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dictionary of e-business

a definitive guide to technology and business terms

second edition



Francis Botto

**DICTIONARY OF
e-BUSINESS**

**A Definitive Guide
to Technology
and Business Terms**

Second Edition

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FRANCIS BOTTO



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PREFACE

This dictionary defines important terms and phrases relating to e-business in the context of design, development and usage. It addresses the many milestone decisions, implementation processes and technologies along the migration paths that lead to e-business sites, as well as those along the paths that lead away from them. These deliverables via the Internet or World Wide Web provide a borderless world with geographically insensitive marketing, advertising and selling channels. Wall Street's response to this most contemporary of 'gold rushes' sees company revenues sky rocket as Web sites make the transition from specialist entities to global successes. Virtual stores, search engines, information services, and the many other Internet-related terms now grace the vernacular of Internet Investors and analysts the world over.

A myriad of migration paths to e-business Web architectures exists as the surrounding technologies develop at a pace, and as new and advancing methodologies dictate change. A notable change is the emergence of 3rd generation (3G) mobile networks that are poised to advance the application of m-commerce (mobile commerce) where users may make purchases using mobile handsets or phones

In spite of the seemingly singular medium that is the World Wide Web, CD-based applications continue to play a role with DVD variants offering high quality MPEG-2 video and an attractive medium for POI or E-catalogues. Hybrid CD-ROM and DVD-ROM multimedia productions may provide the local delivery of high quality video as well as present hyperlinks to e-business Web sites for on-line ordering and for transaction processing.

E-business is another important chapter in the evolution of the role of technology in commerce. It is shrouded in a multiplicity of questions that this dictionary seeks to address through an in-depth study of the technologies, the services, their acquisition, migration paths, investment strategies and comparative advantages. More than a glossary or dictionary with scant definitions, it includes informative essays that address key issues.

It is hoped that you find this text a useful source of information.

Francis Botto

INTRODUCTION

E-business is an awesome, fast changing subject, driving multiple paradigm shifts that are as radical as those that splintered from the industrial revolutions with all their recorded social, economic and technological impacts. For the first time virtual stores may provide advertising and selling channels leading to the global market.

The benefits of e-business have been the focus of numerous papers, publications and conferences for some time, and far outweigh the much-publicised potential pitfalls that include security and the threat of larceny resulting from illegally obtained customer payment details, and the threat of an exodus of traders from the high street.

Industry's response to the security issue has proved technically complex with numerous solutions having been driven into obsolence in what seems like a fleeting moment. Standardisation and advancements in security – that continue to exhibit minor flaws – see today's secure e-business sites win the confidence of consumers, banks and notable credit card companies including Visa and MasterCard. E-business technology and the Web in general is shaped by the:

- constantly updated developer's workbench that includes Microsoft Visual Studio.NET
- advancing operating systems (OSes) like Windows, Mac OS X, Linux and Unix
- evolving programming languages such as Java, JavaScript, XML, HTML, DHTML, C++, C#, Objective-C, Visual Basic and VBScript
- developing *Object Web* with its standard components and building blocks
- constantly updated mainstream Web site development tools from software publishers that include Microsoft, Asymetrix and Macromedia.

The aforementioned technologies are driving change, and are being driven themselves by underlying hardware advancements including:

- new processors primarily from Intel (and other chip makers)
- client/server architectures that use server technologies like SMP, NUMA, and MPP

-
- advancing peripheral devices including modems
 - the vast network that supports the Internet, including physical or wireless digital pathways and mobile networks
 - more efficient protocols.

Access technologies like ISDN and cable are part of the English language, with many people enquiring of their existence when buying or renting a property. To the vast audience currently benefiting from e-business, these are as transparent as the methodologies and the multiplicity of complex processes and sub-processes that constitute the development life cycles of Web sites. The same may be said of the development life cycle required to produce the tools and technologies themselves, where the levels of granularity and technical detail are incomprehensibly fine for all but those directly involved with their creation.

Everyday e-business terms and phrases are entering the English language at a pace, and are beginning to frequent dictionaries of a general nature; terms that are prefixed by *on-line* are widespread, including *on-line shopping*, *on-line banking*, *on-line share dealing*, *on-line travel agencies* etc. E-business is yet another feature of modernity driven by the Internet and by technology as a whole, and is a new specialisation for analysts, and for industry professionals such as Web site designers, developers, researchers and technologists. Many new technologies, software enhancements and development tools are now prefixed by the term e-business, and it drives new global markets in the effort to capitalise on the swing of consumer shopping habits towards the Internet.

Coordination is a key feature pinned to that ubiquitous growing entity that has come to be known as the Internet or to some, the Information Superhighway. More than ever, standards organisations including the Object Management Group (OMG), ITU, ISO and SET provide makers with the opportunity to develop compatible products and at the same time reduce wasted resources and expended energies while attempting to forge proprietary standards. Not that major manufactures will ever be relieved of this effort, but the growing transparency of hardware platforms from a Web-based e-business application viewpoint introduces stability and reassurance for those investing in such implementations and services.

E-business implementations used to address the mass market are at the heart of the current revolution, but more specialist impacts such as those in banking, stock markets, and money markets might be considered more significant as they are influential in determining the performance of an economy. A country's IT infrastructure, as well as those of its enterprises, drives trade at home and abroad.

Selling via the direct channel off the page or over the telephone or via TV shopping is meant to offer the consumer savings, but the theoretical price differential does not always favour the direct seller. Some of the consumer electronics giants favour high street and out-of-town stores with lower prices

as they prefer to win consumer confidence by allowing them to experience their products at first hand. Furthermore shopping in conventional stores is perceived as a leisurely experience to many consumers. Whatever arguments are presented, it seems that it is most probable that numerous sales channels will serve consumers, giving more choice, but the price differentials that exist between them will eventually subside as a slightly imperfect equilibrium takes hold.

Francis Botto

NUMERALS AND SYMBOLS

& An ampersand symbol used as a prefix in the hexadecimal counting system.

***** A wildcard that may be used as a substitute for an undefined series of characters in a search string.

.COM A domain category that generally signifies a commercial enterprise.

.JPG An extension for JPEG files.
(See *DCT* and *JPEG*.)

.NET A Microsoft initiative and strategy for OOP-based development tools and languages that include VB.NET (Visual Basic), and supports:

- Inheritance
- Structured exception handling
- Garbage collection
- Object capabilities like parameterised constructors and shared members.

.NET is a departure from the COM-based strategy, and was announced in Orlando, Florida, in July 2000 at the PDC (Professional Developers Conference). The .NET framework includes:

- languages
- environments
- execution platform
- class libraries
- built-in functionality
- protocols such as SOAP (Simple Object Access Protocol) as an Internet glue
- server-based products called .NET Enterprise Servers that will replace Microsoft BackOffice.

The .NET initiative also embodies the Microsoft products:

- SQL Server 2000
- Commerce Server 2000
- BizTalk Server
- Exchange 2000
- Host Integration Server
- Internet and Security Administration (ISA).

VS.NET (Visual Studio.NET) is the IDE and framework used by all .NET developers.

(See *VB.NET*, *DNA*, *Visual Studio.NET* and *Visual Basic*.)

.NET My Services (MS) Microsoft® .NET My Services is a number of XML Web services that may be developed into Web sites/services, applications and devices. .NET My Services are user-oriented, where the emphasis is on user data, and not applications, platforms, or devices. .NET My Services includes the security and privacy of the Microsoft .NET Passport service. Standard XML Web services are platform independent. .NET My Services serve XML-based user data that is interpreted and rendered by the target device. Use is made of the XML Message Interface (XMI) that is bound to a .NET Passport Unique ID (PUID) – which identifies a user or group of users.

.NET My Services Operation .NET My Services are XML Web services accessed over HTTP or DIME using SOAP messages holding XML data, and using the .NET Passport authentication.

.NET Passport Authentication .NET Passport uses the Kerberos distributed security protocol that is a proven industry standard and is also used by Microsoft® Windows® 2000 and XP. Kerberos authenticates client requests and distributes tickets or temporary encryption keys:

1. The user clicks on the .NET Passport sign-in scarab, and enters a sign-in name and password.
2. A request is made to .NET Passport for a ‘ticket-granting-ticket’ (TGT).
3. If appropriate, .NET Passport grants the TGT that may be cached.
4. The client presents the TGT to .NET Passport or ‘ticket granting server’ (TGS), and request is made for a session ticket.
5. .NET Passport uses TGTs to verify clients and to validate tickets, and then returns a session ticket and session key to the requested .NET My Services service.
6. The client or Web site sends the session ticket to the .NET My Services service.

.ORG A domain category that generally signifies an organisation.

(See *Domain*.)

/ A forward slash used as a separator in URL addresses such as `https://www.FrancisBotto.com`, and to integrate comments in many languages.

/etc/passwd A Unix file used to store passwords.

(See *Unix*.)

? 1. A part of a URL address that marks the beginning of data used by a CGI program that may be executed using a GET method. The URL defines the CGI program (such as `credit.cgi` for example) and the accompanying data used by the server that follows the question mark:

```
www.FrancisBotto.com/cgi-bin/credit.cgi?subject
=transaction
```

2. A wildcard that may be used as a substitute for a single undefined character in a search string.

(See *CGI Environment variables*.)

<? xml version='1.0'?> <! DOCTYPE wml PUBLIC "-//WAPFORUM//DTD WML 1.2//EN" A WML document prologue that declares the WML deck as consisting of XML statements. The second line defines the document using the DTD (Document Type Definition) mnemonic as adhering to the WAP Forum WML 1.2 specification.

(See *WML*.)

<APPLET> An HTML tag that encloses a Java applet.

(See *Applet and Java*.)

<EMBED> Browsers harness plug-ins using the **<EMBED>** tag that includes the SRC attribute that points to the file used. The following form plays a sound file called `mozart.wav` using a plug-in:

```
<EMBED SRC="mozart.wav" HEIGHT=40 WIDTH=100>
```

(See *Plug-in*.)

<FORM> A HTML tag for creating forms:

```
<FORM NAME="Customer" ACTION="http://botto.com/cgi-bin/
form/cgi METHOD=get>
</FORM>
```

The **<FORM>** tag may have the attributes:

- NAME that is the form's name.
- ACTION that indicates the URL where the form is sent to.
- METHOD that indicates the submission method that may be POST or GET.

- **TARGET** that indicates the windows or frame where the output from the CGI program is shown.

<INPUT TYPE> An HTML tag used to define input components such as radio buttons. For example, using HTML you may add radio buttons using the following form that merely displays four radio buttons labeled £30, £40, £50 and £60:

```
<FORM>
NAME="Customer" ACTION="http://botto.com/cgi-bin/form/cgi
  METHOD=get>

<INPUT TYPE="radio" NAME="rad" VALUE="1">
£ 30
<INPUT TYPE="radio" NAME="rad" VALUE="2">
£ 40
<INPUT TYPE="radio" NAME="rad" VALUE="3">
£ 50
<INPUT TYPE="radio" NAME="rad" VALUE="4">
£ 60
</FORM>
```

(See *HTML*, **<META>**, **<TITLE>**, *Search engine and Web page description*.)

<META> A HTML tag which may be used to enclose descriptive meta data used by search engines as an alternative to the 200 characters that follow the **<BODY>** (See *HTML*) tag.

```
<HEAD>
  <TITLE>Francis Botto home page</TITLE>
  <META name="description" content="IT Research">
</HEAD>
Francis Botto
  IT Research
```

The **<META>** tag may also be used to add keywords of up to 1,000 characters to a Web page, and may be retrieved through appropriate search phrases, i.e.:

```
<META name="keywords" content="Multimedia, MPEG, DVD">
```

(See *Search Engine*, **<TITLE>** and *HTML*.)

<tag attr = "wxyz"/> A WML attribute that specifies additional information about an element.

(See *WML*.)

<tag/> A WML structure that identifies elements without content.

(See *WML* and **<tag>content</tag>**.)

<tag>content</tag> A WML expression that specifies elements holding content in the WML deck. These may be:

- Tasks performed in response to events
- Character entities
- Card delimiters.

(See *WML*.)

<TITLE> A HTML tag that encloses the Web page title that is used as meta data by popular search engines when retrieving Web documents, displaying it as the document's title. Such data is collected by search engines periodically, but may remain transparent to some if your ISP uses a robots.txt file to stop web robots from indexing Web pages. It is possible to determine if a server has a robots.txt file by entering the Web page's URL (including its domain name and domain category) and including robots.txt as a suffix:

- <http://www.FrancisBotto.com/robots.txt>

Sending Web page URLs to search engines may cause them to be categorised as available via additional search words and phrases, other than those contained in the Web pages themselves.

(See *HTML*, *<META>*, *<TITLE>*, *Search engine and Web page description*.)

1 billion A 30 bit digital video, animation or colour graphic may have up to (around) 1 billion (2^{30}) colours.

