be completed in order to prime the program for use with Microsoft Word 95 or 97, ViaVoice's SpeakPad and other word processors via the clipboard. An additional Dictation section requires you to dictate a number of sentences and also has a useful demo, which includes information about correcting errors. Single-word errors are corrected by double-clicking them and then typing an alternative word, or by selecting one from a list. ViaVoice learns from such usage habits, because entered words that are not in the 30 000 word dictionary are added to your personalised vocabulary, which cancontain up to 34 000 words. Selected phrases are corrected in much thesame way, except that it is necessary to click on the Correct Error button. Itis advisable to then run the Enrolment program, which improves the recognition accuracy, which IBM broadly claims to be around 95%. Enrolment requires you to dictate one hundred sentences, and if you have a strong regional accent, or if your system hardware is less than that recommended, it is advisable to dictate all 473 sentences. Rather than being expanded through corrections, the personalised vocabulary can also be expanded using the Vocabulary Expander. To use this you first load a document, enter text using the keyboard or paste text into it using the clipboard. ViaVoice then analyses the text and lists unknown words, which can be selected and added to the personalised vocabulary. Apart from customising ViaVoice through the extension of the personalised vocabulary, it is also possible to add macros in order to automate the dictation of perhaps frequently used phrases and even complete paragraphs. The programming of macros takes place in the Dictation Macro Editor, which

requires you to add the text as it should look when dictated and add an appropriate description. ViaVoice then searches its vocabulary to see if the entered dictated text is already available. If it is not, then you are required to train the entry by recording an appropriate voice command. ViaVoice can be set up for a number of different users, who will each have their personalised copy according to the enrolment, user vocabulary and any macros they may have added. User names can be added during installation or immediately before the enrolment process, and are shown in various places including on the status bar of the SpeakPad. At a basic level of operation, users need to familiarise themselves with a number of voice commands, such as Stop Dictation to leave dictation mode, and Begin Spell and Begin Numbers to enter Spell and Numbers modes, respectively. While using Spell mode it is necessary to use the phonetic alphabet in order to enter words on a letter by letter basis.

VidCap   A video capture program supplied with Video for Windows.
(See Video.)*

VideoBlaster   A low-cost video capture card series of products manu-factured by Creative Labs.

Video capture   The process of acquiring video in appropriate digital form, which might be compressed or uncompressed. The video source recording might be analogue or digital. The latter requires the video capture card to incorporate an appropriate input. The three general types of video capture include the following.

- The real-time video capture technique involves digitising the incoming video source signal immediately, and the video source device is not stopped or paused at any moment during capture.
- Automatic step-frame capture requires that the source device is stopped, paused and even rewound to digitise a greater amount of the source recording. It offers certain advantages; namely it is possible to achieve a greater number of colours (or greater image depth), higher capture frame rates, and larger capture frame resolutions than would normally be poss-ible using the same video capture hardware and software configuration to record video in real time.
- Manual step-frame capture usually depends upon the operator clicking a button on screen in order to capture selected video frames.

Before video capture can begin it is necessary to prime the capture program by choosing a number of different options that include colour depth, video capture frame rate, frame dimensions, audio sample frequency and audio sample size. If you are capturing video using an eight bit colour depth (or

256 colours), and you wish to use a colour palette (which is a predefined set of colours), you also have to paste an appropriate palette into the video capture program or open an appropriate palette file. This, however, is a comparatively rare requirement. A capture file has to be set up to optimise the rate at which digitised video can be written to hard disk, so improving video capture performance. If necessary, the target hard disk should be defragmented so that video data is written to a contiguous series of blocks, optimising the target hard disk performance. Available colour depths using fully specified video capture card and capture program partnerships include 8 bit, 16 bit and 24 bit. The 8 bit format gives a maximum of 256 colours stored in the form of a colour palette that can be edited using programs such as PalEdit. 16 bit and 24 bit formats are described as true colour, giving a maximum of 65K (2^{16}) and 16 777 216 (2^{24}) colours, respectively, and when using appropriately specified video capture hardware and software they can produce impressive results. Using many video capture systems the data throughput required to capture 16 bit and particularly 24 bit video in real time limits both the capture frame rate and frame size. One solution to this problem is automatic step-frame capture, where an MCI video source device is operated automatically. The frame dimensions chosen hinge largely on the specification of the capture card, though the image depth chosen and the capture frame rate are also influential. Though the video frame dimensions can be scaled using video editing programs and even multimedia authoring tools, enlargement can result in a blocking effect as the individual pixels are enlarged. However, certain graphics cards, particularly those that enlarge Video for Windows video sequences, will apply a smoothing algorithm during playback in an attempt to minimise the blocking effect. Video editing techniques can also be used to increase the playback frame rate (through frame duplication). Other digital video editing techniques and hardware/software features of the playback system can help improve the quality of video playback. However, capturing and compressing optimum quality digital video relevant to the intended play-back platform remains the most important process. There are limitations in what can be achieved through digital video editing and through playback hardware that enhances digital video playback. The original video sequence may be enhanced, even enlarged, through duplication, but it cannot be used to play video information present in the source recording that it simply does not contain. Even though numerous algorithms can enhance digital video, and numerous others will emerge, it is reasonable to assume that if the video file does not contain a particular frame then that frame cannot be played. The quality levels available using wave audio recorders together with mainstream sound cards can also be achieved through fully specified Windows video capture programs. 8 bit or 16 bit sample sizes are available, recorded at frequencies of 11.025 kHz, 22.05 kHz and 44.1 kHz in mono or

in stereo. The size of the sound track, which increases in relation to the recording quality chosen, can be monitored by selecting the Statistics command (or something similar on many video editing programs) using VidEdit.

