A

AAAS (American Association for the Advancement of Sciences) An American organisation dedicated to the sciences.

AAIM (Association for Applied Interactive Multimedia) An organisation that serves multimedia professionals.
(See www.aaim.org)

Abel, Robert A pioneering multimedia author. His early works include Guernica, an interactive documentary about the destruction of the Basque Town of the same name during the Spanish Civil War. Picasso's famous painting Guernica is used to promote the central theme. Guernica was initially platformed on the Apple Macintosh computer.

Absolute addressing A method of addressing stored information, where addresses are independent of one another. CD-ROM block addresses include measurements of time and data blocks read. Minutes, seconds and blocks provide enough information to locate information. For example, a one-hour CD-ROM would use the addressing scheme:
- Minutes   (M): 0–59
- Seconds   (S): 0–59
- Blocks   (B): 0–74

A track beginning midway through the CD-ROM might be addressed 29:29:37 (M:S:B). This addressing technique is also reflected in CD-I.
(See CD-ROM and DVD.)

Accelerator 1. A graphics card offering high-speed operation and optimised for GUIs such as the X Window system, Windows and OS/2. *(See 3-D and Graphics card.)* 2. A video accelerator is a graphics card that is able to speed up the playback frame rate of video sequences. The acceleration is achieved by inserting duplicate frames. VideoLogic was one of the first companies to demonstrate the acceleration of Windows .AVI video files using this technique. *(See MPEG*.)*

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Acceptance cone   A range of angles at which a laser beam may be injected into a fibre optic cable so that the ray is propagated for the entire fibre's length. It is a function of the numerical aperture (NA), which is greater with multi-mode fibres than it is with mono- or single-mode fibres.

(See Optical fibre.)

Access   A process by which users gain the rights to operate a local or remote system, application or program. The user may be required to enter an ID and password.

(See Encryption and Security.)

Access technology   A method used to connect to the Internet or to a remote network or computer system. Access technologies include:

- PSTN and analogue modem offering speeds up to 56.6 Kbps
- analogue and digital GSM
- ISDN
- Cable
- DSL
- ADSL
- GSM
- DBS (Direct Broadcast Satellite)

(See 56.6 Kbps, ADSL, ATM, B-ISDN, Cable modem, ISDN and Modem.)

Access time   The interval between a data request and data retrieval. Hard disk and CD-ROM access times are measured in milliseconds (ms) (or thousandths of a second.) The length of access time depends largely on the electromechanical architecture, but increasingly controllers play an important role. For instance, hard disk cache controllers may reduce the measured disk access time to tenths of a millisecond. In the perspective of DVD and CD-ROM, average access time is the time taken for the laser head to locate and begin reading an appropriate region of the disc. Access time tends to increase with turns of track that are farthest from the disc's centre.

(See CD-ROM, DVD and Hard disk.)

Accumulator   The part of a processor architecture that can be used to store the results of arithmetic operations. It consists of one or more registers, and its overall size often indicates the size of instructions that can be processed.

(See Processor.)

ACID (Atomicity, Consistency, Isolation and Durability)   A series of properties which define the real-world requirements for transaction processing (TP).

Atomicity A process of ensuring that each transaction is a single workload unit. If any subaction fails, the entire transaction is halted and rolled back.

Consistency A process of ensuring that the system is left in a stable state. If this is not possible the system is rolled back to the pre-transaction state.

Isolation A process of ensuring that system state changes invoked by one running transaction do not influence another running transaction. Such changes must only affect other transactions when they result from completed transactions.

Durability A process of guaranteeing that the system state changes of a transaction are involatile, and impervious to total or partial system failures.

(See Server and Transaction.)

Acoustic coupler A device that may be fitted to a telephone handset, enabling data communications.

Acrobat *(See Adobe Acrobat.)*

ActionMedia II An i750 chipset-based graphics card that can play video compressed according to the Intel Indeo video standard. It is an evolved version of the original i750-based ActionMedia board developed to play and record video according to the Intel Digital Video Interactive (DVI) technology. Two ActionMedia DVI boards were required: one for playback and another for video capture and compression. DVI was a notable milestone in the development of the PC as a multimedia device and in the evolution of digital video in the PC environment.

(See DVI and MPEG*.)

Active Channels A connection to a Web site which sees information pushed to the Windows Active Desktop.

(See Active Desktop.)

Active Control Pad A development tool which may be used to develop interactive Web pages. It supports JScript and VBScript, and can be used to integrate ActiveX controls. The program is supplied with a number of user interface-related ActiveX controls, which include:
- Forms 2.0 Label for creating labels on Web pages
- Forms 2.0 Text Box
- Forms 2.0 Combo Box
- Form 2.0 List Box

- Forms 2.0 Check Box
- Forms 2.0 Option Button
- Forms 2.0 Toggle
- Forms 2.0 CommandButton

(See Active Desktop, Active Document, ActiveX*, Java, JavaScript, VBScript and Visual Basic.)

Active Desktop   1. A term used to describe the client side of an Active Web application, and to describe the addition of Active Desktop Components (ADCs) to the Windows Desktop. The Web page uses ActiveX scripting (with VBScript or JScript) in order to integrate and coordinate:

- Active Desktop Components (ADC)
- HTML code
- ActiveX controls
- Java Applets.

(See Active Desktop Component, Active server, ActiveX control, Java, JScript, OLE, VBScript and Visual Basic.) The integration of Web browsing capabilities in the Windows 95 or 98 Desktop. It is intended to provide the user with seamless connection to, and use of, the Internet. Whether applications and data are local or remote (i.e. on the Internet or an intranet) is transparent to the user. Active Desktop Compondents (ADCs) are arranged on the desktop in the form of Active Channels, and offer various functions. Connectivity to Web sites is provided by Active Channels in the form of Channel bars, which may be selected from the Windows Desktop.

Active Desktop Component (ADC)   A component, which might be an ActiveX control, that is integrated into an Active Desktop. For instance, the PointCast ADC is an example, and may be configured to receive selected information from news services.

(See Active Desktop.)

Active document   A term which describes the integration of Internet Explorer with documents. For instance, Microsoft Office documents might be opened using Internet Explorer.

(See Microsoft Office.)

ActiveMovie   A Microsoft streaming video technology which is integrated in Internet Explorer. It supports the video formats QuickTime, MPEG and AVI.

(See ASF and www.microsoft.com/imedia.)

Active server A server that pushes data to a client's Active Desktop and delivers Active Channels. Server-side application components are common in type to the Active Desktop. These may include:

- ActiveX controls
- Java applets
- JScript
- VBScript
- HTML.