1,000 The number of bits transferred in one second, using the unit Kbps.

1,000,000 The number of bits transferred in one second using a 1 Mbps data transfer rate.

1,024 1. A Kilo Byte (KB) has 1,024 Bytes. 2. A Mega Byte (MB) has 1,024 Kilo Bytes. 3. A Giga Byte (GB) has 1,024 Mega Bytes. 4. A Tera Byte (TB) has 1,024 Giga Bytes.

1.2 Mbps A data transfer rate measured in Mbits/sec, and one for which the original MPEG-1 video standard was designed. It is the approximate data transfer rate that is offered by single-speed CD variants like CD-ROM. 1.2 Mbps approximates 150 Kbytes per second.

(See *CD-ROM*.)

1.2 mm The thickness of a DVD or CD disc variant.

(See *CD-ROM and DVD-ROM*.)

1.44 Mbytes The formatted data capacity of a 3.5 in high-density floppy disk for the PC.

1.544 Mbps 1. A data transfer rate offered by a single T1 line. (*See T1.*)
2. A data transfer rate of a primary rate multiplex of 255 channels of 64 Kbps ISDN channels.
(*See ISDN.*)

1024-by-768 A standard display resolution sometimes referred to as XGA (eXtended Graphics Array).

10base2 An industry name for thin-Ethernet or cheapernet LAN technology. It uses inexpensive coaxial cable, and is popular for small networks. Compliant network computers /devices are fitted with Ethernet cards (or chipsets) and are connected using coaxial cables.
(*See Ethernet and LAN.*)

10base5 An industry name for basic Ethernet LAN technology. Network computers /devices are fitted with Ethernet cards (or chipsets) and are connected using coaxial cables. It provides 10 Mbits/sec data rates up to a distance of 500 m.
(*See Ethernet and LAN.*)

1600-by-1200 pixels A standard graphics resolution used on many PCs, and its delivery requires an appropriate graphics card and display.

1995 1. The year when the World Wide Web became a 3-tier client/server architecture based on the HTTP/CGI model. (*See 3-tier, CGI and HTTP.*)
2. The year when SunSoft announced the Java programming language.
(*See Java.*)

1999 The year when SunSoft launched its Jini technology and JavaSpaces.
(*See Jini.*)

1G Network (First Generation) A category of public analogue mobile network that offers mainly telephony services, and may be assumed to be obsolete in most developed countries. In 1977 Illinois Bell introduced the cellular network AMPS (Advanced Mobile Telephone System) that was developed by AT & T's Bell Laboratories and operated between the 800 MHz and 900 MHz bands. The development of GSM (Global System for Mobile Communications) began in 1982, and emerged globally in 1993.

Early 1G networks offered small capacities, because they were not cellular, and an early internationally agreed standard analogue network did not exist. Standard national networks included Nordic Mobile Telephone (NMT-Scandinavia), Total Access Communications System (TACS), C-Netz (West Germany), Radiocomm 2000 (France) and, of course, Advanced Mobile Phone Service (AMPS).

The UK adopted TACS that was based on AMPS but using the 900 MHz frequency band; TACS became successful in the Middle East and in Southern Europe. The American AMPS standard used the 800 MHz frequency band and was also used in South America, Far East, and in the Asia Pacific region including Australia and New Zealand. In the Asia Pacific country of Japan, NTT's MCS system was the first commercial delivery of a mobile 1G Japanese network. While most first-world countries are closing 1G networks, many Less Developed Countries (LDCs) are actively investing in, and upgrading, them. (See 2.5G, 3G, GPRS and UMTS.)

2.5G EDGE EDGE is an overlay solution for existing ANSI-136/TDMA networks, and may use the existing ANSI-136 30 kHz air-interface. EDGE is on the migration path to UMTS, and may even co-exist with it so as to provide services for wide-area coverage. EDGE standards support mobile services in ANSI-136/TDMA systems with data rates of up to 473 kbps.

A significant change in the ANSI-136/ TDMA standards to support higher data rates is the use of modulation schemes including 8-PSK (Phase Shift Keying) and GMSK (Gaussian Minimum Shift Keying). GMSK provides for wide area coverage, while 8-PSK provides higher data rates but with reduced coverage.

(See 3G.)

2.5G HSCSD HSCSD (High-Speed Circuit-Switched Data) usually uses a maximum of four time slots (that may be 9.6 Kbps or 14.4 Kbps) for data connections. Because HSCSD is circuit switched, used time slots are constantly allocated even when there is no transmission. This disadvantage makes HSCSD appropriate for real-time applications with short latencies. HSCSD also requires appropriate handsets that are not as widespread as GPRS for example, but at the same time HSCSD is a less expensive network upgrade than GPRS for operators.

2.5G Networks A category of public mobile network that offers improved data rates by adding an overlay such as GPRS (General Packet Radio Service) to a 2G network like GSM. Other 2.5G solutions include HSCSD (High-Speed Circuit-Switched Data) and EDGE (Enhanced Data Rates for Global Evolution).

2B + D Using the basic rate interface (BRI), this denotes two bearer (2B) channels and one (D) ISDN channel.

(See ISDN.)

2-D (Two dimensional) An image that may be visualised from a 2D vector coordinate data set, and is devoid of the Z dimension of depth. [X, Y] vector coordinates may be used to store the image data in an array that may

be held in memory, or on hard disk or on other DSMs like CD-ROM or DVD. Sets of 2D coordinates are manipulated using a transformation matrix [T], and in the case of ordinary coordinates this is a 2-row matrix:

$$[X, Y][T]=[X1, Y1]$$

To accommodate a three-row transformation matrix, the homogeneous coordinate representation is used where [X, Y] becomes [X, Y, H], and the resulting transformed coordinate set may be normalised so it can be plotted.

(See 3-D.)

2-D curve A curve that is devoid of the Z dimension, and may be generated or visualised using:

- a set of 2-D vector coordinates, or 3-D homogeneous coordinates stored in an array. This method may be considered an inefficient use of memory (if the coordinates are stored within the code itself) but improves the speed of drawing and transformation.
- coordinates generated using an equation (i.e. $x = \cos(y)$) and then written to an array; as used memory is reclaimed after plotting, it is regarded as memory efficient but requires more processing.
- coordinates loaded from a mass storage device such as CD-ROM, DVD or hard disk, or downloaded from a server.

(See 2-D and 3-D.)

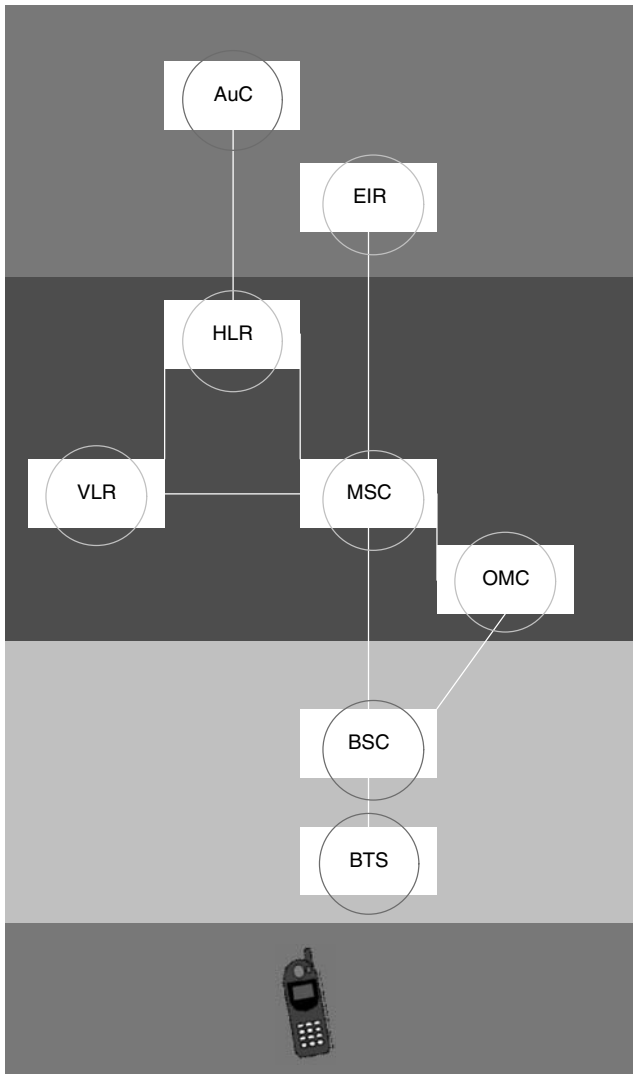
2G Network (Second Generation) A category of public mobile network offering the earliest mobile digital telecommunications and includes variations of:

- Global System for Mobile (GSM)
- Digital-AMPS (D-AMPS)
- Code Division Multiple Access (CDMA – IS95)
- Personal Digital Cellular (PDC).

Typically a 2G GSM network provides users with data rates of 9.6 kbps or 14.4 kbps.

Two GSM variants include Digital Cellular Systems 1800 (DCS-1800 or GSM-1800) and PCS-1900 or GSM-1900 that is used in North America and Chile. The different frequency is used because of the lack of capacity in the 900 MHz band. The 1800 MHz band accommodates a larger number of mobile users particularly in densely populated areas. The coverage area of 1800 MHz networks is often smaller, and therefore dual band phones are used, able to roam between either network.

ETSI has also published GSM-400 and GSM-800 specifications, with the former suited to large geographic area coverage, and can therefore be used in conjunction with higher frequency band networks in sparsely populated regions.



AuC: Authentication Centre. EIR: Equipment Identity Register.
GGSN: Gateway GPRS Support Node. HLR: Home Location Register.
ISDN: Integrated Services Digital Network. MSC: Mobile Switching
Centre. VLR: Visitor Location Register.

Comparable to GSM, DCS-1800 (Digital LPC Cellular System) is used in the UK. It operates in the uplink radio band between 1710 MHz and 1785 MHz and can be assumed to provide a user data rate of 9.6 kbps, and exhibits a 250 km/hour speed threshold on the mobile station.

GSM Network Operation 1. When switched on, a mobile phone registers its presence with the nearest MSC that is then informed of the location of the mobile user. 2. If the user is outside the geographical area of the home MSC, the nearest MSC will implement a registration procedure. This procedure uses the home MSC to acquire information about the mobile device. This information is held by the home MSC in a database called the home location register (HLR) that holds mapping information necessary so as calls can be made to the user from the PSTN (Public Switched Telephone Network). The local MSC duplicates part of this information in the VLR (Visitor Location Register) for as long as the caller is in the MSC area. 3. Normally one HLR and one VLR is associated with each MSC that provides switching, and a gateway to other mobile and fixed networks. 4. Mobile devices have SIM chips holding user identification and configuration data. SIM chips permits an authorisation procedure to be implemented between MSCs and EIRs (Equipment Identification Register). The EIR has a black list of barred equipment, a grey list of faulty equipment or for devices that are registered for no services, and a white list for registered users and their service subscriptions.

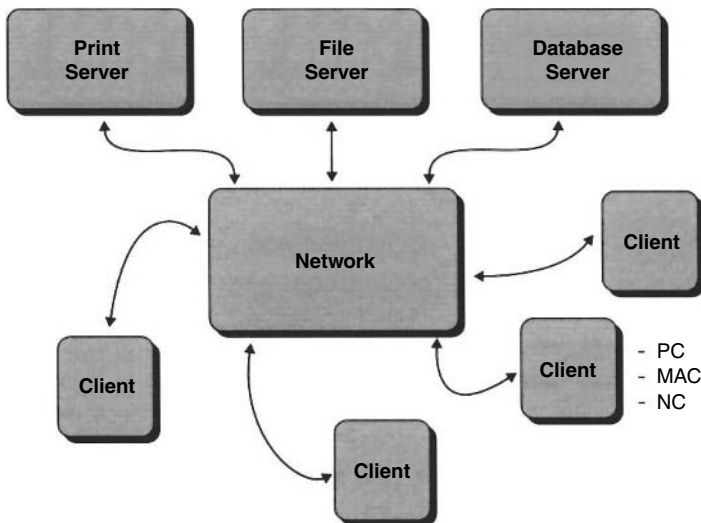
When either voice or data traffic originates at the subscriber terminal, it goes over the air interface to the BTS, from where it goes to the BSC.