Video capture card   A card that can be used to capture and sometimes compress motion video, converting it into digital form. The majority of video capture cards sold are aimed at the production of video for the Windows environment, and are often supplied with the full implementation of Video for Windows. Manufacturers of mainstream video capture cards include Creative Labs, Fast Electronics, Intel, VideoLogic and Spea. Increasingly, as MPEG is entering into mainstream computing, video capture packages are able to capture and compress video according to MPEG. Important points to consider when purchasing a video capture card include the following.

- The image depths supported. All fully specified versions should support 8 bit, 16 bit and 24 bit colour depths.
- The maximum capture frame rate and capture frame resolution supported at a given image depth.
- The video editing tool supplied with the package; examples include VidEdit, Adobe Premiere and Asymetrix Digital Video Producer.
- The video capture program supplied; this will normally be Microsoft VidCap, though other variants are available.
- Video sources supported; it can be assumed that all modern implementations will support both PAL and NTSC.
- The video formats and compression schemes supported; these include Intel Indeo, M-JPEG and MPEG.
- The sound feature capabilities; with the exception of Video Spigot all video capture cards feature a built-in sound facility that is able to record sound tracks of audio qualities that are equivalent to those available using an MPC-2 compliant sound card.
- The presence of a VL channel connector indicates that the card can be connected to graphics cards that also feature a VL channel connector. Occasionally such cards can be slightly less expensive, as well as being expandable to incorporate additional functionality such as an M-JPEG video capture facility.

Video capture file   A capture file is set up prior to video capture to optimise the rate at which digitised video can be written to hard disk. This improves the quality level of captured video. If necessary, the target hard disk should be defragmented so that video data is written to a contiguous series of blocks, thus optimising the target hard disk performance. The specified size of the capture file should be large enough to accommodate the video sequence that is to be captured and stored. Though the capture

program will usually enlarge it automatically, the possibility of complete frames being omitted or dropped during video capture is increased, as is the possibility that the capture file will become fragmented.

(See Video capture.)

Video CD (or White Book) A standard for storing MPEG-1 video on single density CD variants. It can be assumed to store approximately 74 minutes of MPEG-1 video. Discs are interchangeable between appropriately specified PCs and appliances. It can be assumed that a Video CD or a White Book disc can be used to store around 74 minutes of MPEG-1 video, the quality of which can be equated to an analogue VHS video recording. A key advantage of Video CD over analogue VHS video cassette is that there is no incompatibility between PAL and NTSC recordings, thus eradicating the need for separate NTSC and PAL versions, as is currently the case with VHS cassette video distribution.
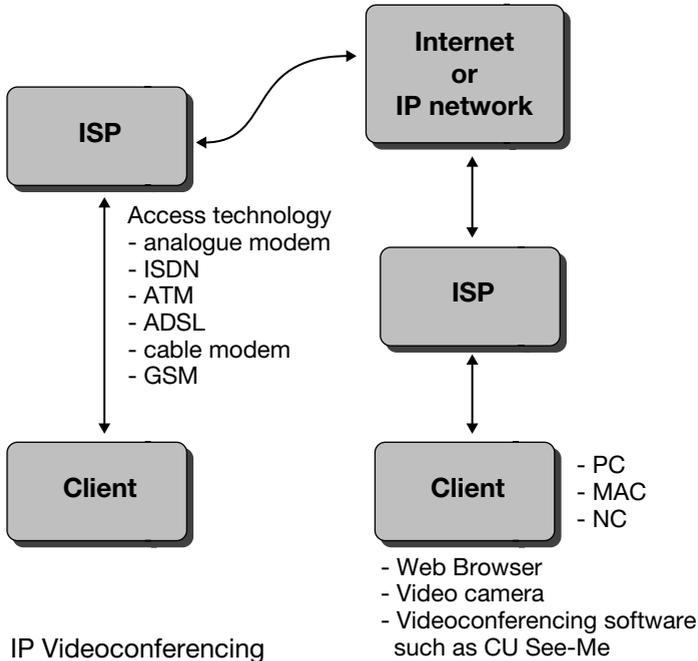
(See MPEG.)*

Videoconferencing A process by which users in remote locations communicate in real time both visually and verbally. Systems may be divided into the categories of:

- desktop videoconferencing using conventional desktop or notebook computers
- conference room videoconferencing, which typically include appropriately large displays.