The server-side implementation may integrate the MCIS server components.

(See ASP, Java, JScript, MCIS, OLE, VBScript and Visual Basic.)

Active Server Components *(See ASP.)*

Active Server Page (ASP) *(See ASP.)*

Active Template Library (ATL) A development tool used to develop Active Server Components, which may be in-process or out-process.

(See ASP.)

Active Web Architecture An architecture which provides bi-directional information flow between the HTTP server and HTTP client. The resulting interactivity on the client side permits data entry and the editing of HTML documents. It uses the Common Gateway Interface (CGI) between the HTTP server and its applications and databases. CGI is a protocol which provides the necessary communications. CGI scripts are created using a scripting language or programming tool. (See Figure on page 22).

(See CGI and Perl.)

Active window A window which is currently selected by the user. The window might be activated when the user:

- clicks on the window
- selects its related application button from the Taskbar
- selects the window from the Window menu
- selects the window using the keyboard by pressing Alt-Esc, or by pressing Alt-Tab.

(See Windows.)

ActiveX control An object or component that adds functionality to an application which may be standalone or deployed over the Web or network. Microsoft ActiveX is an object architecture based on OLE 2.0, and is intended for deployment over the Internet and compatible IP networks.
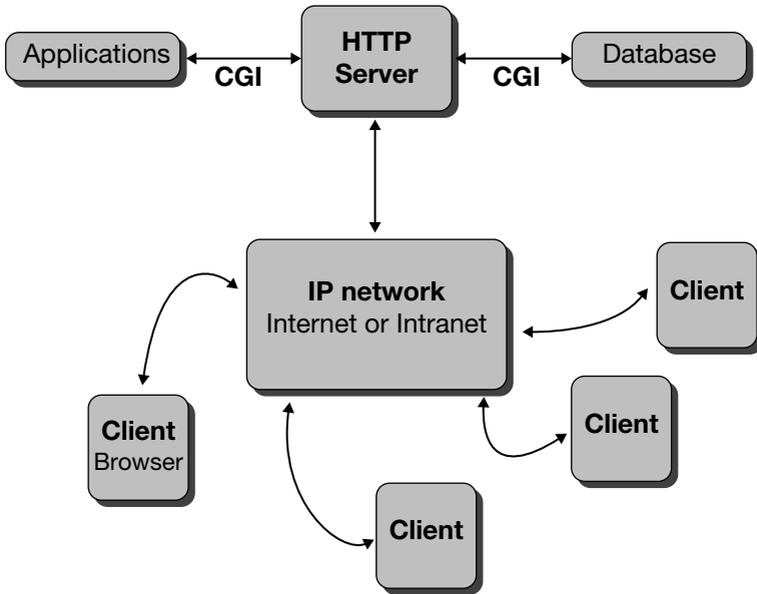
Active Web

More accurately, ActiveX is a reincarnation of OCX and may use COM and DCOM as glues. ActiveX provides cost-effective functionality gains for Web browsers. An ActiveX control might take the form of a streaming video player, or a streaming audio player that might be added to Internet Explorer (which is a Web browser). ActiveX controls may be created using Visual C++, Visual Basic 5 Control Creation Edition or Java.

Guidelines for creating ActiveX controls

- Refer to existing active controls in the public domain, to those that are shareware, and to those that might be conventionally marketed and sold. The economics of recreating that which has already been created might prove undesirable. Study the functionality of the ActiveX controls and try to obtain real-world reviews of them, in order to gain an understanding of what may be expected from them.
- Use the latest editions of development tools such as Visual Basic Control Edition and Visual Studio.
- Supply detailed design, architecture, implementation and functionality documentation. If the ActiveX control may be modified at the code level, provide adequate comments in the source listing. Also include an impact statement of how the ActiveX control changes targeted applications, together with reusing a strategy of useful code segments or algorithms designed.
- Do not intentionally integrate patented algorithms in your ActiveX control. It

is accepted that such infringements can be implemented unwittingly by the developer/programmer.
- Test the ActiveX control.
- Provide case scenarios giving real-world examples of their integration in Web applications.
- Refer to Microsoft's Web site for the latest ActiveX specification and development tools.
- Integrate configuration features which may be used from within the application where the ActiveX control is embedded.
- State the development environments/tools with which the ActiveX control has been tested.

(See Authenticode.)

ActiveX components running on the same system may interact using the COM protocol as a glue. Industry-wide support beyond Microsoft in ActiveX-compatible development tools includes:

- Borland Delphi
- Powersoft PowerBuilder *(See www.powersoft.com)*
- Powersoft Optima++ *(See www.powersoft.com)*
- Symantec C++ *(See www.symantec.com)*
- MetroWerks Code Warrior *(See www.metrowerks.com)*.

(See Active Desktop, Active document, Active server, Authenticode, COM, DCOM, Glue, HTML, Java and Visual Basic.)

ActiveX scripting   A process by which ActiveX controls and Java Applets may be integrated into the underlying HTML code of an interactive Web application. Such scripting is generally used with Web applications, though standalone applications may also be built using the same. The scripting languages JScript and VBScript are used widely. A basic HTML listing may be given functionality and responses to events through:

- JScript code
- VBScript code
- ActiveX Controls such as Shockwave and multimedia streaming components
- Java applets.

Such a development strategy can be used to give the client-side a level of intelligence. Validations of user data and interactions distribute processing away from the server-side. This lessens the volume of data traffic and serves to optimise application performance. ActiveX scripting may also be applied to the server-side; it is possible to create Active Server Pages (ASPs).

(See ASP, CGI, HTML, Java, Java applet, JavaScript, Shockwave, VBScript.)

ActiveX SDK (Software Development Kit) A programming tool for creating ActiveX controls. ActiveX controls can also be produced using:

- C++
- Java
- Visual Basic.

(See ActiveX control, Java* and Visual Basic.)

ActiveX security A term used to describe the filtering of unwanted ActiveX controls or presenting the user with an option to do so.

(See Authenticode and Security gateway.)

ADA A high-level programming language and the namesake of Lord Byron's daughter, who became the world's first technical writer in computing when documenting Charles Babbage's mechanical computer.

Adaptive data compression A proprietary data compression technique integrated into the design of many Hayes modems. The algorithm adapts itself so as to optimise compression.