2G Origins In 1982 CEPT (Conference Europeene des Postes et Telecommunications) assembled the Groupe Special Mobile (GSM) committee so as to specify a pan-European cellular radio system that would increase the capacity of the analogue systems like the Nordic Mobile Telephone system, NMT. A pan-European bandwidth of 890–915 MHz and 935–960 MHz was agreed. The proposed systems were piloted in Paris in 1986, when ELAB's offering was chosen. By June 1987 a narrow-band TDMA system based on ELAB's was agreed, and would support eight (and eventually 16) channels per carrier. GMSK was chosen because of its improved spectral efficiency, and the initial drafts of the GSM specifications were published in mid-1988. At the request of the United Kingdom, a version of GSM operating in the 1800 MHz dual band was included in the specification for Personal Communications Networks (PCN) that became Digital LPC Cellular System at 1800 MHz (DCS 1800 or GSM 1800). 1988 saw GSM become a Technical Committee within the European Telecommunications Standards Institute (ETSI). In 1991 the GSM Technical Committee was renamed Special Mobile Group (SMG) and given the task of specifying a successor to GSM. The group SMG5 was assigned the task of specifying the Universal Mobile Telecommunication System (UMTS), but has since been discontinued and the task of specifying UMTS is given to other committees. (See *2G, 2.5G, 3G, GSM and UMTS*.)

2 Mbits/s A threshold bandwidth beyond which a network or access technology is described as broadband. 2 Mbits/sec = 2,000,000 bits per second. (See *Access technology and B-ISDN*.)

2-tier A client/server architecture where application logic, data and presentation are distributed between client systems (at tier 1) and one or more servers (at tier 2). Now consigned to history, early versions were based on ‘dumb terminals’ (or client systems) that did little more than send and receive messages to and from a server that was invariably a mainframe.

The World Wide Web of the early 1990s was a 2-tier client/server model where the Web/HTTP server simply published HTML documents to the client via a largely uni-directional path. The early static Web and the many intranets were 2-tier, where the user simply received published information (or Web pages) from the Web server. There was no feedback from the client system, and the application elements were partitioned so that data and logic were on the server-side.



Two-tier client/server

This changed in 1995 with the introduction of CGI (Common Gateway Interface). The dynamic or active Web model that was initially driven by CGI impacted the partitioning of the application elements of data, logic and presentation. File servers, print servers and database servers may also be integrated in the design architecture so as to distribute processing and optimise performance. The connection or access technology between servers and clients is provided by a LAN variant.

(See 3-tier, Client/server and CGI.)

320-by-240 pixels A frame resolution that may be used as a SIF (Source Input Format) for an MPEG-1 video sequence encoded using an NTSC

broadcast television/video source. The playback frame rate is standardized at 30 frames/second.

(See *MPEG.*)

32 bit 1. A program or operating system that uses 32 bit instructions. 32 bit operating systems include Windows 98, Windows NT and OS/2 Warp. Windows 95 is not a pure 32 bit operating system due to certain 16 bit instructions, but is generally regarded as 32 bit OS.

32 bit software is able to access memory more efficiently than 16 bit variants. It is capable of flat memory addressing in which 4GBytes (2^{32}) memory segments can be addressed. A 32 bit segment register is used to point to addresses within a 4GByte range.

(See *Operating system and Windows.*)

2. A 32 bit processor using 32 bit instructions. The earliest Intel 32 bit processor was the third generation 80386. 3. A data bus width (in terms of the number of its lines) connected to a device such as a processor, hard disk controller, memory card, or graphics card. 4. An extension of the 24 bit image depth, an additional Byte (or *Alpha Channel*) provides control over the transparency of pixels. Red, green and blue are each represented by eight bits, giving 256 tones of each, which in turn leads to over 16.7 million ($256 * 256 * 256$) colours. The additional eight bits (the *Alpha Channel* in Apple parlance) are used to control transparency. 32 bit graphics make possible photographic quality images. The Apple Macintosh is remembered as the first platform upon which the 32 bit graphics capability became commercially available.

36 bit An image depth.

(See *32 bit.*)

384-by-288 pixels A frame resolution that is described as the SIF (Source Input Format) for an MPEG-1 video sequence encoded using a PAL broadcast television/video source.

(See *MPEG.*)

3-D A 3-D computer image or animation stored and generated using absolute or relative coordinates that include X (horizontal), Y (vertical) and Z (depth) dimensions. Standard file formats and standard languages for developing 3-D animations for multimedia and virtual reality (VR) have emerged. The VRML (Virtual Reality Modeling Language) is suitable for the development of 3-D World Wide Web (WWW) pages. Web content development tools may be used to create 3-D graphics and animations for Web pages, and often do not require knowledge of VRML.

Chips aimed at the acceleration of 3-D graphics include the Glint family that was developed by 3DLabs. Creative Labs licensed Glint technology from 3DLabs in 1994, following which they collaborated to develop the GLINT 3-D processor. This is used in the Creative 3D Blaster that was first shown at Creativity '95 in San Francisco – a milestone in the development of 3-D graphics cards. 3-D engines that may be used to generate 3-D animations include:

- Microsoft Direct3D
- Apple QuickDraw3D
- Silicon Graphics OpenGL

Authentic 3-D animations depend upon matrix multiplication where sets of coordinates are multiplied by a transformation matrix. 3-D vectors, or ordinary 3-D coordinates, $[X\ Y\ Z]$, may be exchanged for homogeneous vector coordinates $[X\ Y\ Z\ H]$. The homogeneous dimension (H) is added to accommodate a four-row transformation matrix, so increasing the number of possible 3-D transformations. The transformation of homogeneous coordinates is given by:

$$[X\ Y\ Z\ H] = [x\ y\ z\ 1] \mathbf{T}$$

The resulting transformed coordinates may be normalised to become ordinary coordinates:

$$[x^*\ y^*\ z^*\ 1] = [X/H\ Y/H\ Z/H\ 1]$$

Consider the 4×4 transformation matrix:

$$\begin{bmatrix} a & b & c & p \\ d & e & f & q \\ h & i & j & r \\ l & m & n & a \end{bmatrix} = \mathbf{T}$$

Scaling, shearing and rotation is achieved using the 3×3 matrix sector:

$$\begin{bmatrix} a & b & c \\ d & e & f \\ h & i & j \end{bmatrix}$$

The transformation matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos \theta & \sin \theta & 0 \\ 0 & -\sin \theta & \cos \theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

is used to rotate a 3-D object by the angle θ around the X-axis.

A rotation of an angle θ about the y-axis is achieved using the transformation matrix:

$$\begin{bmatrix} \cos \theta & 0 & -\sin \theta & 0 \\ 0 & 1 & 0 & 0 \\ \sin \theta & 0 & \cos \theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

A rotation of an angle θ about the z-axis is achieved using the transformation matrix:

$$\begin{bmatrix} \cos \theta & \sin \theta & 0 & 0 \\ -\sin \theta & \cos \theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

It is possible to concatenate the rotational transformation matrices so as to perform two rotations concurrently through one matrix multiplication. However, the rotations are non-commutative, so attention must be paid to the order of the transformation matrices during multiplication. To perform a rotation about the x-axis and the y-axis, the transformation matrix may be achieved as follows:

$$\begin{aligned} & \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos \theta & \sin \theta & 0 \\ 0 & -\sin \theta & \cos \theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos \theta & 0 & -\sin \theta & 0 \\ 0 & 1 & 0 & 0 \\ \sin \theta & 0 & \cos \theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \\ & = \begin{bmatrix} \cos \theta & 0 & -\sin \theta & 0 \\ \sin^2 \theta & \cos \theta & \cos \theta \sin \theta & 0 \\ \cos \theta \sin \theta & -\sin \theta & \cos^2 \theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \end{aligned}$$

Translation is achieved through the 1×3 matrix sector:

$$[l \quad m \quad n]$$

Perspective transformation is achieved using the 3×1 matrix sector:

$$\begin{bmatrix} P \\ Q \\ R \end{bmatrix}$$

The remaining element “a” produces overall scaling. For instance, overall scaling is achieved using the transformation matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & s \end{bmatrix}$$

Normalising the transformed coordinates drives the scaling effect:

$$\begin{bmatrix} x^* & y^* & z^* & 1 \end{bmatrix} = \begin{bmatrix} x/s & y/s & z/s & 1 \end{bmatrix}$$

It is important to note that 3-D images can also be stored using 2-D vector matrices that include X and Y dimensions only.

Graphics transformation algorithms may be written in appropriate high level languages such as C++, Java and Visual Basic, and even in machine code or assembly language. Any high-level programming language that supports arrays may be used to develop graphics transformation software. However, APIs for popular 3-D engines such Microsoft Direct3D, Apple QuickDraw3D provide the necessary high-level programming statements, in order to bypass the underlying mathematical elements. Intel MMX technology gives improved delivery of 3-D graphics and animations.

(See *MMX and VRML*.)

3-D Modeler An artist that creates 3-D animations.

(See *Autodesk Animator*.)

3D Now A 3-D technology/instruction set enhancement integrated in AMD processors.

(See *3-D*.)

3-D surface A surface that exists in three dimensions. APIs for popular 3-D engines such as Microsoft Direct3D and Apple QuickDraw3D provide the necessary high-level programming statements.

(See *3-D*.)

3-D vector coordinate Authentic 3-D animations depend upon matrix multiplication where sets of coordinates are multiplied by a transformation matrix. 3-D vectors, or ordinary 3-D coordinates, are represented by [X Y Z].

(See *3D*.)

3DO A company engaged in the manufacture of multimedia related products including video capture hardware. It produces real-time MPEG-2 video encoding hardware used to capture, and to compress, video in real time.

(See *MPEG-2 and Video capture*.)

3G Network (Third Generation) A category of public mobile network capable of offering user data rates that may extend to Mbps, and describes the universal mobile telecommunication system (UMTS) that was shaped in part by the Third Generation Partnership Project (3GPP). 3G services include:

- Video applications using MPEG standards
- Video telephony
- Videoconferencing
- Video on demand (VoD)
- Telepresence
- Surrogate services such as exploration
- Client for remote services
- Web/Internet browsing
- Client for VPN
- Client connection for teleworkers
- mcommerce – retailing, online banking etc.
- Point of Information (POI) in real estate sector etc.
- Point of Sale (POS) for secure purchasing
- CCTV Closed Circuit Television Security
- UAV (Unmanned Aerial Vehicle) video communication and navigation

A 3G UMTS provides global roaming and is architected using orbiting satellites that may integrate BTSs (Base Transmitter Stations) and BSCs (Base Switching Centers). To create this type of network, satellites may orbit at altitudes between 780km and 1414km so as to minimise signal transmission latency. One example of a satellite network is Teledesic whose Consortium is led by Bill Gates. Other mobile satellite services include Motorola's Iridium (with 66 satellites), Loran's/Qualcom's Globalstar (with 48 satellites) and TRW-Matra's Odyssey (with 10 satellites orbiting at high altitude).

UMTSes offer broadband user data rates and operate in the K-band (10.9–36 GHz) and L-band (1.6–2.1 GHz). Aeronautical and maritime telecommunications were catalysts in the development and deployment of satellite mobile telephone services with the first maritime satellite launched in 1976. Called MARISAT it consisted of three geostationary satellites and was used by the US Navy. This later evolved into the INMARISAT (International Maritime Satellite Organization) that provide public telecommunications services to airliners.

3G Layers A 3G network consists of layers dedicated to:

- Transport – carries data (bits) over the IP backbone and wireless access network that may be ATM, SONET or an alternative.
- Control – controls calls, authenticates calls, manages mobility, manages sessions, and is accommodated in the network nodes that include RNC/BSC, MSC, SGSN and GGSN.

- Applications/services – hosts applications and services and is otherwise known as the *service network*.

3G history WAP and I-mode have been key to mass-market mobile wireless applications that converge on the Internet, giving limited access to Web content. The precursor to WAP is, of course, SMS (Short Message Service) where text is sent to mobile users' handsets, and while this is considered the trailing edge of mobile applications, such solutions remain a practical industry for many WASPs globally. WASPs such as these are (generally) positioned close to the trailing edge, as opposed to being leading edge enterprises that may be engaged in developing core software solutions.

The European RACE 1043 project began with the aim of identifying services that Y2K 3G services would deliver, and evaluating how the mobile network infrastructure would evolve in the mass market telecommunications sector. The project's forecasts include a displacement theory where TACS (Total Access Communications System) would be displaced by GSM that would then be displaced by UMTS (Universal Mobile Telecommunications System) – a term that was coined by the project.

(See *2G and UMTS*.)

3G GGSN (Third Generation GGSN) A Gateway serving node for a 3G public mobile network such as UMTS.

(See *3G, GPRS and UMTS*.)

3G QoS (Third Generation Quality of Service.) A threshold or series of thresholds that determines the overall standard of service provided by the operator, and includes among other things:

- Latencies or delays
- Minimum bit rate guarantee that may be within a specified coverage area.

3G SGSN (Third Generation SGSN) A Server serving node for a 3G public mobile network such as UMTS.

(See *3G and UMTS*.)

3GPP (Third Generation Partnership Project) An international Group of telecommunications representatives/entities that shaped the UMTS.