Desktop videoconferencing systems include a camera, microphone, video compression/decompression hardware/software and an interface device that connects the system to an access technology. The interface device might be:

- a conventional modem used to connect with an ISP or intranet server, thereafter using an Internet-based videoconferencing solution such as CU-See Me
- a cable modem that might provide high-speed Internet access via cable
- an ISDN interface, which provides a connection to the Internet or appropriate IP network
- a Network Interface Card (NIC) which connects to a LAN
- a wireless interface which provides connection over GSM or another mobile communications network.

Access technologies for videoconferencing include PSTN, ISDN, ADSL, cable, GSM, ATM, T1 frame relay and proprietary wireless technologies. Point-to-point videoconferencing involves communication between two sites, while multi-point videoconferencing involves interaction between more than two sites. The latter might require a chairperson to conduct

Internet
or
IP network

ISP

Access technology
- analogue modem
- ISDN
- ATM
- ADSL
- cable modem
- GSM

ISP

Client

Client

- PC
- MAC
- NC

- Web Browser
- Video camera
- Videoconferencing software
  such as CU See-Me

IP Videoconferencing

proceedings. Also, the collective system might be voice activated, switching sites into a broadcasting state when the respective participant begins speaking. Vendors of videoconferencing solutions include Intel, PictureTel, Insoft and Creative Technology. Internationally agreed standards relating to videoconferencing include H.320 and T.120. The former was introduced in 1990 and provides guidelines to vendors and implementers that yield appropriate levels of compatibility.

(See ATM, Cable, Cable modem, ISDN, ISP, T1 and Video*.)

Videodisc   A disc used to store video images. Popular videodiscs include DVD, LaserVision and Video CD.

Video editing   The process of editing a video file. Digital video files can be edited using programs such as VidEdit, Adobe Premiere, and Asymetrix Digital Video Producer. Typical video editing operations include:

- Copying frames from one point to another in a sequence.
- Moving/cutting frames from one point to another in a sequence.
- Copying frames from one sequence to another.
- Moving frames from one sequence to another.
- Deleting unwanted frames from a video sequence.

- Titling video sequences.
- Cropping video frames.
- Altering the playback speed in terms of frames per second.
- Fading colours.
- Tinting colours.
- Changing colours.

The frame rate of a video sequence may be increased or decreased using many video editors without loss of synchronisation between the video and audio track. An increase in the frame rate results in the duplication of existing captured frames. For instance, increasing a frame rate from, say, 9 to 12 frames per second results in the duplication of the third, sixth, and ninth frames, while lowering the frame rate from 12 to 9 frames per second results in the removal of the fourth, eighth and twelfth frames. The capture frame dimensions also may be altered by cropping or resizing, though when enlarging or stretching a frame the resultant resolution can become poor, as the pixels are each expanded. ToolBook and other multimedia authoring tools can themselves be used to resize video sequences, so there is no need to do so at the video editing stage. A video editing program will also permit you to paste various different media files into a sequence, and depending upon its sophistication you may have a choice of fades as one video clip is merged into another. When cutting/copying and pasting between video sequences, video editors that are able to open multiple video sequences or tracks can prove more convenient than using multiple instances of a program such as VidEdit. Using all modern video editing programs you can edit the audio and video tracks independently, perhaps in order to paste a wave audio file over an existing substandard or unrequired sound track. Audio and video data tracks making up a video sequence may drift out of synchronisation, particularly when editing them individually. The synchronisation of video and audio can even go adrift at the video capture stage. For video footage where the sound track is a continuous musical sequence which does not tie in exactly with video images a lack of synchronisation may make little difference. This is not the case, however, where spoken dialogue is lip-synched or where cuts to different scenes result in different passages of music or sound tracks. In order to synchronise data tracks, the editing program will normally permit the adjustment of the video frame rate, or offset the audio track using an appropriate positive or negative value. Both audio and video formats can be altered following capture using a fully specified modern video editing program. The audio data track can be altered in terms of the number of channels, sample size, and sampling frequency. The video format depth can also be changed, perhaps to reduce a 16 bit and 24 bit sequence to an 8 bit video sequence. More complex editors also make titling possible, where text can be super-

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imposed over video sequences, perhaps to add captions or credits. Control is given over the font, type style and size and colour, as well as the position of the title or text which exists for a predetermined range of frames. Some editors, such as Digital Video Producer and Adobe Premiere permit 'film strip editing', where frames of a sequence are shown on screen in horizontal or vertical strips. Often users find that these provide a better overview of sequences and help in the editing process. Video editing programs may also accommodate multiple open video sequences, so that video data can be copied/moved from one to another more easily. Without this ability it is often necessary to run multiple copies of the editing program. See: Botto, F., *Video for Multimedia PCs*, Computer Step, 1995.

(See MPEG*.)