ADC (Analogue to Digital Converter) 1. A device or electronic assembly used to convert continuously varying analogue signals into digital form. The accuracy achieved depends largely on the size of samples and on the sampling rate. Video capture boards and sound cards include analogue to digital converters. Standard PC and Macintosh sound cards tend to record using 8 bit or 16 bit samples at sampling rates of 11.25 kHz, 22.05 kHz or 44.1 kHz. Highly specified sound cards may record using sampling rates of up to 48 kHz, which equates to DAT quality. Video capture cards generally play a dual ADC role, converting audio as well as video into digital form. Normally audio is digitised using the same sample sizes and sampling frequencies available on most fully specified sound cards. Whether capturing from a VHS or S-VHS video source recording, the process of digitising a video signal requires a great deal more computation than that of an analogue audio signal. The maximum frame capture rate of a video capture card is a function of its maximum sampling rate, which is linked to the maximum data rate at which it can operate. 2. Active Desktop Component.

(See Active Desktop and Active Desktop Component.)

Address 1. *(See IP address.)* 2. CD-ROM addresses include measurements of time and data blocks read. *(See Absolute addressing.)* 3. A binary address of data or instructions that are stored in memory. 32 bit software is able to access memory more efficiently than 16 bit variants. It is capable of

flat memory addressing in which 4 Gbyte (2^{32}) memory segments can be addressed. A 32 bit segment register is used to point to addresses within a 4 Gbyte range. At the machine code level, the addresses of data and instructions are held in a register called a program counter. Typically its contents grow by increments of one, except when a conditional or unconditional jump occurs to a new memory location. This normally occurs when a subroutine is executed. At such times, the contents of the program counter are placed on a stack, which is a portion of memory that operates according to the LIFO (last in, first out) system. This ensures that the last address placed on the stack is the first to be retrieved. When the subroutine is completed (perhaps using the RET command), the return address is recovered from the stack and placed back into the program counter register.

Address Book   A Windows NT-based server which is part of the Microsoft Commercial Internet System (MCIS). *(See MCIS.)* Address Book allows users to query a database of users, which may include dynamic values such as IP addresses as well as static values that might include names, addresses, age, interests and occupation. It is compatible with:

- NetMeeting, which supports Internet telephony and conferencing
- an Internet Locator server, which may be used to query the database
- a Microsoft SQL Server, which can be used as the database.

(See Internet telephony and Microsoft SQL Server.)

Address bus   A unidirectional address bus on a processor. It consists of a number of lines, and interfaces with memory devices and memory decoders.

Adobe Acrobat   An Adobe file format that permits formatted documents to be deployed efficiently over the Web. Adobe Acrobat Reader is required to read Acrobat files (which have the .PDF extension). Using Netscape Navigator, the Acrobat Reader requires a plug-in, while Microsoft Internet Explorer uses an ActiveX control.

(See ActiveX control.)

Adobe After Effects   A 2-D/3-D animation program which permits various effects and enhancements.

Adobe Dimensions   A 3-D graphics program.

Adobe Illustrator   A graphics program used widely for Web and multimedia production and to originate images for print.

Adobe PageMill   A Web site development tool which may be used to develop Web applications.

(See ActiveX control, CGI, Java*, MCIS and Web Server.)

Adobe PhotoShop   A program used widely for image manipulation, enhancement and editing.

Adobe Premiere   A video editing tool.

(See Multimedia production and Video capture.)

Adobe Streamline   A graphics package that provides a number of tools, and can convert images into line drawings.

(See PaintShop Pro.)

ADPCM (Adaptive Delta Pulse Code Modulation)   A process by which an analogue signal is converted into digital form. It is a development of Pulse Code Modulation (PCM). The sampling rate influences how accurately sharply varying analogue signals are digitised. It is used in CD-I and many other digital audio, video and multimedia technologies.

ADSL (Asymmetric Digital Subscriber Line)   An access technology that uses the existing copper wire networks that are synonymous with POTS (Plain Old Telephone Services), though these may also include fibre optics. Its downstream bandwidth is considerably wider than its upstream bandwidth:
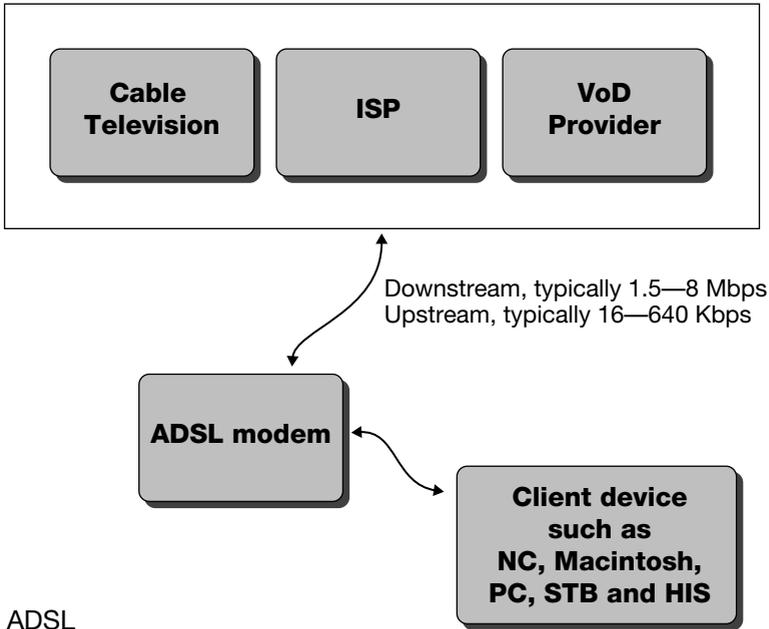
- Downstream bandwidth of between 1.5 Mbps and 8 Mbps. Typically it is 1.5 Mbps.
- Upstream bandwidth of the order of 16 to 640 Kbps, which can be a function of the line length. Typically it is 384 Kbps.
- Line lengths of up to 5 km are quoted. Typically a repeater is required for distances greater than 1800 feet in order to overcome attenuation.

Applications include:

- high-speed Internet access
- VHS quality videoconferencing
- VoD (video-on-demand)
- multimedia networks

Discrete multitone (DMT) modulation according to ANSI T1.413 separates upstream data from downstream data by separating the signal into separate 43 kHz carrier bands.