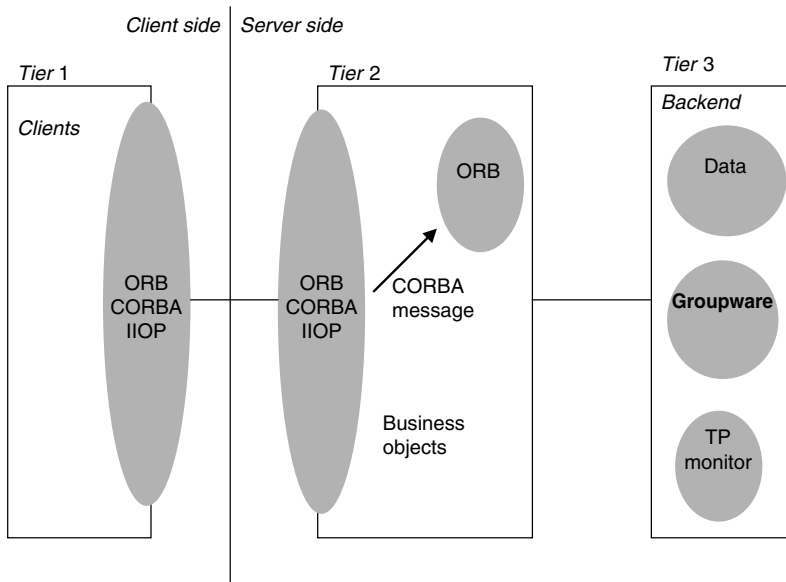
3-tier A client/server architecture where the elements presentation, application logic and data may be perceived as distributed across different platforms. The three tiers are separate and independent, and interact via appropriate glues or middleware and include:

- Tier 1: presentation that is the front-end and may be composed of view objects
- Tier 2: application logic that is the middle-tier
- Tier 3: data that is the back-end

- Tier 0 devices are those that connect with clients (at tier 1) and include printers, DVD-ROMs, scanners etc.

The partition that separates these three entities, in terms of those that reside on the client and those that reside on the server, is a function of the client/server implementation, and the clients may be PCs, Macintosh computers, or NCs. If middleware is included, it may be based on an interface definition language (IDL) like CORBA.

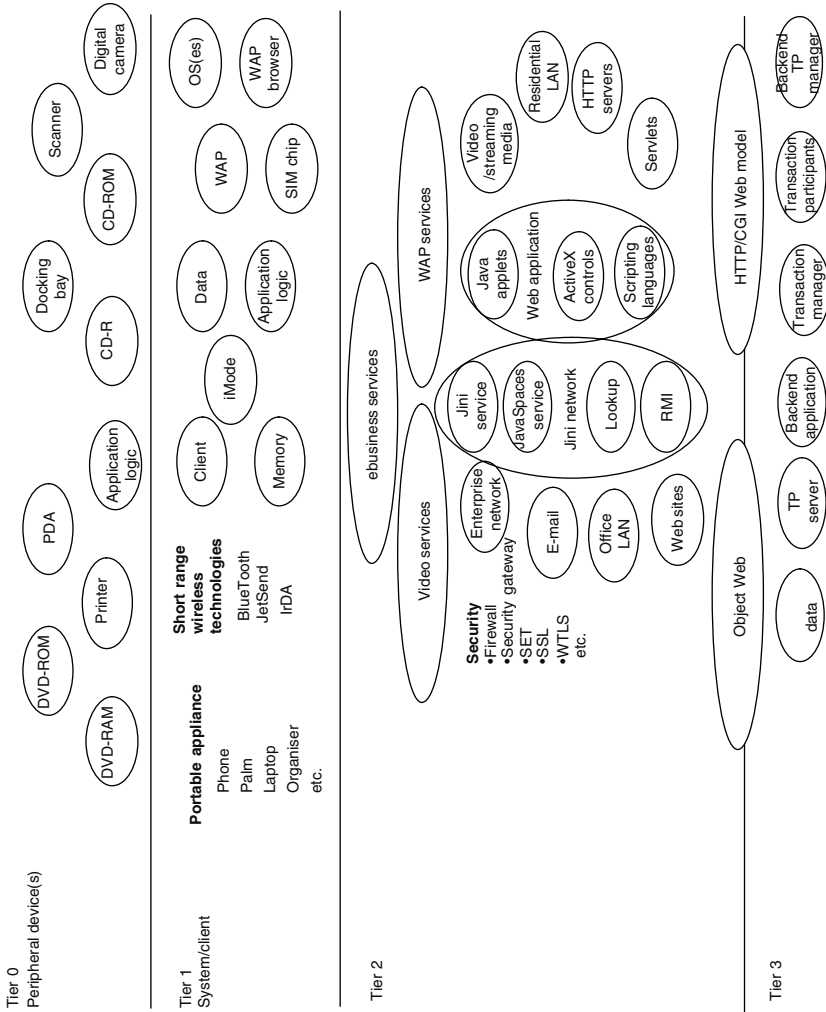
(See *Client/server, OMG, CORBA, IDL, WAP and UMTS.*)



44.1 KHz A sampling rate required to produce CD quality audio when using a 16 bit sample size. The resulting digital audio may be stored using media such as:

- CD
- CD-ROM
- Hard disk
- Zip disk
- Jaz disk
- Mini Disc
- CD-R
- DVD-RAM
- DVD-ROM

(See *Digital audio.*)



3-tier client/server CORBA-based OO architecture (simplified)

48 KHz A sampling rate required to produce high quality digital audio that may be stored on Mini Disc, DAT, hard disk or another DSM that offers an appropriate data transfer rate.

(See Digital audio.)

4GL (Fourth Generation Language) A programming language/environment that does not require the programming of code on a line by line basis. One of the earliest 4GL programming tools for the PC was Mapper from Sperry that later became part of Unisys.

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

4 KHz The bandwidth of POTs (Plain Old Telephone services).

56.6 Kbps A standard modem speed that is implemented using the standards x2 Technology and Rockwell K56flex. It exceeds the proven bandwidth limit calculated using Shannon's theorem by using PCM, and a digital link between the telephone company and the ISP. 56.6 Kbps modems are asymmetrical offering wider downstream bandwidths, so downloading times are shorter than those of uploading.

The ITU has attempted to amalgamate two the industry standards:

- X2
- K56flex

The resulting V.90 standard was specified provisionally and finally released in 1998.

(See Access technology and Modem.)

64 Kbps A data transfer rate offered by a single ISDN line.

(See ISDN.)

8 bit image depth An 8 bit image depth gives a maximum of 256 colours for digital video, and computer generated animations and images. The colour information for each pixel (or dot) is stored using eight bits giving a maximum of 256 (2^8) colours. The 8 bit colour information may be edited using a palette editor such as Microsoft PalEdit that is part of the complete implementation of Microsoft Video for Windows, and Asymetrix Multimedia ToolBook. A palette editor may be used to:

- alter the order of colour cells in a palette
- reduce the number of colours in a palette by deleting unwanted colour cells
- alter brightness
- alter colour contrast
- fade and tint colours
- copy colour cells from one palette to another

- merge two or more palettes into one
- develop common colour palettes that may be used with a number of different 8 bit video sequences so as to reduce any flicker that may occur as a result of palette switching when one image, animation or video sequence is exchanged for another. This operation may also be implemented using a palette optimiser.

(See AVI, MPEG, Streaming, and Video.)

8-PSK (8-Level Phase Shift Keying) An enhanced modulation method that is used in the EDGE radio interface. In this context 8-PSK:

- Has three bits per symbol
- and gives a gross bit rate per slot of 69.2 Kb/s (including overhead, and given that the symbol rate is 271 ksymbols/s).

All rates per time slot include 22.8, 34.3, 41.25, 51.6, 57.35 and 69.2 Kb/s for code rates of 0.33, 0.50, 0.60, 0.75, 0.83 and 1.

(See EDGE and GPRS.)

A

AAEI American Association of Exporters and Importers.

ABA American Bankers Association.

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 mid way through the CD-ROM then, is addressed 29 : 29 : 37 (M : S : B).

(See CD-ROM, DVD and IP address.)

Abstract class A class with at least one abstract method that is declared but has no implementation. An abstract class therefore requires a subclass to provide implementations for the abstract method(s).

(See Class, Java, OOP, and Servlet.)

abstract type A definition in a property list that gives characteristics of documents.

Accelerator 1. A graphics card offering high-speed operation and optimised for GUIs like X-Windows, 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 may be achieved by inserting duplicate frames, though today the challenge is to playback video at the capture frame rate rather than artificially accelerate it. VideoLogic was

one of the first companies to demonstrate the acceleration of Windows. AVI video files.

(See *MPEG*.)

Access A process where users gain the rights to operate a local or remote system, or application, or program. The user may be required to enter an ID and one or more passwords.

(See *Encryption and Security*.)

Access technology A method used to connect to the Internet, or to a remote network or computer system. Access technologies may be physical or wireless and include:

- PSTN and analogue modem offering speeds up to 56.6 Kbits/sec
- ISDN
- GPRS
- 3G
- UMTS
- EDGE
- T1
- Cable
- DSL
- ADSL
- GSM
- DCS
- DBS (Direct Broadcast Satellite)

(See *3G, 56.6 Kbps, ADSL, DSL, B-ISDN, ISDN, Cable modem, GPRS, ATM, T1, Mobile Network and Modem*.)

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

(See *CD-ROM, DVD and Hard disc*.)

Account number A unique number that identifies an account held at a financial institution such as a bank or credit card company. It reveals the

financial institution, type of account, and even the branch or office that holds the account.

ACID (Atomicity, Consistency, Isolation, and Durability.) A series of properties that 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 the system state changes of a transaction are involatile, and impervious to total or partial system failures.

(See Server and Transaction.)

Acknowledge A message in an OO (Object Orientated) system that verifies a state, and may be passed between client and server objects that may perhaps confirm that a client is able to receive a series of packets or messages that may be data or events.

Acquirer

(See Acquiring bank.)

Acquiring bank A bank whose clients are Merchants that accept credit cards for customer payment transaction purposes. Each Merchant is assigned an account into which is deposited the value of their card sales. Batches of sales slips are used to credit Merchants accounts. The bank submits charges destined for banks to the interchange network either directly or through third parties.

Acquiring Financial Institution

(See Acquiring bank.)

Acquiring processor A company specialising in card processing, offering services that include:

- Billing
- Settlement
- Management Information Services (MIS).

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 (that have the .PDF extension). Acrobat files offer scalability where users may zoom in on document portions; they are therefore effective for intranets and Internet sites where complex diagrams and large images are to be published.

(See ActiveX.)

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) standard. 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 channel A connection between a consumer and supplier, or between a client and server that adheres to the push or pull model for publishing digital information over networks such as the Internet. The channel variants exist in the CORBA/OMG NS as defined by the OMG (Object Management Group)

(See OMG, CosNotification, Active Desktop, CORBA, Push technology and www.omg.com.)

Active Channels A connection to a Web site where information is pushed or pulled to the client.

(See Active Channel.)

Active Desktop A term used to describe the client side of an Active Web application, and to describe the addition of Active Desktop Components (ADCs) to a Browser. 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.

Selected Active Channels invoke the Explorer browser in full screen mode that provides standard Web Browser options. The Fullscreen button allows users to switch between the normal Microsoft Internet Browser application and the full screen view. Both views share many of the same user interface



features. The application window view provides additional features, such as the ability to add Web addresses to a Favourites folder. These may then be visited without having to enter a Web address.

(See Active Desktop Components, Active Server, ActiveX Controls, Java, Visual Basic, VBScript and JScript and OLE Controls.)

Active Server Components *(See ASP.)*

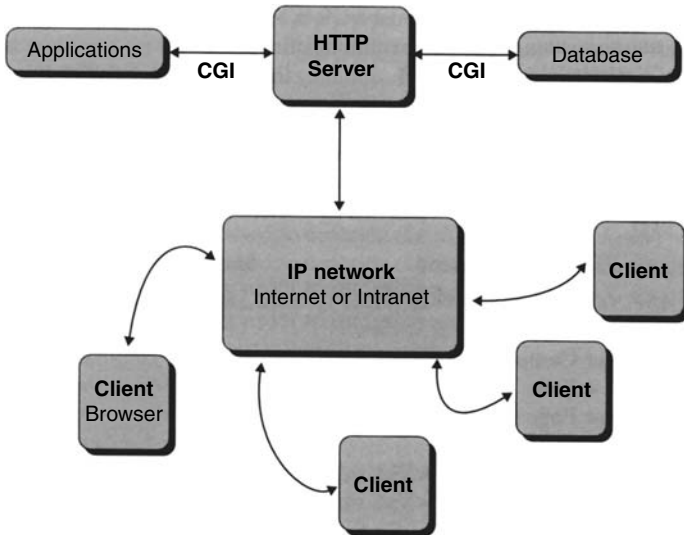
Active Server Page (ASP) *(See ASP.)*

Active Template Library (ATL) A development tool used to create Active Server Components that 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



Active Web

necessary communications. CGI scripts are created using a scripting language or programming tool.