Video for Windows   A video standard. Video for Windows (VfW) permits video playback, capture and editing. Microsoft Video for Windows which includes the VidCap video capture program, VidEdit video editing program, BitEdit 8 bit graphics editor and PalEdit 8 bit colour palette editor. VidEdit provides a gateway to several video compression schemes, the variety of which depends upon the video card you have. Compression algorithms such as Intel Indeo, Microsoft RLE (Run Length Encoding) and Microsoft Video 1 can help reduce video file sizes by varying amounts. The size and quality of the video files can be controlled using compressors through the adjustment of compression settings. The resultant video can be added to applications through OLE (Object Linking and Embedding). It supports the AVI (Audio Video Interleave) format and features a number of compressors, including Microsoft 1, Microsoft RLE and Intel Indeo. See: Botto, F., *Video for Multimedia PCs*, Computer Step, 1995.

(See JPEG and MPEG.)

Video overlay   A process by which video is combined with computer graphics or text. The hardware feature that provides the facility is called a genlock, and it can be found on many video capture cards.

Videotex   A service used to publish text and graphics over the PSTN. It emerged from the BT Research Laboratories in 1970s, and was launched in the form of Prestel in 1979. Videotex uses alpha-mosaic text and graphics. The display is based on character blocks, which require 7 or 8 bits, and is produced from a look-up table or from a character generator. A videotex frame consists of a matrix of such characters, consisting of 24 rows of 40 characters. Typically the frame requires 960 bytes, and may be transmitted in around 6.5 seconds over PSTN. Using faster ISDN access technology, the transmission time is reduced.

ISDN D channel
Transmission time $=(960 \times 8)/16\,000$
              $=480\text{ mS}$

ISDN B channel
Transmission time $=(960 \times 8)/64\,000$
              $=120\text{ mS}$

(See DCT and MPEG*.)

Virtual private networking   *(See VPN.)*

Virtual processor   A processor which is implemented in software. It may sometimes be referred to as a virtual machine. It is a design approach used by such programming languages as Java, so that they may be system- and OS-independent. They may, therefore, be applied as applets in hetero-geneous environments such as the Web.

Virtual reality   *(See VR.)*

Virtual Web server   A Web server that is not physically implemented; rather it may exist with a number of other such virtual Web servers on the same site. Virtual Web Servers may be created using Microsoft IIS, and they may have a:

- domain
- TCP/IP address
- root directory.

Whether or not a Web server is virtual is transparent to the user.

(See IIS, TCP/IP and Web server.)

Virus   A program which propagates itself from computer to computer and which has a detrimental effect on the operation of software or hardware. Viruses may be assumed to be programs that often cling to applications and perform occasionally catastrophic procedures such as the erasure of files or even formatting of disks. Known viruses are said to be 'in the wild', and include Michelangelo, which alters the size of the DOS COMMAND.COM file and attempts to make a system unbootable. Such known viruses may be removed from a system or DSM using commercially available anti-virus programs. These include Dr Solomon's Anti-Virus Toolkit, and other com-parable products from companies like IBM and Symantec. Typically viruses are spread via removable media like floppy disks and e-mail attachments. Appropriate anti-virus programs may alert the user to the presence of such unwanted software components. Certain applications are more susceptible to viruses than others. The Microsoft Word program may be subjected to

the unwanted effects of so-called macro viruses. The Concept virus is one such common example, which alters Word templates.

(See Firewall and Security*.)

Visual Basic   A programming language which offers OOP and visual programming features. The most popular implementation is the Microsoft Visual Basic programming tool, which can be used to tackle a variety of different programming projects, including the development of:

- ActiveX controls
- client/server applications
- mainstream business applications
- utilities
- multimedia-related programs such as media players
- leisure programs.

Microsoft Visual Basic forms part of its Visual Studio package, and is also available in standalone form. 1998 editions of Microsoft Visual Basic are:

- The Standard Edition, which can be used to build 16 bit and 32 bit applications. The standard edition does not support ODBC databases or Visual SourceSafe.
- The Professional Edition, which adds to the Standard Edition's facilities through such features as ODBC compliance.
- The Enterprise Edition, which includes the features of the Standard and Professional Editions, and also integrates Visual SourceSafe.
- The Control Edition, which is intended for building ActiveX Controls.