(See Access technology.)

```
+------------------------------------------------------------------+
|   +------------------+  +------------+  +------------------+      |
|   |     Cable        |  |            |  |      VoD         |      |
|   |   Television     |  |    ISP     |  |    Provider      |      |
|   +------------------+  +------------+  +------------------+      |
+------------------------------------------------------------------+
```

Downstream, typically 1.5—8 Mbps
Upstream, typically 16—640 Kbps

```
+------------------+
|                  |
|   ADSL modem     |          +------------------------+
|                  |          |     Client device      |
+------------------+          |       such as          |
                              |    NC, Macintosh,      |
                              |   PC, STB and HIS      |
                              +------------------------+
```

ADSL

Aftertouch   A keyboard which is sensitive to the firmness of touch, e.g. musical volume is increased by pressing harder on the key(s).

Agent   1. An agent/manager architecture used for system management in client/server systems. The agents represent managed subjects, which are communicated with and manipulated by managers. 2. A triggered agent is a program that responds to events with appropriate actions. The actions might be little more than answering a telephone call. More sophisticated agents might modify software, build databases or even data warehouses, or add items to a cache, in response to usage habits. Events such as changes to files or directories might also be used as triggers. 3. An habitual agent can be programmed to implement tasks at a precise frequency, such as hourly or daily. 4. A Microsoft ActiveX control intended to enhance the UI of local and Web applications. 5. In a telecommunications network, an agent interprets various commands and responds to them appropriately.

AGP (Accelerated Graphics Port)   A high-speed graphics controller implementation which uses a 66 MHz bus. This doubles the speed of PCI cards, which exploit a 33 MHz bus connection.
(See Graphics card.)

AI (artificial intelligence)   A term used to describe the use of a system to emulate human decision-making and learning abilities. The founding father

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of artificial intelligence is Alan Mathison Turing, through his writings, which include *Computing Machinery and Intelligence* (1950). Turing, an English mathematician, Second World War code-breaker, computer scientist and inventor, also described the 'Turing machine', and how it could theoretically implement logical processes. Expert systems (or knowledge-based systems (KBSs)) and neural networks are perceived as part of AI. It is believed that massively parallel processing (MPP) systems will unleash and emulate many human-like thought processes. Neural networks represent a key area of AI.
See: Cawsey, Alison, *The Essence of Artificial Intelligence*, Prentice Hall, 1998.

(See KBS, MPP and Neural network.)

AIX   A Unix operating system variant.

A-Level audio   A CD-I audio quality level, which is equivalent to the first play of a vinyl disc under optimum conditions. Such conditions are devoid of the noise caused by static and the physical stylus contact. A-Level audio consumes half the data capacity of audio CD data. The transfer occupies half the data channel, leaving more bandwidth for other multimedia elements such as video, computer graphics and text.

Algol   A high-level programming language.

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

Algorithm   1. '*An algorithm is a set of rules for getting a specific output from a specific input. Each step must be so precisely defined that it can be translated into computer language and executed by machine*' (Donald E. Knuth). 2. A collective name describing the components of the problem solving process. It can be a program or series of steps defining a *modus operandi*, which yields what is regarded to be an acceptable solution. 3. A term used loosely to describe a program or program segment. Algorithms for compression, and those that perform other operations, are often patented.

Allen, Paul   A co-founder of Microsoft and sole founder of Asymetrix. He is *one* of the world's richest men.

(See Asymetrix and ToolBook.)

Alpha   1. A family of RISC processors manufactured by Digital. 2. A pre-release copy of an application, which is distributed and tested in-house. It is the penultimate development stage that precedes beta testing. *(See Beta.)*

3. An 8 bit data channel on 32 bit colour systems that provides control over the transparency of pixels, thus facilitating numerous video effects.

AMD (Advanced Micro Devices)   A chip manufacturer that produces PC processors. AMD came to prominence when it reverse engineered Intel's third-generation 80386 processor and won the legal right to market and sell it. More modern AMD offerings include the K6 MMX processor.

(See Pentium.)

Amiga   A personal computer manufactured by Commodore Business Machines. With its excellent graphics, four digital sound channels and multi-tasking OS, the original Amiga 1000 was suited to multimedia. In 1990 Commodore launched the more powerful Amiga 3000, and introduced the 3000T-040/200 and 4000-040/120 in 1992.

Amplitude   A measurement of the magnitude of a digital or analogue signal.

Analogue   A signal which does not vary in precise preset steps but passes smoothly from one level of amplitude to another. Waveforms are used to represent analogue entities such as sound. For storage and processing using computers, analogue signals are converted into a digital form using analogue to digital converters (ADCs), of which many variants exist.

Analogue RGB   A method by which red, green and blue components are excited in accordance with individual (analogue) constantly varying signals.

Analogue video editing   A process of editing analogue video typically stored on media such as standard VHS or S-VHS tape. With appropriate software such as Video Director (Gold Disk) it is possible to edit analogue video using a PC. Video Director interfaces with camcorders that have either a Sony LANC (Control-L) or a Panasonic RMC (5-pin) edit terminal. It controls the recording or target VCR through infrared commands.

And   1. A logic gate that has two or more inputs and a single output. The output is one, or positive, when all inputs are set to one. 2. A logical operation in a search string that requires the presence of two or more words or phrases. 3. An operator in a program that tests for two or more conditions.

(See C++, Java, VBScript and Visual Basic.)

Andreessen, Marc   A computer scientist and entrepreneur, who created the Netscape Navigator Web Browser and is the founder of Netscape. He

also worked on one of the earliest Web Browsers, Mosaic, which was developed at the National Center for Supercomputing Applications at the University of Illinois.

(See Browser, Hypertext and Web.)

Animatic   A film or video summary of a multimedia production. It is the motion picture equivalent of storyboard.

Animation   A series of frames used to create the illusion of movement. Animation types include:
- morphing, which dissolves one image into another, and may be created using dedicated morphing programs or equivalent features in animation programs
- sprite, where one or more screen objects are moved
- cell-based, where entire frames are updated fully or partially to give the illusion of movement
- micons, where a continuous series of frames is repeated conditionally. The condition might be a mouse-click event.

(See Animation program.)

Animation program   A program designed for the production of 2-D and 3-D animations. Autodesk Animator Pro and Autodesk 3D Studio are popular off-the-shelf packages. Other 3-D animation development tools include NewTek's LightWave 3D, Strata Studio and the Electric Image Animation System.

Anonymous FTP (File Transfer Protocol)   An FTP server to which users may connect, browse its files, download files and possibly upload files without the need for an individual password.

(See Archie and TCP/IP.)

ANSI (American National Standards Institute)   A highly influential standards institution. The array of ANSI standards covers everything from character sets to programming languages such as C++.

AOL (America Online)   A large international ISP, which has POPs (points of presence) in many major cities. The Compuserve ISP is part of the AOL corporation.