(See *CGI and Perl*.)

Active window A window is active or currently selected for use 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*.)

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

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

ActiveX control An object or component that adds functionality to an application that may be stand-alone, or deployed over the Web or a network. Microsoft ActiveX is an object architecture initially based on OLE 2.0, and intended for deployment over the Internet and compatible IP networks. More accurately, ActiveX is a reincarnation of OCX and may use COM and DCOM as glues. ActiveX controls may take the form of a streaming video player, or a

streaming audio player that might be added to the Microsoft Internet Explorer, and are embedded in HTML pages performing various functions that may be the generation of a simple Marquee. ActiveX controls may be created using Visual C++, Visual Basic 5 Control Creation Edition, Java, Java 2 and other development tools. There are ActiveX controls in the public domain, as well as in the shareware sector, and those that might be conventionally marketed and sold. ActiveX components running on the same system may interact using the COM protocol as a glue. Industry-wide support beyond Microsoft exists, and ActiveX compatible development tools include:

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

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, Visual Studio etc.
- 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 a reuse 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 Web sites 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 Active Desktop, Active Server, Active Document, Authenticode, COM, DCOM, Glue, HTML, Java, Middleware, CORBA and Visual Basic.)

ActiveX scripting A process where ActiveX Controls and Java Applets are integrated in the underlying HTML code of an interactive Web application.

Such scripting is generally used with Web applications, though stand-alone applications may also be built using the same. A basic HTML based application 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 may be used to give the client-side a level of intelligence. Validations of user/customer data and interactions distribute processing to the client-side. This lessens the volume of data traffic, and serves to optimise application performance.

(See ASP, CGI, HTML, Java, Java applets, JScript, Shockwave, VBScript.)

ActiveX SDK (Software Development Kit) A programming tool used for creating ActiveX controls that may also be created using the:

- C++ programming language.
- Java programming language.
- Visual Basic programming language.

(See Active X 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.)

ADC (Analogue to Digital Converter) 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 (ADC) 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 that 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.

Address 1. (*See IP Address.*) 2. CD-ROM 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 mid way through the CD-ROM might be addressed 29 : 29 : 37 (M : S : B). The length of a CD-ROM track in minutes may be used to calculate user data capacity. 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 GBytes (2^{32}) memory segments may be addressed. A 32 bit segment register is used to point to addresses within a 4 GByte range. At a 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 that 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 that is part of the Microsoft Commercial Internet System (MCIS). It allows users to query a database of users that may include dynamic values such as IP addresses, as well as static values that might include names, addresses, age, interests, occupation etc. It is compatible with:

- NetMeeting that supports Internet telephony and conferencing.
- Internet Locator server that may be used to query the database.
- Microsoft SQL Server that may be used as the database.

(*See Internet telephony, MCIS and Microsoft SQL Server.*)

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

Address space A range of memory used by a running process that may not share address space with another process.

ADO (ActiveX Data Object.) A client/server technology that is used to access data using an OLE DB provider, and has since evolved into ADO.NET. (*See ADO.NET and ASP.*)

ADO.NET (ActiveX Data Object.NET) An advancement of ADO, ADO.NET is designed for distributed applications that typically have HTTP to glue tiers, and XML may be used to transfer data among them.

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

Adobe Dimensions A 3-D graphics program.

Adobe FrameMaker A professional desktop publishing package from Adobe.

Adobe Illustrator A graphics program used widely for Web and multimedia production, and for originating images for print.

Adobe PageMaker A professional desktop publishing package from Adobe and originally published by Aldus for the Apple Macintosh.

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

(See ActiveX, Java, CGI, Web Server, MCIS.)

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

Adobe Premier A video editing tool.

(See Multimedia production, and Video capture.)

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

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

ADSL (Asymmetric Digital Subscriber Line) An access technology that has a downstream bandwidth which is considerably wider than its upstream bandwidth:

- Downstream bandwidth of between 1.5 Mbits/sec and 8 Mbits/sec. Typically it is 1.5 Mbits/sec.
- Upstream bandwidth of the order of 16 to 640 Kbits/sec that may be a function of the line length. Typically it is 384 Kbits/sec.

- Line lengths of up to 5 Km are quoted. Typically a repeater is required with distances greater than 1,800 feet in order to overcome attenuation.

Applications include:

- High speed Internet access.
- VHS quality videoconferencing.
- VoD (Video-on-demand).
- Multimedia networks.
- et al.

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 and DSL.)

Affiliate Companies Companies that provide a web front-end or brand for other manufacturers or retailers goods or services. End users select a product at the affiliate web site, but the sale is actually transacted at the sponsoring merchant's web site.

Agent 1. An Agent/manager architecture is used for system management in client/server systems. The agents represent managed subjects that 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 may modify software, or 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 may also be used as triggers. 3. An habitual agent may 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.

Agent log A log of Browsers used by visitors to an e-business site.

AI (Artificial Intelligence) A term used to describe the use of a system to emulate human decision making and learning abilities. The founding father of artificial intelligence is Alan Mathison Turing, through his writings that include *Computing Machinery and Intelligence* (1950). Alan Mathison Turing OBE, an English mathematician, second world war code-breaker and 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 (NNs) are perceived as part

of AI. Related areas include NNs and Rule-base systems, that are applied to automated decision making in the financial sector for such activities as money laundering and fraud detection.

(See *AML*, *KBS* and *Neural net*.)

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 may 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 may be a program or series of steps defining a modus operandi that 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.

alias A reference to files and folders.

Alpha 1. A family of RISC processors manufactured by Digital. 2. A pre-release copy of an application that is distributed and tested. 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.

AltaVista A search engine.

Alternate Style Sheet A stylesheet used to define an *alternate* style to those declared as *persistent and/or preferred*. The persistent style is of course the default style and may be overridden by the alternate style.

Amazon A very large and world famous on-line bookseller and auction house.

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.

(See *Pentium*.)

American Express A large credit card company.

AMIS Audio Messaging Interchange Specification

AML (Anti Money Laundering) A solution that alerts banks and financial institutions of irregular customer activity that is consistent with money

laundering. AML software is perceived as ‘business intelligence’, and is implemented using one or more of the following approaches:

- Neural networks (NNs) that are able to program themselves through unassisted learning.
- Rule-based consisting of business logic in the form of rules and heuristics.
- Genetic algorithms.
- Statistical analysis and adaptive profiling.

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, Jscript, VBScript and Visual Basic.)

Andreeson, 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 that was developed at the National Center for Supercomputing Applications at the University of Illinois.

(See Browser, Hypertext and Web.)

Animation A series of frames used to create the illusion of movement. Animation types include:

- morphing that dissolves one image into another, and may be created using dedicated morphing programs, or equivalent such 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 programs.)

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.

Annual company report A document that addresses the previous financial performance of a company using balance sheets and profit and loss

accounts, and may also make certain forecasts regarding growth. It is typically used by business analysts and investors and even by potential employees as they gauge the performance and current state of the enterprise.

(See *Balance sheet*.)

Anonymous class An extension of the local class, it is declared, and using Java it may be instantiated using a single expression.

Anonymous FTP (File Transfer Protocol) An FTP server to which users may connect, browse its files, download files, and possibly upload files also. An ftp client may be used to login to secure ftp sites so as to download and upload files.

(See *Archie and TCP/IP*.)

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

Anti fraud detection A solution that alerts banks, financial institutions, and credit card companies of irregular customer activity that is consistent with fraud. Anti fraud detection software is perceived as intelligent and there are two main types:

- Neural networks (NNs) that are able to program themselves through unassisted learning.
- Rule-based consisting of business logic in the form of rules and heuristics.
- Genetic algorithms.

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

Apache A Web server that is free of charge and used with Unix operating system, and may be perceived as superseding the original NCSA Web server that is also available free of charge and runs on top of the Unix operating system.

API A set of interfaces and methods used by programmers that define operations specific to applications and hardware. For example, a development environment built using the CORBA-based Notification Services will have IDL modules or files as its collective API. In OOP languages, including Java, C++ and Objective-C, an API consists of defined classes.

(See *CORBA-based Notification Services*.)

Apple Computer A computer manufacturer founded by technologist and entrepreneur Steve Wozniak, and by entrepreneur Steve Jobs. Together they revolutionised computing by mass producing one of the world's most affordable microcomputers known simply as the Apple, and later the Apple II. It was designed by Steve Wozniak, whose dream was always to own a computer, once saying 'I don't care if I live in the smallest house, just so long as I have my very own computer.'

Microsoft founders, Bill Gates and Paul Allen, had already written a Basic interpreter for the Altair personal computer. While Microsoft mined massive revenues from its DOS operating system for the IBM PC XT and AT, Apple Computer shook the computing world once again in 1984 with its Apple Macintosh or 'Mac' that changed the human-machine interface forever. It had a multi-tasking windows operating system exactly like that defined by Douglas Engelbart, and implemented at Xerox Palo Alto Research Center (PARC), and it also had a mouse, another invention of Douglas Engelbart. A more subtle technical innovation was the use of an analogue graphics port in the Mac design that could theoretically drive an unlimited number of colours. Immediately it opened the door to affordable desktop publishing using such software packages as PageMaker that was then owned by Aldus, a company aptly named after the Italian inventor of the italic typeface. The Apple Macintosh was advertised during the 1984 Superbowl, and was the greatest success in the history of Apple Computer.

Microsoft responded with Windows, its own multi-tasking windows-based operating systems and GUI. This finally gained a respectable user base through the release of Windows 3.0. IBM's belated response to the 'Mac' was the Personal System/2 (PS/2) which was launched in the Summer of 1987, and offered 16-colour VGA and 256-colour MCGA colour graphics. This was significant for Microsoft because it was the driving technology which shaped the software it produced, and was a milestone in the evolution of the PC as a colour graphics system, and one that could theoretically become a multimedia appliance. Later Apple products include the Apple PowerBook, the Apple Newton PDA, and the more contemporary iMac series of personal computers.

(See Windows.)

Apple event An event that is defined by the Apple Event Interprocess Messaging Protocol (AEIMP), and is typically a message from an application.

Apple iMac A family of personal computers produced by Apple Computer.

Apple Mac OS X An Apple Computer operating system (OS) and environment that also combines Unix, and delivers multi-tasking and a windows-based environment.

Apple Macintosh A range of desktop computers produced by Apple Computer, and when introduced in 1984 it pushed forward the boundaries of desktop computing through the:

- Graphical user interface (GUI or “goosey”)
- 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, and 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.

Modern incarnations of the Macintosh include the:

- iMac
- PowerBook
- iBook
- Power Mac G4
- Server G4.

(See *GUI*.)

Apple QuickTime A digital video playback technology and standard developed by Apple Computer.

Applet A program that resides on a server, and when requested, it is downloaded and executed by the client Browser. 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. The Java Virtual Machine is described variously as a runtime environment or even virtual processor because it actually processes Java byte codes, and interprets them into an executable form.

(See *Java*.)

AppleTalk A family of network protocols included in Macintosh computers.

Application development A process where an application is created. The development life cycle might include various standard stages that include:

- Project planning
- Analysis
- Design
- Scripting

- Prototyping a storyboard design
- Multimedia production
- Production
- Coding in a multimedia language such as OpenScript or Lingo
- Coding in Internet-related languages such as Java, VBScript, JScript, HTML, VRML and Perl
- Coding in general purpose languages such as Visual Basic and Visual C++
- Alpha testing
- Beta testing
- Packaging the application for distribution on a CD variant, or for deployment on a network.

In 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 multimedia production tasks.
- Web Site development tools that permit production tasks such as integrating media with navigation schemes et cetera.

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

Application development tool/software A software package dedicated to the development of applications, with the most popular commercial example being Microsoft Visual Studio.

(See Microsoft Visual Studio.)

Application kit A Cocoa framework that provides a program structure for an application's event-driven UI.

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 may be set using SetMessageQueue.

Application renovation An upgrade path used to modernise legacy systems that may be based on older mainframe computers, and essentially adds new client and connectivity components. The process may 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 relatively high maintenance costs associated with mainframe computers are seen as a key 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 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 123 and Quattro Pro
- databases – such as Microsoft Access, Paradox and DataEase.
- contact managers – such as Outlook, Goldmine, and those supplied with many integrated packages.
- et al.

The three staple elements of an application are:

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

The physical, or perceived, location of the three functional elements depends 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.)

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

(See Firewall and Security gateway.)