(See ODBC and Visual SourceSafe.) The following paragraphs show how Microsoft Visual Basic can be used to develop a video player application which uses an OLE container along with standard Windows UI objects. Drawing the program's controls is one of the first stages of program development when using MS Visual Basic. Consider an instance where we wanted to develop the media player shown here.
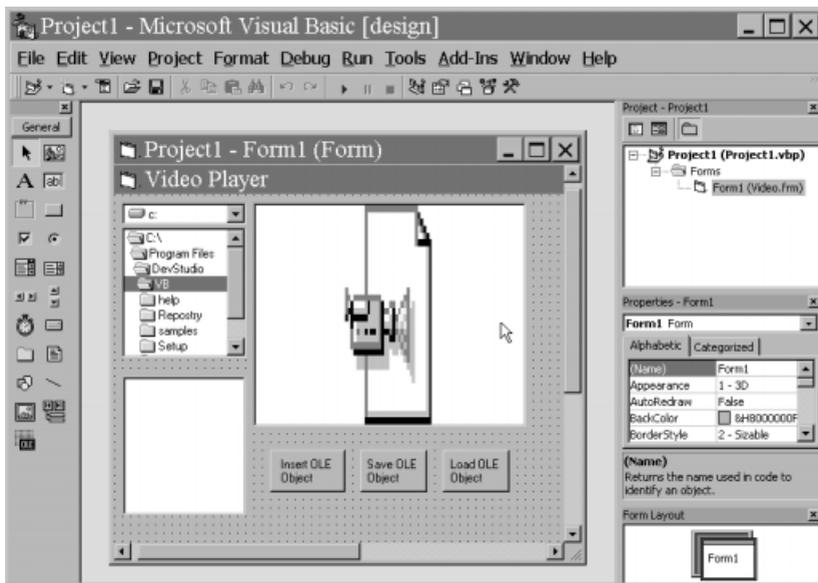
1. It is necessary to draw:

- a directory list box
- a files list box
- a drive list box
- an OLE container.

2. Go to the *media type* property box and select *Video Clip* as the media type.

3. Modify the properties of the page, by typing the name *Video Player* alongside Caption.

4. In the *File list* properties box, type *.AVI to ensure that only Windows AVI compatible video files are listed.

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5. Modify the OLE1 object properties so that AutoActivate is set to Manual, its Class is 'avifile' and its SizeMode is 1 'Stretch'.

6. The final and most important stage of the program is the addition of code to the controls. The following lines should be added to the form to be executed when the application is loaded through the `Form_Load` event.

```
Private Sub Form_Load()
  Drive1.Drive = App.Path
  Dir1.Path = App.Path
End Sub
```

The code segment merely ensures that the drive and pathname default have the same directory and drive as the VideoPlayer. So if the video player application was in `C:\WINDOWS` the program would start to look for AVI files on the C drive in the `\WINDOWS` directory. To make sure that the drive, directory and file list boxes all refer to the same locations, add the following code segments to the `Dir1` and `Drive1` controls.

```
Private Sub Dir1_Change()
  File1.Path = Dir1.Path
End Sub

Private Sub Drive1_Change()
  Dir1.Path = Drive1.Drive
End Sub
```

This ensures that a change made in the drive list box is reflected in the directory list box, and changes made therein are echoed by the file list box. Shown below is the code segment assigned to the file list box activated by a double-click event. It first declares a string variable in which to store the selected path and filename using the statement `Dim Video As String`.

```
Private Sub File1_DblClick()
  Dim Video As String
  If Right(File1.Path, 1) = "\" Then
    Video = File1.Path + File1
  Else
    Video = File1.Path + "\" + File1
  End If
  OLE1.CreateEmbed (Video)
  OLE1.DoVerb
End Sub
```

The second thing that it does is to determine whether or not the selected file is in the root directory or in a named directory. It does this by using the statement that begins with the `Right` function. This returns the right-most character of the pathname. If this is not a backslash '\', then the selected file is identified as residing in a directory, in which case the statement `Video=File1.Path+"\"+File1.filename` is implemented. This ensures that a backslash is inserted between the path and the filename. It also assigns the complete path and filename to the string variable `Video`. If the rightmost character of the pathname is found to be a backslash, the statement `Video=File1.Path + File1.filename` is executed, which assigns the filename to the string variable `Video`. The contents of the string variable `Video` are then used as a source document and embedded in the OLE1 container control using the statement `OLE1.CreateEmbed Video`. Finally the `DoVerb` method activates the embedded object in order to play the selected video file. The OLE container control does not require coding, but it is important to adjust its properties as previously described. It is important that you set its `Class` property to `avifile` and its `SizeMode` property to `1 Stretch`. The application can be run by pressing F5 by using the menus or the appropriate toolbar icon. After testing and debugging, the program can be saved as an executable file by clicking Save as EXE file on the File menu. OLE provides a quick method of including wave audio, MIDI files, animations and video, and helps to shorten the software development life cycle. There are many instances when program users need to include their own media files through OLE2 at runtime. Users may harness it to add voice or video annotations, documents, etc. This can be achieved by including Paste Special or Insert Object dialog boxes in the program. The Paste Special dialog box is produced using the PasteSpecialDlg

method. The Insert Object dialog box is produced using the InsertObjectDlg method. This allows the user to choose a compatible application or file type to insert in an OLE container control. Whether an object is linked or embedded depends on the `OLETypeAllowed` property of the OLE container control. When an object is linked, the `OLETypeAllowed` property equates to `0-Linked`, while it is set to `1-Embedded` when an object is embedded. The listing below shows how a button can be used to open the Insert Object dialog box and allow the user to place an object in an OLE container control called `OLE1`.

```
Private Sub Command1_Click()
  OLE1.InsertObjDlg
    'Produce the Insert Object dialogue box
End Sub
```