API (Application Program Interface)   An interface which provides programmers with high-level instructions and possibly routines. An API for a

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3-D engine, for instance, would provide statements that permit graphics to be drawn and manipulated. The complex underlying matrix transformations (*see 3-D*) and mathematical elements are transparent to the programmer.

Apple Computer   A computer manufacturer renowned for innovative designs and for consistently setting high standards later sought by competing companies. Co-founded by Steve Jobs, the company underwent a meteoric rise to become a heavyweight multinational in the eighties. The first Apple computer was designed by Steve Wozniak, a co-founder of Apple Computer. The launch of the highly successful Macintosh (Mac) computer in 1984 represented a significant point in its history. The Macintosh has since been refined into several versions and is an excellent platform for multimedia delivery and development. HyperCard is synonymous with the Macintosh and marked the beginning of a deserved reputation for suitability to multimedia. HyperCard was the birth of hypertext/hypermedia in mainstream computing.

(See Apple Macintosh.)

Apple Computer Human Interface Guidelines   A set of guidelines drafted by Apple Computer to promote consistency between different applications and programs, thus making them easier to use and learn.

Apple Macintosh   A range of desktop computers produced by Apple Computer. When introduced in 1984 the Macintosh pushed forward the boundaries of desktop computing through the:

- graphical user interface (GUI or gooey)
- mouse input device
- analogue graphics port; PC users had to wait until 1987 before gaining analogue graphics.

It marked the beginning of affordable desktop publishing, with PageMaker becoming the chosen application. It was first advertised during the Super Bowl in January 1984. The advertisement was based on Orwell's novel 1984 where the Apple Macintosh was portrayed as saving society from the nightmare of Orwell's Big Brother scenario/theory. It became hugely successful and led Apple Computer to produce a series of Apple Macintosh computers. The Apple Macintosh has consistently led the way in multimedia, being significantly more advanced than the PC.

(See GUI.)

Apple Media Tool   A multimedia authoring environment.

Applet   A program that resides on a server and when requested is downloaded and executed by the client browser. Such applets deployed on the Web require machine independence and a virtual processor such as the Java Virtual Machine installed on the client. The applet concept is not new, predating Java by a considerable margin.

(See ActiveX control, Java* and UltraJava.)

Applet Designer Professional   A development tool that permits the development of Java-based database applications and is able to port Visual Basic applications to Java.

(See www.vbnet.com.)

AppleTalk^{TM}   A network capability built into Macintosh computers that permits integration into heterogeneous environments. It may be used with LocalTalk^{TM} cabling, Token Ring and Ethernet.

(See Ethernet and Token Ring.)

Appliance controller   A generic name for hardware through which a computer controls an appliance, such as a mass storage device.

(See Hard disk.)

Application development   A process by which an application is created. In terms of authoring multimedia, the development life cycle might include various standard stages that include:
- project planning
- design
- scripting
- prototyping a storyboard design
- multimedia production
- production
- coding in a multimedia language such as OpenScript or Lingo
- coding in an Internet-related language such as Java, VBScript, JScript, HTML, VRML or Perl.
- coding in general purpose languages such as Visual Basic or Visual C++
- alpha testing
- beta testing
- packaging the application for distribution on a CD variant, or for deployment on a network.

From the perspective of the Web or Internet, application development may require the use of:
- content authoring programs, such as those that permit the generation of animations and carry out multimedia production tasks

Application elements
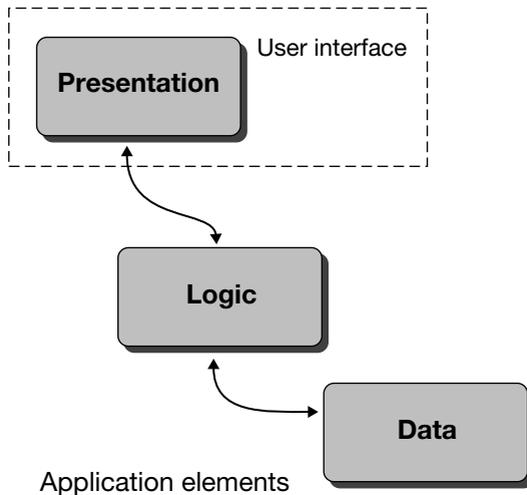
- Web site development tools that permit production tasks such as integrating media with navigation schemes etc.

(See C++, Java, MCIS, VBScript and Visual Basic.)

Application-level gateway   An application-level gateway is able to process store-and-forward traffic and provide security features. It may be programmed to maintain logs of application usage. Users must log in to the application gateway machine.

(See Firewall and Security gateway.)

Application Message Queue   A buffer used in Microsoft Windows to store messages posted by an application using the PostMessage routine. The size of the queue can be set using SetMessageQueue.

Application Programming Interface (API)   An interface that provides programmers with the necessary high-level instructions to implement what would otherwise require a great deal of coding and specialist skills. For example, an API might provide access to the complex functions of a 3-D graphics engine through simple instructions. The underlying mathematical elements are transparent to the programmer, and need not be understood or coded. Multimedia-related APIs are released constantly.

Application renovation   An upgrade path used to modernise legacy systems, such as those based on older mainframe computers. It essentially adds new client and connectivity components. Wall Data is one company linked with both the term and the products that make possible application renovation. The process can be viewed as an alternative to migrating from a

mainframe-based solution to more modern client/server implementations. It offers the advantage of reduced costs, but the relatively high maintenance costs associated with mainframe computers are seen as a disadvantage.

(See Client/server.)

Application software A program or suite of programs designed to perform a particular task, or set of tasks. Mainstream business applications include word processors, spreadsheets, relational databases and contact managers. These are generally included in integrated packages. Examples of applications include:

- integrated packages such as Microsoft Office, Microsoft Works and ClarisWorks
- word processors such as Microsoft Word, WordPerfect and Lotus Word Pro
- spreadsheets such as Microsoft Excel, Lotus 1-2-3 and Quattro Pro
- databases such as Microsoft Access, Paradox and DataEase
- contact managers such as Outlook, Goldmine and those supplied with many integrated packages

The three staple elements of an application are:

- presentation, which is required by those applications that feature user interaction
- logic, which is required to process and manipulate information
- data, which may be of many different types.

The physical, or perceived, locations of the three functional elements depend upon a series of logical topologies devised by the Gartner Group. This is explained under the entry *Client/server*.

(See Client/server and Microsoft Office.)