Embedded or linked objects in an OLE container control can be saved using the `SaveToFile` method, which causes the placeholder and link to be saved. Changes made to the linked object can be saved using the OLE server application. When applied to embedded objects, the data is saved in its entirety. The `SaveToFile` method can be used to write OLE 2.0 object data to files, while the `SaveToOle1File` method saves objects in the OLE1.0 file format. The listing below can be used to save embedded or linked object data.

```
Private Sub_Command2_Click()
  FileOLE=FreeFile 'Assign a free file number to
    'FileOLE
  Open "ONE.OLE" For Binary As #FileOLE
    'Open the file
  OLE1.SaveToFile FileOLE
    'Save the object data in OLE
  Close #FileOLE    'Close file
End Sub
```

The subroutine first determines a free file number. Then it opens that file, writes the object data to it and closes the file. The opening statement `FileOLE=FreeFile` returns a legal file number that can be used by the `Open` statement. It ensures that the `FileOLE` variable is assigned a file number that is not currently in use. An argument can be added to `Freefile` in the form of a suffix. The default argument '0' used in this case returns a file number from 1 to 255. A '1' argument returns a file number from 256 to 511. `Freefile` can be used to specify the number of the file to be opened with the `ReadFromFile` method or saved using `SaveToFile` or `SaveToOleFile` methods. It is dormant at design time, and returns no value. The second statement `Open "ONE.OLE" For Binary As #FileOLE` opens the file that is defined by the file number assigned to the

FileOLE variable. The statement `OLE1.SaveToFile FileOLE` writes the data within the `OLE1` container control to the file specified by the contents of the `FileOLE` variable. Finally, with the object data saved, the file is closed using the statement `Close #FileOLE`. As you would expect, the code required to retrieve saved OLE data is markedly similar to that required to write it. The listing below illustrates this:

```
Private Sub Command3_Click()
  FileOLE=FreeFile    'Assign a free file number
  Open "ONE.OLE" For Binary As #FileOLE
    'Open the file
  OLE1.ReadFromFile FileOLE
    'Read the object data from
    'the file
  Close #FileOLE
    'Close the file
End Sub
```

The statement `OLE1.ReadFromFile FileOLE` reads object data from the file and writes it into the `OLE1` container control. Like the `SaveToFile` method, the `ReadFromFile` method requires the file number of an open binary file to read object data.

Visual Basic Control Edition   A version of Microsoft Visual Basic aimed at the development of ActiveX Controls.

(See Visual Basic.)

Visual Basic Standard Edition   A version of Microsoft Visual Basic which can be used to build 16 bit and 32 bit applications. It does not support ODBC databases or Visual SourceSafe.

(See Visual Basic.)

Visual C++   A Microsoft C++ programming environment which can be used to create

- DLLs
- ActiveX controls
- 16 bit and 32 bit applications

(See C++.)

Visual FoxPro   A Microsoft OOP database management system for creating enterprise solutions. It is supplied with the Microsoft Visual Studio.

Visual InterDev   A Microsoft development tool which is used to create Web and intranet applications. It can be used to:

- access ODBC databases
- script client and server Web pages
- edit content files
- manage multiuser Web projects.

The files of an InterDev application are stored on the Web server. Files are accessed with Visual InterDev, using a local *project* file that points to the server and to the relevant Web. InterDev lends itself to the team collaboration environment because multiple developers can work simultaneously with files (on the Web server or in a Web). The Web project includes the Web files on the server and, on the client-side, the local project files. A Web Project File is available for the creation of project files that point to relevant Webs and Web servers. Visual InterDev is also supplied with the multimedia production tools:

- Image Composer, which offers a sprite-based drawing environment. Each imported image becomes a sprite. A number of effects and filters are available. Support is provided for plug-ins from Adobe and Kai. It supports BMP, GIF and TIF formats.
- Music Producer is used to create MIDI sequences.
- Media Manager empowers Windows Explorer to view media files.

(See MIDI, Multimedia production and Wave audio.)

Visualisation   A process which transcribes often empirical data into a more readily understandable form. It can accelerate the interpretation, communication and understanding of complex data sets. Visualisation takes place on a computer platform or in a VR environment. Visualisation tools have many applications, ranging from molecular biology to architectural design.

Visual Java++   A Microsoft development environment for writing, compiling and debugging Java applications and applets. Visual J++ can be used to integrate JDK packages into Java programs, and to create multithreaded Internet and intranet applications. InterDev is included in Microsoft VisualStudio 97.

(See Java, JDK and JScript.)

Visual programming   A programming technique where the programmer simply draws usually standard components on screen and then attaches code to them. The code segments may be written in a line-by-line fashion or selected from a library. Many multimedia authoring tools and modern development tools employ visual programming techniques at various levels.

(See Visual Basic.)

Visual SourceSafe A Microsoft solution which lends itself to the team collaboration environment. Once installed, this restricts editable files to individual authorised developers.

Visual Studio (Enterprise Edition) A comprehensive suite of Microsoft development tools, which includes:

    Visual J++
    Visual C++
    Visual Basic
    Visual InterDev
    Visual FoxPro.

It also includes numerous tools, extensive documentation and the Microsoft Developer Network (MSDN) on CD-ROM.

(See ActiveX*, C++, Java* and Visual Basic.)

VLAN (Virtual Local Area Network) A network where computers may not be connected to the same physical LAN; rather, they are connected on different networks, and in remote locations. They may be configured using software, and are immune to the physical location of the networked systems.

(See Ethernet, LAN and VPN.)

VLB (VESA Local Bus) A standard local bus, which supports compatible peripherals such as hard disk controllers, I/O cards and graphics cards. It is internationally agreed and backed by VESA (Video and Electronics Standards Association). It is used widely on PC designs, and gives better performance than IBM's original ISA (Industry Standard Architecture) expansion bus developed for the PC AT (Advanced Technology) in the early 1980s.

VLSI (Very Large-Scale Integration) A semiconductor chip (or die) which integrates between 1000 and 10 000 devices. The packed assembly may contain more than one chip, such as the Intel Pentium Pro.

(See ULSI.)

VOC A wave audio file format introduced by Creative Labs as part of its SoundBlaster range of sound cards.

(See Wave audio.)

VoiceAssist A program that permits Windows to be operated using voice commands. It is comparable to Microsoft Voice Pilot.

Voice Pilot   A basic voice recognition system supplied with Microsoft Windows Sound System, which permits the operation of Windows and Windows applications using voice commands. It works by storing acoustic models of your voice. For example, when you train it to understand the way you say 'File' it will implement this voice command by opening the File menu. It is not intelligent. For instance when training Voice Pilot, and you are asked to say 'Maximise' you could just as easily say 'big'. Voice commands are implemented using simple macro recordings which are shown in the Detail window.
(See ViaVoice.)

Voice recognition   *(See Speech recognition and ViaVoice.)*

VPL Inc. (Virtual Programming Language Inc.)   A company founded in 1985 by Jaron Lanier with the purpose of serving the VR market. Its products include the DataGlove and the EyePhone HMD. Other early products include RB1 (Reality Built for 1), a single-user VR system. Its specification was raised to RB2 (Reality Built for 2), which could interface two users.
(See VR.)

VPN (Virtual Private Network)   A network which may be built using Internet technologies, as opposed to private lines. VPNs may be LAN-to-LAN, or even extranets, which include remote users that may be business partners or even customers.

VPN tunnelling   A method of connecting to VPNs via an ISP. The ISP must have a Network Access Server (NAS). For many enterprises, VPNs form part of an IT solution for teleworking.
(See VPN.)

VR (Virtual Reality)   A non-linear medium that can extend to the concurrent communication of interactive 3-D images, sound and numerous different variables that include 3-D movements and manipulations. Its key property is that of a theoretically infinite bandwidth. Users' extracted movements typically include body, limb and digit movements, but can range from intricate muscular contractions to intimate vessel expansions and retractions, and from surface movements of the skin to eye movements. Trends point to a yet more sensitive interface able to read every movement down to the blink of an eye, the enlarging of a pupil, and even the displacement of a human hair. A verbatim image of the interfaced user is foreseeable. Jaron Lanier lays claim to having coined the term. Users

themselves may also be the recipients of 3-D movements, most notably in simulation applications. Subtler manipulations may also be experienced. Variables that are unidirectional include user coordinates, pulse rate, heart beat rate, blood pressure and capacity. Variables that may be bi-directional in nature include temperature and moisture. Other more specialised variables include pressure, flow, air flow, acidity, luminance, potential, mass, velocity/speed, acceleration and directionality. Computer-generated 3-D images comprise full or partial virtual environments, as well as perhaps complete or partial replications of interfaced users. The attainable sophistication of the overall graphical environment is a function of the driving graphics engine, the software and particularly transformation algorithms. Features which determine complex virtual environments include requirements for high-speed graphic transformations, large sets of coordinates, high-resolution images, large numbers of independent 3-D graphic objects, complex 3-D objects with changeable behaviours and high levels of chrominance. Voice commands can replace and/or complement tangible and even virtual mechanisms for interaction and navigation. 3-D sound rendering also may be included to maintain the perspectives of virtual sound sources. The tangible VR platform provides the necessary mechanisms for navigation, browsing, interaction, stimulation of sensory channels and monitoring variables. At the core of a standalone VR system is at least one appropriately specified computer that might typically range from a single-processor-based variant to a multiple microprocessor-based system based on a single shared data bus or a complex supercomputer architecture including multiple processors (such as the Transputers used by Division (Bristol, UK)) working in concurrence. The graphics performance of the collective virtual engine and accompanying graphics engine/controller is the key to determining overall complexity and effectiveness of supported applications. Obvious VR applications can be revealed, or discovered, by considering instances when interactive 3-D graphics/environments have to be communicated and experienced. The experience may be intimate, vague or detached, where the user need not be fully immersed, in which case the HMD may be exchanged for something less intimate, or even a two-dimensional display. Current applications include architectural visualisation, scientific and engineering visualisation, civil and military simulators, surrogate travel, surgery (telepresence), point-of-information using realistic computer-generated images or video overlay. Distant future applications include virtual conferencing, three-dimensional multimedia authoring tools, and the simulation of ergonomically effective working environments, yielding the virtual desktop. The visualisation tool market for desktop computers has mushroomed in recent years, giving professionals of various different kinds the ability to experience and experiment with structures in three dimensions. The resultant acceleration of