Arbitrated loop *(See Fibre channel.)*

Archie An on-line database of indexed words from FTP sites that was developed at Montreal's McGill University. The database can be searched using TelNet or by sending e-mail messages that have simple instructions to Archie servers. For example, to find FTP sites and files that contain the word 'occam', the e-mail message would read:

```
set search sub
find occam
```

Archie would then return a listing of appropriate files and FTP sites. This information can be used to download the files using an FTP client program. Alternatively, e-mail messages with appropriate instructions can be sent to the relevant sites.

Architecture   1. A processor architecture refers to the processor's internal design in terms of:

- whether it includes a CISC or RISC instruction set
- multimedia functionality such as MMX technology
- internal cache, and internal cache size
- size of registers
- external and internal data buses
- types of registers
- whether the processor is a von Neumann serial design (such as an Intel Pentium II) or a parallel variant.
- number of devices

2. A system architecture generally refers to the type of operating system and the types of hardware it uses. For example, the hardware and software might be proprietary. 3. An underlying object architecture of an application in terms of the types of objects used, which might be ActiveX controls or even OLE objects. Its glues, such as COM and DCOM, may also form part of an architectural description. *(See Glue.)* 4. An open system architecture is an attempt to standardise hardware and software. The rationalisation of hardware and software standards means that products from numerous manufacturers can be integrated into one system. 5. A firewall architecture includes component parts such as screening routers. *(See Firewall and Security gateway.)* 6. A general term that might be used to refer to the design of hardware and software, ranging from mainframes and networks to applications programs and operating systems (OSes).

Archive   A method of storing files for backup or long-term storage. Removable media that might be used for archiving purpose include 100 Mbyte Zip disks and 1 Gbyte Jaz disks from Iomega, as well as media devices from SyQuest. Other media include conventional hard disks, and CD-R discs and DVD-RAM discs. Various file compression utilities can be used for backup purposes, including the popular WinZip program.

(See DVD.)

ARM   1. Acorn RISC Machine: a computer manufactured by Acorn (UK), which incorporates a RISC (Reduced Instruction Set Computer) processor. It was the first such computer/processor to be brought to market. 2. Argonne Remote Manipulator: an input or user communication device that provides 6 DOF (degrees of freedom).

ARP (Address Resolution Protocol)   An IP protocol that can be used to convert logical IP addresses (such as 18.170.103.34) into physical addresses. An ARP request results in a node's physical address, which might be used by

Ethernet networks, Token Ring and FDDI (which may have a bandwidth of up to 100 Mbps).

(See TCP/IP.)

ARPA (Advanced Research Projects Agency) A US government agency formerly called DARPA (Defense Advanced Research Projects Agency).

ARPANET (Advanced Research Projects Agency NETwork) An early network developed by the then DARPA (Defense Advanced Research Projects Agency) for researchers. Originally coined DARPANET, its development was commissioned in 1969, resulting in a working network of four computers by 1970, growing to 37 computers by 1972, at which time it became ARPANET. Some assert that DARPANET was the technical and possibly conceptual birth of the information superhighway or Internet. The key development resulting from ARPANET is the TCP/IP family of protocols. ARPANET ceased to exist in 1990.

(See TCP/IP.)

Array 1. A two- or three-dimensional matrix of data values. The values might be characters, numerals or even binary objects. All modern high-level programming languages support arrays. The concept is similar to the use of tables in databases and data warehouses. *(See Data warehouse.)* 2. An uncommitted logic array (ULA) is an electronic package that has electronic devices (or gates) that are unconnected. By adding the connections in the form of a metallisation layer, the ULA is given a specific functionality. 3. A transformation array is used to manipulate a 2-D or 3-D set of coordinates.

(See 3-D.)

AS/400 An industry-standard IBM computer system.

ASCII (American Standard Code for Information Interchange) A standard set of codes introduced to promote compatibility in terms of characters and symbols. Originally it consisted of 127 ASCII characters derived from seven bits. The eighth bit was not used in order to preserve the sign bit. ASCII has since been extended into a larger highly standardised character set.

ASF (Advanced Streaming Format) A storage container data format (and standard) for streaming multimedia. The contents of the container are not defined, and neither is the communications protocol which may be:
- HTTP
- TCP

- RTP
- UDP.

The ASF container file contents are read by an appropriate media server and transmitted to the client, where they may be stored or played.

(See MPEG* and Streaming*.)

ASP (Active Server Page)   A web page technology which supports ActiveX scripting and all modern Internet languages. It has a .ASP extension, and its components may be altered independently, following which they are compiled when the Web page is loaded. The technology is included with IIS 3.0, which may be used to develop scalable browser-independent Internet applications. DCOM and COM may be used as glues within ASP-based applications. The resulting Web applications can acquire information about the client browser and act accordingly. This enables compatible HTML pages to be served to the browser without error messages. Web browsers that are not ActiveX-compliant, for instance, can be served appropriate Web pages. This intelligence facet is integrated into the architecture using server-side scripting. The Microsoft Active Server provides the component parts to implement the aforementioned functionality, and includes the following:

- browser capabilities, which acquire the connected browser's key features
- ActiveX Data Object (ADO), which provides access to back-end data (irrespective of its location) and is not limited to ODBC-compliant data sources
- TextStream, which is used to create and open files.

Third-party and bespoke components can be integrated into an Active Web site. Such components are devoid of user interfaces (UIs), and can be developed using an ActiveX control developer's workbench, including:

- Visual Basic
- Visual C++
- Visual C++ ControlWizard, which is used for OLE development
- ActiveX Software Development Kit

Active Server components fall into the categories of:

- in-process
- out-process.

Active Server Pages (ASPs) are seen as an alternative to CGI, and offer the advantages of:

- shorter Web application development life cycle, particularly with developers/development teams that have little CGI programming experience

- optimised server-side processing, because calls to CGI programs may invoke new processes on the server.
- easier renovation through independent alteration of server components /files. *(See Active Desktop, Active server, ActiveX and CGI.)*
- support for ActiveX scripting and for modern Internet languages.

Aspect ratio   1. The ratio of the height and width of a display. Scaling still or moving images proportionately requires maintenance of the aspect ratio. Typical resolutions include 640 × 480 pixels, 800 × 600 pixels, 1024 × 768 pixels, 1280 × 1024 pixels and 1600 × 1200 pixels. Each yields an aspect ratio of exactly 3:4 (except for 1280 × 1024, which has a 4:5 aspect ratio). DVD video playback offers a choice of aspect ratio in order to accommodate the wide-screen film format. 2. The ratio between the height and the width of a pixel, which can be used to determine how close they become to being square-shaped, which is often desirable. The aspect ratio of pixels depends on the monitor's screen design. In the case of CRT monitors, the aspect ratio hinges on the deposits of red, green and blue phosphors and on the mask or screen behind them, which helps focus the electron gun. Early computer monitors tended to feature rectangular pixels, but things changed most noticeably when Apple introduced displays with square pixels. Manufacturers in the PC market quickly followed suit.