understanding renders visualisation a useful instrument for learning. The absorption of 3-D movements at various different levels and their replication in remote, and even multiple, sites is termed telepresence. Related applications include instances where human operatives may be subject to hostile elements in the remote environment; human operatives cannot physically exist due to the large or small scale of the remote environment; the cost of physically implanting human operatives in the remote environment is reduced through telepresence; a single human operative must have a concurrent presence in multiple remote environments; or the presence of human operatives must be shifted quickly between different multiple remote environments. Current real-world applications include remote surgery and keyhole surgery, while a plethora of others wait in the wings, ranging from deep-sea diving to the remote realisation of military roles. Conceivably telepresence will one day extend to VR-conferencing, providing full interaction between participating users; conference members or even a complete workforce could be congregated from multiple locations. An almost mandatory stage in the development of a multimedia application is the development of a storyboard, which may also include the various implanted links that support its non-linear paths. This preliminary design stage can be carried out using the multimedia authoring tool itself, which is the case with Asymetrix ToolBook and many other tools. This stage provides a prototype structure for testing the partial or complete interactive design. Multimedia based on a complex hypertext model that features a fine level of granularity can be difficult to storyboard in two dimensions; a single page, window or screen that forms part of a frame-based multimedia application may contain a number of micro features that provide navigational controls. The micro features may include active words/phrases, image fragments or micons (motion icons), all of which will require the implantation of links. Modern authoring tools offer visual programming techniques where you first draw screen objects such as buttons and then attach program scripts to them, so defining their behaviour. Modern tools also provide a number of commonly used ready-made scripts that can be used to handle events such as mouse clicks. Even if the authoring tool provides a means of drawing the links using a graphical model of the application, the underlying hypertext structure can remain difficult to overview. This is largely because the conventional computer monitor is restrictive and fuels a tunnel vision that significantly lengthens the design stage. Now consider a 3-D multimedia authoring tool: a virtual environment ergonomically designed as a receptacle for the components of a multimedia application. It could be a room of any shape or size, a sphere, or simply a free space without visible boundaries. Documents/frames with multiple media types could be pasted on virtual walls and surfaces, or suspended in free space. Mixed media documents could be cascaded or tiled as required, while the

all-important links could be implanted graphically. Multimedia, hyper-media and hypertext authors familiar with two-dimensional environments will appreciate fully the advantages of a third dimension: both the story-board and interactive design are implemented and overviewed more easily; while testing the interactive design and debugging is made easier. See the following works.

Sutherland, Ivan, *A Head-Mounted Three-Dimensional Display*, Harvard Computation Laboratory, *Proceedings Fall Joint Computer Conference*, Thompson Books, 1968.
Larijani Casey, L., *The Virtual Reality Primer*, McGraw-Hill, 1993.

VRML ('Vermul') (Virtual Reality Modeling Language)   A file format and a language for creating and describing objects or nodes and their behaviour. VRML extended the Open Inventor specification to include cone, cube and cylinder primitives, along with methods for embedding hyperlinks. Applications of VRML include:

- multimedia presentations and titles
- leisure software
- virtual reality
- Web pages.

Objects may be:

- static 3-D images
- static 2-D images
- audio
- multimedia
- embedded with hyperlinks.

VRML authoring tools or generators are widely available.

VRML nodes   Node properties have:
- a *name*, which is dedicated to the class
- *parameters*, which offer an object's definition and have fields that contain dimensions etc.

VRML events   The nodes are event driven, and receive and send messages such as:
```
eventIn
```
which typically changes a property of the node, or
```
eventOut
```
which sends a message from an object that might have undergone change due to an interaction with a message. Nodes interact using messages passed via ROUTE, which interconnects `eventOut` and `eventIn` processes.

VRML ISO/IEC 14772   An official designation for the internationally agreed VRML specification.

V standards   A set of recommendations that covers voice and data tele-
phony. Popular V standards cover the following full-duplex modem speeds:

V.21	300 bps
V.22	1200 bps
V.22 bis	2400 bps
V.32	9600 bps
V.32 bis	14 400 bps
V.34	28 800 bps
V.90	56 600 bps

(See Access technology and Modem.)

Vulnerabilities   A listing of comparative flaws in a network's defences
against illegal access.

(See Firewall and Security.)