Assembler   1. A compiler which converts assembly language mnemonics into machine code. *(See Assembly language.)* 2. A device which assembles received packets in a packet-switched network.

Assembly language   A low-level language used to program processors directly. It consists of mnemonics (such as LDA, DEC A and INC A), as opposed to the more readable statements associated with high-level languages such as Java and C++. Assembly language is loosely referred to as machine code, when in actual fact it requires an assembler to compile it into machine code. Of all the generations of program languages, it is the closest to machine code.

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

As We May Think   A prophetic and momentous article published in July 1945 in *Atlantic Monthly*. Its author, Vannevar Bush, Science Adviser to President Roosevelt, put forward a new paradigm for information storage and retrieval. He foresaw the imminent miniaturisation of storage media, and described a central repository of published information accessible via multiple access points. Calling it Memex, its functionality approximated that of the evolving Internet, Infobahn, or information superhighway. As such,

Memex may be considered the conceptual birth of the Internet. Vannevar's vision relates to hypertext. Hypertext set a familiar continuum in motion, first yielding hypermedia that introduced still images and later modern multimedia that added computer animation, motion video, synthesised sound and digitally recorded waveform audio to hypermedia. Multimedia currently drives an ongoing re-evaluation of the way we store, retrieve and communicate information, as well as the way we generally think. It is reasonable to state that the near-term final stage in the continuum will be immersive virtual reality (VR) and a total integration of multimedia as an information communication medium within that environment. A noticeable underlying trend in the evolution of modern media is an increasing dependence upon concurrency; the growing number of human sensory channels interfaced concurrently renders tours within the medium more memorable.

Asymetrix   A company founded in 1985 by Paul Allen, who, along with Bill Gates, also founded Microsoft. Asymetrix is a leading developer and publisher of Windows-based multimedia and client/server application development tools. Its headquarters are in Bellevue, Washington, and its European operation centres around its Paris offices, with further subsidiaries in London and Munich. Its flagship product is Multimedia ToolBook.
(See OpenScript and ToolBook.)

Asymmetrical compression   A compression/decompression algorithm in which the processes that constitute compression are not reflected in decompression.
(See DCT, JPEG and MPEG*.)

Asynchronous   A data transmission technique where the sending device and receiver are not synchronised in real time. Each transmitted item, or packet, is encoded with start and stop bits, so that the receiving device can decode it without ever receiving a timing signal from the sending device. Because the asynchronous data transmission technique makes good use of available bandwidth or data rates, it is particularly suitable for networked multimedia.

Asynchronous messaging   A mode of communications between running threads, where a call from one thread to another does not require a response before it may continue processing. Rather it proceeds processing, and receiving and sending messages.

AT (Advanced Technology)   The suffix used in IBM's PC AT, which saw the introduction of the ISA expansion bus.

ATA-2   A disk interface technology, which includes a controller. Like all others, it is an evolving disk controller specification.

(See Hard disk.)

AT command set   A set of attention commands that can be used to control modem functions. The commands were devised by Hayes for use in its modems, and are often called Hayes commands. They can be used to set various modem properties, and all but two of them have the prefix AT. AT commands are entered using a communications program such as Windows HyperTerminal or Windows Terminal. In certain instances the communications software might generate AT commands automatically in response to the user's selected options. AT commands include the following:

- ATA: Answers a call manually when the modem returns the RING result code
- ATDT <number>: Dial a number
- ATE command: Character echo
- ATE<0 | 1>: Toggle character echo, which allows you to see characters as they are typed
- ATE, ATE0: Disable character echo
- ATE1: Enable character echo
- ATH Command: Hang up
- ATH: Disconnect a connection
- ATI Command: Product information
- ATI, ATI0: Product identification code request
- ATI1: Fetch checksum of firmware revision
- ATO Command: Return to online data state
- ATO: Return the modem to the data state if the modem had been in the offline mode
- ATQ Command: Enable result
- ATQ<0 | 1>: Control the modem's handling of result codes
- ATQ, ATQ0: Enable result codes (default)
- ATQ1: Disable result codes
- ATS Command: Display/configure S registers manage s register(s)
- ATS<reg>=<value>: Sets S register <register_number> to <value>
- ATS<reg>?: Show the value of a specified S register
- ATS?!: Show all configurable S registers
- ATS?: Show the contents of the register last accessed
- ATS=<value>: Load a value into the register that was last accessed
- ATV Command: Result code format. Result codes are stored in some communications programs when opening and closing connections. These can be returned in the form of numbers or words
- ATV, ATV0: Show numeric result messages

- ATV1: Show numeric result messages
- ATW: Extended result code support
- ATW1: Enable extended result codes

(See Access technology and Modem.)

ATM (Asynchronous Transfer Mode) An internationally agreed tele-communications standard which supports transmission line speeds of up to 622 Mbps. Other line speeds include 2 Mbps, 12 Mbps, 25 Mbps, 34 Mbps, 45 Mbps, 52 Mbps and 155 Mbps. The CCITT accepted ATM in 1990 as an internationally agreed standard for data, voice and multimedia networks. ATM bases itself on cell relay, which is a form of statistical multiplexing similar to packet switching. The data transmission consists of cells which have 53 octets or bytes, including a 5 octet header. Using 52 Mbps line speed, a single cell can be transmitted in:

```
53×8/52 Mbits=8.15=10⁻⁶
              =8.15 microseconds
```

The cells from different signals are interleaved, and the signal propagation delay or jitter is a function of the transmission line speed. It is sufficiently low to give a stream of contiguous cells, which is acceptable for real-time data, voice, audio and video transmission. Like packet headers, cell headers contain destination addresses.

(See Frame relay.)

AT&T (American Telephone and Telegraph) A telecommunications company (or telco).

Attachment A file that is sent and received along with an e-mail message. The file may be binary or text, and is opened using an appropriate application.

(See E-mail.)

Audio block A block of audio data on a CD-DA or CD-ROM disc used to store audio data. There are 2336 bytes in a CD-DA block.

(See CD-ROM.)

Audio compression A general term used to describe the process of reducing the size of audio data. Compressed audio data may be decompressed and played using streaming audio technologies. In uncompressed form the large size of wave audio files occasionally places unreasonable demands on distribution media in terms of data capacity and/or bandwidth. Wave audio compression operates on the actual audio data, compacting it in

order to give smaller file sizes. It is decompressed on playback using either dedicated hardware and software or software alone, such as an appropriate driver in the Windows environment. Standard wave audio compression algorithms include A-Law, IMA (Interactive Multimedia Association) ADPCM and MPEG-1. MPEG-1 compression wave audio tools include PixelShrink, XingCD and XingSound. The latter can compress wave audio files and record and compress audio from an analogue source in real time. It can also be used to perform standard editing operations on MPEG-1 wave audio files, including cut and paste. Whatever compression standard is used, the resultant file sizes, or the compression ratios achieved, depend on the compressor parameter settings chosen. As the compression ratio is increased, the resultant playback quality diminishes. High-quality wave audio, therefore, tends to be compressed by a great deal less than a dialogue recording, for instance.

(See Streaming*.)

Audio Video Interleave   *(See AVI.)*

Authenticode   A technology supported by the Microsoft Internet Explorer, which permits components such as ActiveX Controls and Java applets to be digitally signed. When such a signed component is encountered, Explorer checks its signature status. An unsigned component causes Explorer to display an appropriate prompt, while a signed component causes Explorer to display a certificate. The certificate includes information about the component and its author. The user is given the option to download the component.

Authoring   The process of developing a multimedia application, which may include the processes of:
- design
- scripting
- agreeing on the content required in terms of images, video, text and sound
- developing an interactive design
- prototyping
- implementing the interactive design
- testing the interactive design
- multimedia production
- digitising text
- digitising images and retouching them in-house or using an appropriate bureau
- recording wave audio files
- composing Midi files

Multimedia authoring
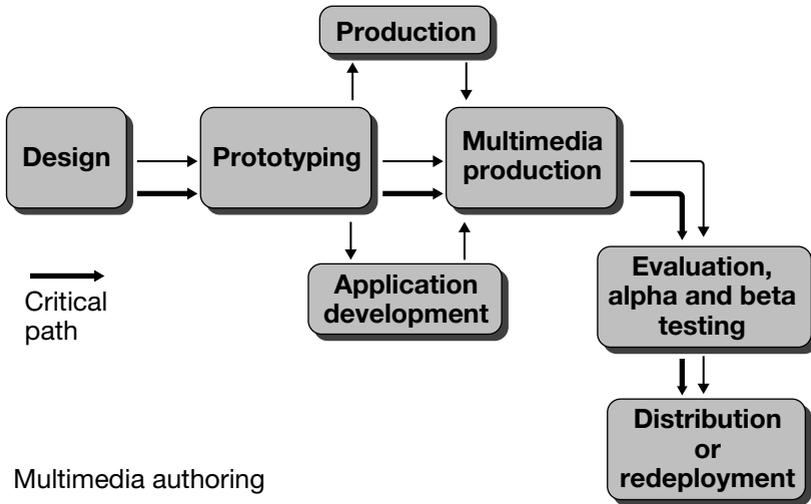
- capturing video files
- application development
- implementing the interactive design
- production
- uniting acquired media files with the interactive design
- testing.

CD-based authoring requires an authoring station and authoring tool such as Icon Author, Macromedia Authorware Professional or Asymetrix Tool-Book. For Multimedia production, or the creation and gathering of all necessary media files, it might be necessary to use:

- video capture software and hardware such as VidCap and a Video-Blaster card
- video editing software such as VidEdit
- wave audio recording and editing software
- a midi sequencer such as CakeWalk.

Authoring consists of design, multimedia production, navigational scheme design and production. For distribution purposes, disc pressing or deployment over a network may constitute a final stage.

(See Authorware, Lingo, OpenScript and ToolBook.)

Authoring station   A hardware platform and software tool required to author a multimedia application. Normally it will have a video capture card and a digital sound recording facility. It may also provide a means through

which the resultant material can be submitted to a replication company for mastering and manufacture.

Authoring tool   A program or program suite which permits the creation of multimedia applications. Generally it is more complex than a presentation program, providing more advanced features such as indigenous or standard authoring/programming languages which are often visual in nature. *(See Authoring language, Lingo and OpenScript.)* Occasionally, authoring tools are bundled with bitmap editors (graphics programs), palette editors, and video capture and editing programs. Modern authoring tools permit the deployment of applications over the Internet. Popular authoring tools include:

- Authorware Professional
- Asymetrix ToolBook Assistant/Instructor
- IconAuthor.

Modern authoring tools aimed at the production of CD-based multimedia should provide cost-effective migration paths to the Internet. They should also provide support for Java applets, as does Asymetrix ToolBook Assistant.

(See Authorware Professional and ToolBook.)

Authorware Professional   An authoring tool for Windows-based multi-media applications produced by Macromedia. The authoring process consists of dragging objects onto a flowline, which runs vertically in its own window. Authorware is considered to require no programming skills.

(See Lingo, OpenScript and ToolBook.)

Auto-answer   A feature that permits a modem to respond appropriately to an incoming call.

Autodesk 3D Studio   A 3-D animation development program.

Autodesk Animator Pro   A 2-D animation development program.

Auto-dial   A feature integral to all fully specified communications (comms) programs that permits stored telephone numbers to be dialled automatically.

Automatic speed fallback   A modem that matches its data transfer rate with that of a communicating device or network.

Availability   *(See MTBF and Reliability.)*

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AVI (Audio Video Interleave)   A Microsoft file format for storing inter-leaved audio and video. When introduced in 1990 it quickly became an industry standard. Many video editing and video capture tools allow the interleave ratio to be varied. The ratio can be specified as a single figure where, for instance, an interleave ratio of 7 indicates that seven video frames separate each audio chunk. Using Microsoft VidEdit, the statistics of a video file can be shown, where the interleave ratio is displayed along-side the phrase Interleave Every. Generally, high interleave ratios are applicable to video stored on hard disk, whereas .AVI video stored on a CD variant is optimised using lower interleave ratios, which often equate to one video frame for every audio chunk. Video stored in the AVI format can be compressed using various schemes, including Intel Indeo, Microsoft, Cine-pak and Microsoft 1. The sound track quality commonly found in AVI files ranges from mono 8 bit recordings digitised at 11 kHz to 16 bit stereo recordings digitised at 44.1 kHz.

(See MPEG* and Video*.)