Archie An on-line database of indexed words from FTP sites that was developed at Montreal's McGill University. The database may 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
```

The archie would then return a listing of appropriate files and FTP sites. This information may be used to download the files using an FTP client program.

Alternatively, e-mail messages with appropriate instructions may be sent to the relevant sites.

Architecture 1. A description of a client/server implementation and may include a vast array of information such as:

- number of tiers
- CGI/HTTP and Object model
- Server side languages
- Back-end databases
- Protocols and Glues including HTTP, COM, DCOM
- Operating systems
- Software model adopted – such as DNA or the Microsoft. NET initiative

A description of a client/server hardware solution may include:

- Client systems
- LAN technology
- File servers
- Firewalls
- Fax servers
- Proxy hosts
- Hosts
- Dual-homed hosts
- Mail servers
- Modems
- Digital links such as ISDN, T1, cable, etc.
- Security perimeters
- VPN
- LAN Servers
- Network cards/specifications
- Routers
- Bridges
- Backbone switches (*See Client/server.*)

2. A processor architecture refers to the 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 bus size
- 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.
- et al.

3) 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. 4) An underlying object architecture of an application in terms of the types of objects used that 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.*) 5) 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 may be integrated into one system. 6) A firewall architecture includes component parts such as screening routers. (*See Firewall and Security gateway.*) 7) 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 may be used for archiving purpose include 100 MB Zip disks and 1 GB Jaz disks from Iomega, as well as media devices from SyQuest. Other media include conventional hard disk, and CD-R discs and DVD-RAM discs. Various file compression utilities may be used for backup purposes, including the popular WinZip program.

(*See DVD.*)

ARP (Address Resolution Protocol) An IP protocol that may 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 that might be used by Ethernet networks, Token Ring and FDDI that 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, and growing to 37 computers by 1972 by 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 that may be character, numeric, or even binary objects. All modern high-level programming languages support arrays, and 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 metalisation 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 and Java.*)

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.

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 128 Ascii characters derived from seven bits. Eight bits were 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 and local-playback 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 it may be stored or played.

(*See MPEG and Streaming.*)

ASN.1 (Abstract Syntax Notation One) A standard that defines the encoding, transmission and encoding of data and objects that are architecture neutral.

ASP (Active Server Page) A server side software architecture that is Browser neutral. ASPs may be normal HTML that glues together scripts written in Jscript, VBScript, Javascript or other ActiveScript compliant languages. The following ASP is compiled by the server and then the resulting HTML code downloaded to the browser

```
<% for a = 1 to 2 %>
    <font size= <% = a %> > Hello World
    </font> <br>
<% next %>
```

Downloaded HTML:

```
<font size= 1 > Hello World </font> <br>
<font size= 2 > Hello World </font> <br>
```

ASP applications may use ODBC databases, VBScript objects and ActiveX DLLs. ASP objects include Request that may be used to retrieve cookies using request.cookies, and to request information from forms using request.form. ASP pages also have a response object that is used to write to the HTML file using Response.write, and to write to a cookie using response.cookies.

DCOM and COM may be used as glues within ASP-based applications. Resulting Web applications may acquire information about the client browser, and act accordingly. This enables compatible HTML pages to be served to the Browser without error messages. The Microsoft Active Server provides the component parts to implement the aforementioned functionality, and includes the components:

- Browser Capabilities that acquires the connected browser's key features
- ActiveX Data Object (ADO) that provides access to backend data (irrespective of its location), and is not limited to ODBC compliant data sources
- TextStream that is used to create and open files.

Third-party and bespoke components may be integrated in an Active Web site and may be developed using an ActiveX control developer's workbench, including:

- Visual Basic
- Visual C++
- Visual C++ ControlWizard that is used for OLE development
- ActiveX Software Development Kit.

Active Server Pages (ASPs) offer the advantages of:

- shorter Web application development life cycle – particularly with developers/development teams that are devoid of, or have little, CGI programming experience
- optimised server-side processing, because calls to CGI programs may invoke new processes on the server.

(*See Active Desktop, Active Server, ActiveX, and CGI.*)

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 that was used to develop Microsoft Multimedia Beethoven: The Ninth Symphony.

(*See OpenScript and ToolBook.*)

Asymmetric compression A compression/decompression algorithm where the processes that constitute compression are not reflected in decompression.

(*See DCT, JPEG and MPEG.*)

Asymmetric key cryptography A cryptosystem where the keys used to encrypt and decrypt data are dissimilar.

(*See Ciphertest, Plaintext, Encryption, SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetric, Transposition and Dictionary attack.*)

Asynchronous 1. 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 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. 2. A ‘distributed computing’ 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.

Asynchronous messaging (*See Asynchronous.*)

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

ATA A standard hard disk controller.

ATA-2 A disk interface technology.

(*See Hard disk.*)

ATM (Asynchronous Transfer Mode) An internationally agreed telecommunications standard that supports transmission line speeds of up to 622 Mbits/sec. Other line speeds include 2 Mbits/sec, 12 Mbits/sec, 25 Mbits/sec, 34 Mbits/sec, 45 Mbits/sec, 52 Mbits/sec and 155 Mbits/sec.

The CCITT accepted ATM in 1990 as an internationally agreed standard for data, voice and multimedia networks.

ATM bases itself on cell relay that is a form of statistical multiplexing, and is similar to packet switching. The data transmission consists of cells that have 53 octets or bytes, including a 5-octet header.

Using 52 Mbits/sec line speed, a single cell may be transmitted in:

$$\begin{aligned} 53 \times 8 / 52 \text{ Mbits} &= 8.15 \times 10^{-6} \\ &= 8.15 \text{ micro seconds} \end{aligned}$$

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 that is acceptable for real-time data, voice, audio and video transmission.

Like packet headers, cell headers contain destination addresses.

(*See Frame relay.*)

ATMI American Textile Manufacturers Institute.

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

(*See E-mail.*)

Attenuation (*See Digital audio.*)

Auction An electronic market that offers buyers and vendors an automated bidding service.

Audio (*See Digital audio.*)

Audio compression A term used to describe the process of compressing audio data that may be decompressed and played using streaming audio technologies. In uncompressed form the large size of wave audio files occasionally place unreasonable demands on distribution media in terms of data capacity and/or bandwidth. Wave audio compression gives smaller file sizes that are decompressed on playback using either dedicated hardware and software, or

software alone such as an MP-3 player. Standard wave audio compression algorithms include MP-3, A-Law, IMA (Interactive Multimedia Association) ADPCM and MPEG-1. 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 1. A technology supported by the Microsoft Internet Explorer that 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.
2. Authenticode ensures that software is not illegally altered prior to download and provides an ID of the software's publisher.

Authoring A process of developing a multimedia e-business site, and 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
- 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 ToolBook. For Multimedia production, or for the creation and gathering of all necessary media files, it may be necessary to use:

- video capture software and hardware such as VidCap and a VideoBlaster card
- Animation software such as flash
- video editing software such as VidEdit
- wave audio recording and editing software
- midi sequencer such a 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 digital sound recording facility. It may also provide a means through which resultant material may be submitted to a replication company for mastering and manufacture.

Authoring tool A program or program suite that permits the creation of multimedia e-business applications. Generally, it is more complex than a presentation program, providing more advanced features such as indigenous or standard authoring/programming languages that 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
- IconAuthor.

Modern authoring tools aimed at the production of CD-based multimedia may provide cost-effective migration paths to the Internet, and should also provide support for Java applets.

(See ToolBook and Authorware.)

Authorization A formal clearance from a credit card or bankcard issuer indicating that a transaction will be honoured.

Authorization code A code that indicates the willingness of the card issuer to honour a credit card or bankcard transaction.

Authorware Professional An authoring tool for Windows-based multimedia applications produced by Macromedia. The authoring process consists of dragging objects onto a flowline that runs vertically in its own window. Authorware is considered as requiring no programming skills.

(See Lingo, OpenScript and ToolBook.)

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

Autodesk Animator Pro A 2-D animation development program.

Availability *(See Reliability, MTBF and MTTR.)*

AVI (Audio Video Interleave) A Microsoft file format for storing interleaved audio and video. Using many video editing and video capture tools, the interleave ratio may be varied. The ratio may 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 may be shown where the interleave ratio is displayed alongside the phrase Interleave Every.

The interleave ratio is expressed as the number of video blocks that separate audio blocks. 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. 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.)

AWT Abstract Windows Toolkit A set of Windows development tools focusing on GUI components like radio buttons, check boxes, data entry fields, dialogues and other similar widgets.

B

B2B (Business-to-Business) An activity that sees business enterprises trade directly with one another, without dealing directly with a mass of customers or end-users. A WASP offering services to telecommunications operators is considered a B2B.

Backbone A core high-speed transmission line, which serves a number of networks. Switches and bridges provide the physical connections between it and the multiple networks for which it provides bi-directional data traffic paths.

A backbone is comparable to a main artery in anatomy, which divides into smaller veins and capillaries that might be thought of as switches and networks.

A backbone might comprise ATM backbone switches, which comprise a number of ports for connection to networks. Enterprise backbones that have ATM backbone switches, offer scalability, fault tolerance, and are based on internationally agreed standards.

(See ATM, Frame relay and Screening router.)

Backdoor A flaw in the security defenses of a system or a network. For example, modem access either inbound or outbound, may bypass the network's collective security infrastructures.

(See Firewall and Security.)

Backdrop A background image or colour in a multimedia presentation or title that remains constant for a given number of frames.

Backend Another name for tier 3.

(See 3-tier and client/server.)

Background 1. Multi-tasking operating systems such as Windows 98, Windows NT and OS/2 Warp, are able to run applications in the background

of others. Background applications and tasks generally receive less processing time, and run more slowly. 2. A background sound may be added to a Web page using FrontPage and other Web development tools. The sound technology used may be wave audio or MIDI. 3. In Windows, Background Mode permits the background colour to be toggled between opaque (on) and transparent (off).

Background task A task that takes place in a multi-tasking operating environment and is allocated a specific and changing portion of processing time. The amount of time is less than allocated to tasks that are in the foreground.

Backtracking A process of retracing a user's path of interaction by perhaps using the Back button in the application window. All fully specified authoring tools – such as Multimedia ToolBook – and Help System development tools allow the developer to integrate a backtracking feature in applications. Web browsers also feature backtracking controls.

(See Hypertext and Multimedia.)

Backward compatible A hardware component, program object, language compiler, program or operating system that is compatible with an earlier version.

Balance sheet A comparison between assets and liabilities of an enterprise that is normally published annually as part of companies' annual report. Assets may be intangible, tangible, or liquid, and may include buildings, profits, amounts due, intellectual property such as patents and copyrights, investments, shares, fixtures, etc. Liabilities may include general running costs, leases, mortgage repayments, tax, amounts owed, materials, office supplies, miscellaneous operating expenses, etc.

Bandwidth A rate at which data is transferred to, or from, a computer or appliance, using a medium that might be physical or wireless.

Media and their bandwidths:

- A single-speed CD-ROM has a bandwidth of 1.2 Mbps (or 150 Kbytes/sec), and generally CD-ROM drives exhibit data transfer rates, which are broadly multiples of 150 Kbytes/sec.
- A single ISDN line will provide a bandwidth of 64 Kbits/sec, whereas B-ISDN may offer multiples of that rate.
- The average bandwidth of a 24-speed CD-ROM drive is about 3,600 KBytes/sec.
- ADSL has a downstream bandwidth of between 1.5 Mbits/sec and 8 Mbits/sec. Typically it is 1.5 Mbits/sec.

- ADSL upstream bandwidth of the order of 16 to 640 Kbits/sec, which can be a function of the line length. Typically it is 384 Kbits/sec.

(See 2.5G, 3G, Access technology, ADSL, ATM, DBS, ISDN, B-ISDN, CD-ROM and DVD.)

Bandwidth 1. A data transfer rate supported by physical or wireless media.
2. A range of frequencies supported by media.

Bankcard A card that is linked to one or more bank accounts, and may have an assigned PIN in which case it may be used with cash dispensers, and it may perform transactions using international standards that include Switch, EFTPOS, and Cirrus.

Bankers EDI Council A council formed by NACHA to help banks make the transition to EDI for corporate customers.

Barclay card A credit card.

Barings A merchant bank that collapsed in the 1990s owing to the irregular trading practices of a certain individual. A rescue package was put together by ING that now operate the bank under the name ING Barings.

Base case A system that is specified as being a base case is the minimum implementation, or the bottom of a product range.

A base case NC will have only the essential elements of the official specification, as will a base case NC.

(See NC.)

BASIC (Beginners All-purpose Symbolic Instructional Code) A high-level language developed by Kemeny and Kurtz in the 1960s. Early implementations for personal computers include the BASIC interpreter developed by Microsoft founders Bill Gates and Paul Allen in the mid 1970s for the MITS Altair – the world’s first affordable computer. Interpreted languages differ from compiled languages in that they are not compiled into object code (such as .EXE file) before execution. Instead the source code is interpreted in real-time when the program is run. In the late seventies and early eighties, almost every microcomputer (or personal computer) had its own BASIC interpreter stored in a ROM variant. Even the original IBM PC XT had a BASIC ROM. It was at this time that Acorn Computer (Cambridge, England) introduced Structured BASIC, advancing the language to structured programming. (See *structured programming*.) Structured BBC BASIC gave procedures and routines names such as PROCfind, for instance, and were ended using commands like ENDPROC. BBC BASIC was also recursive in that procedures could be called from within procedures. Its most unusual feature, however,

was the ability to include 6502 assembly language code within the high-level listing itself. This feature gave it flexibility, and helped programmers increase the speed of program execution by confining certain procedures to assembly language or machine code. This functionality evades many of the industry standard languages of today. The structure programming model adopted by BBC BASIC made the GOTO command redundant, and later did the same to line numbers – though BBC BASIC did include the GOTO command. Until the advent of structured programming, the flow of program execution was directed solely using the GOTO <line number> command. After structured programming, the next significant advancement for BASIC came when visual and object-oriented programming (OOP) arrived. Such Visual Basic development tools allowed programmers to draw objects in order to, perhaps, create a user interface. All the programmer then needed to do was to add code to the objects in order to define their behaviour in response to events such as mouse clicks. The Basic syntax has changed dramatically, though it continues to be a procedural high-level language, and one that is considerably more than language for novice programmers. It can be used to tackle demanding programming projects, and is considerably more portable than the early interpreted versions for popular microcomputers.

(See Visual Basic.)

Bastion host A host that is critical to a network's security and Firewall architecture. This is the focus of network management, security monitoring, and is a network's principal defense against illegal usage. A dual-homed host may play the role of a bastion host.

(See Firewall.)

Batch file compression A technique by which files may be compressed for distribution, archiving or backup purposes. It is appropriate for modem-based file transfer and DSM-based distribution. It can be used to compress any binary file. In the context of video distribution its main disadvantage is the fact that end-users have to decompress or unpack the files before they can be played. Decompression can be carried out using an installation program, a program such as PkUnzip, or in the case of a self extracting compressed file the user simply types the name of the compressed file. Standard batch file compression programs include WinZip.

Batch settlement An accrued number of card transactions that may be processed.

Baud rate A rate at which data is transferred from one point to the next, which broadly equates to bps. More precisely it is a measure of logic/bit changes per second over media which may be physical or wireless. It is

the namesake of French telegraphic communications pioneer J M E Baudot (1845–1903). It is a rarely used term nowadays, and is replaced by bits/second (bps) – which is not quite the same thing.

(See Modem.)

BBS (Bulletin Board Service) A dial-up service that is independent of the Internet. It can be used for publishing information, distributing files, and for electronic conferencing.

BCBSA Blue Cross Blue Shield Association.

BCPL (Basic Combined Programming Language) A high level programming language, BCPL was designed by Martin Richards in 1967, as a compiler writing and system programming tool. It was based on CPL (Combined Programming Language), which was developed jointly by Cambridge and London Universities. BCPL is perceived as a forerunner to C and C++.

Further reading

BCPL the Language and its Compiler, Martin Richards & Colin Whitby Stevens, Cambridge University Press, 1980.

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

Bend A bend in an optical fibre results in increased attenuation. Such losses can be used to determine the degree to which a fibre is bent. This forms the basis of operation for many gloves and suits used in VR, where the fibres run along the lengths of fingers or limbs.

(See LED and Optic fibre.)

BER (Bit Error Rate) A measurement of how error-free the storage or transmission of data is. Typically expressed as the average number of bits in which one bit-error will occur. CD-ROM has appropriate error detection and correction codes. In Mode 1 CD-ROM data blocks, 4 Bytes are reserved for error detection and 276 Bytes are reserved for error correction. The three layers of error detection and correction integrated in the CD-ROM format include CIRC, EDC and ECC. Typically the bit error rate of CD-ROM equates to 10–18, which amounts to one error for every 1,000,000,000,000,000,000 bits.

Berkeley Sockets *(See Socket.)*

Berners-Lee, Tim The original architect of the World Wide Web, and inventor of its accompanying HTML (Hypertext Markup Language). The birthplace of HTML is considered to be CERN in Geneva. These origins LED the original server to be referred to as the CERN server. The conceptual birth of the Web might be accredited to the visionary Vennevar Bush through his

momentous article, 'As We May Think.' Theodore Nelson is also significant (but much more contemporary), through his work *Literary Machines*, and the project *Xanadu*. If Vannevar Bush and Ted Nelson were responsible for putting forward the concept of the Web, then Tim Berners-Lee must be considered its architect.

(See *IP*, *HTML*, *HTTP*, *Web and Xanadu*.)

Beta copy A test copy of a software product that has yet to be commercially released. Usually beta copies are distributed externally to beta test sites.

(See *Alpha*.)

BIAC Business Industry Advisory Council.

Bi-directional 1. A highly compressed frame in an MPEG-1 data stream. (See *MPEG*.) 2. A link which offers upstream and downstream data transmission. 3. A link in an information structure that can be following in either direction.

Big Blue A nickname for IBM. It originates from the fact that early IBM mainframes were painted blue.

BIN (Bank Identification Number) A three or five-digit code that adheres to the ISO 8663 recommendation and dictates account numbers that are owned by card companies.

Binary A counting system comprising only two states, either '1' or '0'. All electronic files are stored in binary form. Binary files generally contain executable programs and program data, and have the .EXE or .COM extension.

BIOS (Basic Input Output System) A program stored in firmware on all PCs and includes low-level code for implementing I/O operations, startup code and the setup program. The setup program permits the system to be configured, and is invoked by pressing the Del key during the memory check, when the system is booting.

BISAC Book Industry Systems Advisory Committee.

B-ISDN (Broadband ISDN) An access technology that offers a wider bandwidth than conventional (narrow bandwidth) N-ISDN, which offers data transfer rates of 64 KBits/second per single connection. Low-end B-ISDN implementations include multiple 64 Kbits/second channels. For instance videoconferencing architectures that feature FMFSV might include 6* 64 bits/second channels, yielding a collective bandwidth of 384 Kbits/second.

(See *Access technology and ISDN*.)

Bit A single, indivisible item of binary data that might be '1' or '0'.

Bit error rate

(See *BER*.)

BitBlt 1. (BIT-BLock Transfer) A method of copying areas of an image from one point to the next. 2. (BIT-boundary BLock Transfer) A Windows GDI (Graphics Device Interface) function that moves rectangular geometric shapes such as windows and dialogue boxes.

BitEdit An 8 bit bitmap editor supplied with Video for Windows (VfW) and Asymetrix Multimedia ToolBook. Multiple instances of BitEdit program (which is supplied with VfW) may be run.

Bitmap An image represented by pixel data which defines each pixel. The pixel data is referred to as bit map. Can provide intricate control over graphics resulting in high quality.

(See *Image Compression, DCT and JPEG*.)

Bitmapped Display Graphic controller and display partnership, where pixel data representing each pixel is stored in memory

(See *Bit Map*).

Black An account or balance that is in credit.

Black box A conceptual view of software or hardware where the internal architecture and operation are ignored. All that is considered are input and output values.

Black list A list of barred equipment held in an EIR (Equipment Identification Register) of a mobile network. The EIR has a grey list of faulty equipment or for devices that are registered for no services, and a white list for registered users.

(See *2G and GSM*.)

BLOB (Binary Large Object) An item of binary data that is of no specific type, but is identified simply as containing some sort of digital data. It may be a graphic, a video file, a midi file, a wave audio file, a program file, or any type of digital data.

(See *DBMS and OODBMS*.)

Block 1. A segment of code that is enclosed within opening '{' and closing '}' braces. 2. A block of 2,352 Bytes on a CD/CD-ROM track. (See *CD-ROM*.) 3. A section in a program.

Block address *(See Absolute Addressing.)*

Blue Book A specification for multi-session CDs, and was announced by Sony, Philips, Apple and Microsoft.

(See CD-ROM.)

BlueTooth A wireless connection technology for home appliances.

BMP A graphics file format that tends to lead to larger files than more compressed variants such as Compuserve's GIF and JPEG.

(See JPEG.)

BNC A connector consisting of round socket and plug which are locked together with a twist. It was invented by the engineers Neill and Concelman at Bell Laboratories.

Body suit An item of clothing that provides a means of interfacing a user with a virtual or synthesised environment. It permits user-interaction to varying degrees that extend from giving simple hand signals, to grasping and manipulating virtual objects; it may also provide a means of stimulating the user's sensory organs through changes in temperature, pressure, moisture levels and so on. It may be used for:

- telepresence and telemanipulation
- computer aided design
- computer games
- translating sign language into speech
- researching the effectiveness of manual or semi-automatic processes so as to refine ergonomic environments and minimise the risk of RSI (Repetitive Strain Injury)
- sports medicine.

Low specification suits simply sense the flexing of limbs and fingers using silica fibres of the sort commonly used for data transmission and telephone networks. A silica or optic fibre is embedded along the length of jointed limbs. The operation hinges on the fact that the losses experienced by a beam of light propagated in a silica fibre increase when the fibre is physically bent. The resultant varying signal is referred to as bend information. The light sources use LEDs (Light Emitting Diodes). More highly specified variants include a greater number of optic fibres or flex sensors to relay a greater number of movements. These will also contain a detection system that provides the spatial 3-D coordinates of the entire suit. The level of sophistication can extend to integrated transducers that sense angular rotation in three dimensions, temperature, pressure and moisture. Tactile feedback devices might also be included in the form of inflatable bladders.

(See LED, Optic fibre and VR.)

Bolt-on-application An application that is coupled with another, as is a SET implementation that is added to a Merchant Commerce Server.

Bookmark A marker inserted at a specific point in a document so as it may be revisited with ease.

Boolean A variable type that has one of two states: either yes or no. Named after Irish mathematician George Boole who pioneered logic-based *Boolean algebra*, they feature in programming languages search engines and databases. AND, OR, NOR, NAND and NOT are Boolean operators. They are also logic gates used in electronics and in the architecture of digital components, and their behaviour can be described using a truth table. A truth table is a simple table which shows the output obtained for each and every combination of inputs.

Borland A software company, whose name was changed to Inprise in 1998. It is best known for programming tools such as Delphi, Turbo Pascal and Turbo C++, as well as business applications. It is headquartered in Scotts Valley, CA. Its lesser known products include the Sprint word processor for DOS. The company was founded by Philippe Kahn, and its initial rapid growth can be attributed largely to its PC programming tools that include Turbo Pascal. Inprise (UK) International is headquartered in Twyford, and its European headquarters are considered to be in Amsterdam. Kahn is now the President of StarFish.

(See C++ and Inprise.)

Borland JBuilder

(See Jbuilder.)

Borland Turbo C++ An implementation of C, based on the object-oriented programming (OOP) model.

(See C++, Java, Object and OO.)

Bottom-up analysis A design approach, where the process begins with the design of low-level components, and progresses to the design of higher level components; top-down analysis represents the opposite.

(See Top-down analysis.)

Bps (bits per second) A measurement of data transfer rate. Modems are frequently specified in terms of their data transmission and reception speeds.

(See Modem and V-standards.)

Brand certificate authority A party authorised by a credit card company like Visa or MasterCard to carry out digital certificate management.

Branded payment card A credit card or charge card that has the brand of a sufficiently large company like American Express, Visa or Mastercard.

BRI ISDN (Basic Rate Interface Integrated Services Digital Network) access technology that provides two 64 Kbits/sec bearer (B) channels, and one 16 Kbps data (D) channel for signaling. The B channels carry user data. ISDN drives improvements through voice telephony, Internet access, and videoconferencing. Internationally agreed ISDN standards are maintained by the ITU. International ISDN standards include:

- North America – National ISDN-1AT&T 5ESS
- Europe – Euro ISDN (CTR 4)
- Japan – INS-64
- France – VN-3
- Australia – AUSTEL TS013

(See *ISDN*.)

Broadband A term used to describe access technologies and networks that typically offer bandwidths of 2 Mbits/sec and more, though narrow bandwidth networks and access technologies may also be described as broadband. Broadband offers high speed data transfer and is useful for multimedia networks.

(See *Access technology, ATM and ISDN*.)

Broadcast Quality 1. A video recording whose quality approximates that of broadcast television. (See *MPEG*.) 2. A camcorder able to provide video recordings that are considered broadcast quality.

Browse (browsing) A process of following the intricate paths through a hypertext-based information structure. The user passes to and from nodes or objects. In the context of the Internet, it has come to be known as surfing. It normally takes place at the micro-level but can also exist at the macro-level also, where the user may be described as navigating as opposed to browsing. The line that divides navigating from browsing is made clearer by considering the difference between a walker and a motorist. The motorist gains a high level view of travel, and is thus navigating. The walker's experience of a journey is infinitely more detailed, hence the walker is browsing.

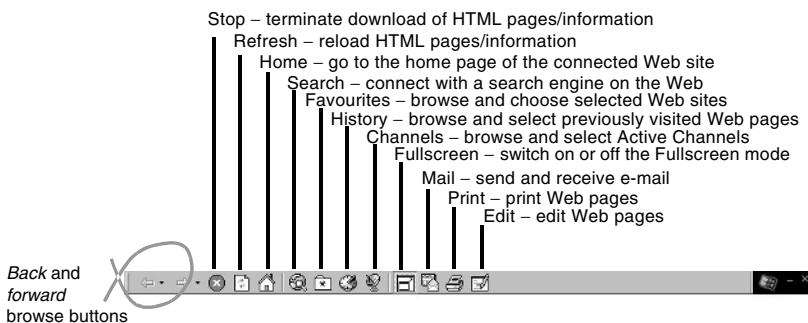
(See *Browser, Client, Microsoft Internet Explorer and Netscape Navigator*.)

Browser An application that permits the user to browse the World Wide Web. The most popular Web browsers are Netscape Navigator and Microsoft

Internet Explorer. Earlier implementations include Cello and Mosaic. A modern browser allows users to:

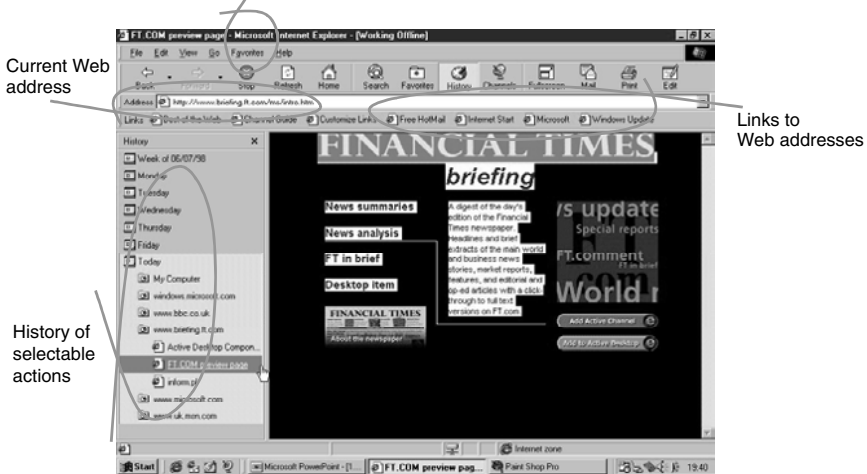
- add Web sites/pages to an address book or a folder called Favourites
- navigate backwards and forwards through visited Web pages
- open a URL that is entered using the keyboard
- playback streaming audio and video using a plug-in or ActiveX control
- playback streaming multimedia using an appropriate plug-in or ActiveX control.
- send e-mail messages – though a Browser is not an e-mail client/application
- specify various preferences including the appearance of Web pages when displayed
- open HTML files that might be local or remote
- chat in real-time, using an appropriately enabled Browser
- view Web pages that contain Java applets (using a Java enabled browser)
- download files
- make telephone calls over the Internet using an appropriate Web phone
- take part in videoconferences using appropriate hardware and software.

(See *World Wide Web and Active Desktop*.)



Author: dynactv • 17th July 1998 Birth of Jewish novelist, Shmuel Yosef Agnon • 17th July 1903 Death of American painter, James McK

Favourites may be used to access, and to add to, your most frequently visited Web sites.



Brute Force Attack An attempt to crack a cryptosystem. Using public key cryptography, the attacker usually has the public key, and attempts to gain the private key.

(See *Brute Force RSA Factoring*.)

Brute Force RSA Factoring A means of deciphering RSA. Attackers may be armed with the public-key (n, e) , and then attempt to determine d in order to gain the private-key (n, d) . This process begins by factorising n in order to yield the two large primes that are a common method of deciphering RSA. Other methods, such as calculating $(p - 1)(q - 1)$, and attempting to determine d through iterative techniques are deemed equally difficult.

Factoring may be carried using the algorithms of:

- Trial division that attempts to find all the prime numbers $\leq \sqrt{n}$
- Quadratic Sieve (QS) that is deemed fastest for numbers that are less than 110 digits
- Multiple Polynomial Quadratic Sieve (MPQS)
- Double Large Prime Variation of the MPQS
- Number Field Sieve (NFS) that is the fastest algorithm for numbers larger than 110 digits.

In 1977 Rivest asserted that it would take 40 quadrillion years to factor a 125-digit number. However, the 1994 factoring of RSA129 took about 5000 MIPS-years. A MIPS-year equates to 1,000,000 instruction per second over a period of one year.

(See *Cryptography and RSA*.)

BSD (Berkeley Software Distribution.) An acronym once used for the Berkeley version of UNIX. 4.4BSD Lite 2 and FreeBSD – a ‘flavor’ of 4.4 BSD, is used in the Mac OS X.

BSR Board of Standards Review – ANSI.

BT (British Telecommunications) A UK-based international telecommunications operator (*or telco*). It evolved as a state-owned enterprise, but was privatised in the 1980s by the British conservative government, which was LED by Margaret Thatcher.

BTLZ (British Telecom Lempel-Ziv) A data compression technique synonymous with modem-based data communications. It can be assumed to yield a compression ratio of around 4:1.

(*See Compression.*)

Buffer A quantity of RAM (Random Access Memory) that improves the rate at which data may be transferred between computers and peripheral devices.

(*See Queue.*)

buffered window A window with a memory buffer that holds rendered drawings.

Bug A hardware or software fault. The first recorded case of an actual bug was witnessed by Grace Hopper, a computer pioneer who did much work in developing valve computers and high-level languages. Using the Harvard Mk 2 computer she discovered a hardware fault caused by a moth caught between the contacts of a relay. After debugging the system, the unfortunate moth was entered in the computer’s log at 15.45, 9 September 1945. The process of authoring or developing multimedia often requires extensive testing and debugging.

Build 1. A version number which denotes the version of a program or operating system. It is interchangeable with the term *development build*. 2. A word used to describe the process of developing hardware or software.

bundle A directory that stores executable code and related resources.

Burst mode data transfer 1. A heightened volume of data traffic over a network. 2. A maximum, unsustainable data transfer rate from a CD-ROM drive. It is many times greater than the average data transfer rate, and is sustainable for a limited period only.

Bush, Vannevar A science advisor to President Roosevelt. He put forward a paradigm for information storage and retrieval in the 1940s. He may be considered the originator of the Internet concept, and of the 'relational model' for storing and retrieving information. His name, therefore, is linked with standalone multimedia as well as with multimedia on the Internet. Principal facets of the Internet such as World Wide Web (WWW) and the many hypertext-based navigation and browsing tools have their origins in Bush's vision. His momentous article 'As We May Think', covering what he called Memex, was published in Atlantic Monthly. Hypertext evangelist, Ted Nelson admitted publicly that he may have read this article.

(See Hypertext, Web and Xanadu.)

Business audio A program that permits you to control a computer using voice commands. It is possible to do the same with dictation systems such as IBM ViaVoice.

Depending upon which system is used, they also have proofreading and text-to-speech capabilities. Microsoft Windows Sound System is a typical example of a business audio system. Modern business audio tools are voice independent.

(See Speech recognition, Wave audio and ViaVoice.)

Business Intelligence A broad term that leads to decision making that may be automated requiring no human intervention, semi-automated, or automated. It may be based on DSS (Decision Support Systems) that use data warehousing and OLAP to answer questions about operations including Sales and Supply chains, etc. Other examples include automated fraud detection and anti money laundering.

Business Process Re-engineering A procedure that aims to optimise an enterprise in terms of profitability. It focuses on processes rather than functions, and involves design, evolution and implementation of integrated systems, reorganisation of personnel, and infrastructure.

Business system engineering A collective term used to describe the processes of implementing business system, which fulfils an enterprise's requirements. The business system includes:

- business processes
- IS (Information Systems)
- personnel.

Business to business *(See B2B.)*

Button An active area on screen, which may be an iconic representation of an option, feature or application. Windows buttons are labeled with appropriate identifying text such as Close or OK. Using visual programming tools buttons

can be created simply by drawing them on screen. Once drawn they become objects that can be moved or copied. Their colour, frame thickness, fonts and other attributes can be altered usually by right-clicking them. As is the case with all event driven applications development tools, the button is responsive to a mouse click. Its behaviour or response to such an event is determined by its method which usually takes the form of short segment of code. The method or code might run a video clip, for instance. Buttons can also be selected using the keyboard, usually by pressing the Alt key together with an appropriate letter that corresponds with a letter in the button's label. Using development tools such as MS Visual Basic, you simply draw buttons and then add methods (code) to them, thus determining their behaviour.

(See ToolBook and Visual Basic.)

Byte 1. A piece of digital information that is eight bits in length. 2. A computer magazine (BYTE) published by McGraw-Hill.

Bytecode A machine language used by virtual processors for interpretation and program execution. Such programming languages include the OO variants Java and SmallTalk. These languages are suited to heterogeneous environments, and may therefore be deployed effectively over the Web as applets. The virtual processor physically exists on the client, and is implemented in software, and is independent of hardware and accompanying operating systems. They may not be as responsive as native code components, where perhaps an ActiveX control is running on a Windows platform. However, any performance difference may be eradicated through the hardware implementation of the virtual processor on the client system, in which case it ceases to be virtual.

(See Java Virtual Machine, Java and OOP.)

C

C A high-level programming language that is little used in industry today because it is considered obsolete. Its OOP version is Objective-C that adds OO constructs to the original C syntax, permitting messages to be sent to objects.

(See Objective-C, C++ and C#.)

C# (C sharp.) A Microsoft OO programming language that has roots in C and C++ and competes with languages like Java and to a lesser extent Objective-C. It may be used with XML in the Microsoft .NET framework. C# offers:

- type-safety
- garbage collection
- simplified type declarations
- versioning.

(See C, C++ and Java.)

C++ An object-oriented version of the C programming language. Like modern programming languages such as Java, it provides the programmer with OO methodologies. Bjarne Stroustrup evolved C++ from C, which has links with BCPL (Basic Combined Programming Language). It extends the C programming language through the inclusion of the OO concepts of:

- inheritance
- polymorphism
- encapsulation
- data hiding.

(See Inheritance, Polymorphism, Encapsulation, Data Hiding.)

ANSI C++ is an internationally agreed standard for the C++ programming language.

#INCLUDE <FILE> When compiled the #include statement is implemented by the preprocessor, which reads the contents of a named file.

MAIN () A C++ program must have a main () function, which begins and ends with open { and close } braces. This is the first function called when the program is run, and may be used to define variable types.

COMMENTS Single-line comments in a C++ program must begin with //, and multiple line comments begin and end with /* and */.

SYNTAX (BASIC) All statements have a semi colon (;) as their suffix. White space may be included, which is ignored by the compiler. Compound statements such as those of a function or a subroutine begin with a single open brace "{", and end with a closing brace "}".

C++ VARIABLES C++ variable types may be defined as follows:

```
#include iostream()
main()
{
    char find;
    float prime;
    double prime_large;
    short int xx;
    long int xxxx;
    unsigned short int yy;
    yy=35;                //assign the
    unsigned long int yyyy;
}
/* the character variable find, may store 256
character values */
// the variable prime, may store signed 4Byte values
/* the variable prime_large, may store signed 8Byte
values*/
// the variable xx, may store signed 2Byte values
// the variable xxxx, may store signed 4Byte values
// the variable yy, may store unsigned 2Byte values
// the variable yyyy, may store unsigned 4Byte values
```

Defined variables may be equated to values using the statement:

```
yy=35;
```

Variables may be defined, and assigned values using the statement:

```
unsigned short int xx=45;
```

Multiple variables of the same type are defined using a comma as a separator:

```
unsigned long int yyyy, yflow
```


TYPEDEF A method of defining types and variables. Using typedef, mnemonics may be assigned to the statements used to define variables and their types. The following statement assigns the word `xxxx` to the unsigned `short int` statement:

```
#include <filename>
typedef unsigned short int xxxx;
int main ()
{
    xxxx coordinate;
    // define coordinate as an unsigned short integer
    variable
}
```

C++ LITERAL CONSTANTS A variable may be assigned a value that is considered a literal constant:

```
int yearsAfter=25;
```

A literal constant may also be used when performing arithmetic operations on variables. In the following statement where the time variable is assigned to the product of the variable `present` and 10, 10 is considered a literal constant:

```
time=present*10
```

C++ SYMBOLIC CONSTANT A symbolic constant has a name, and is assigned an unchanging value. It may be used just like an integer constant. Symbolic constants improve program maintenance and updating; a single change made to a symbolic constant, is echoed at every point it may occur.

A symbolic constant multiplier may be assigned the value 10 using the statement:

```
#define multiplier 10
```

or,

```
const unsigned short int multiplier = 10
```

C++ ENUMERATED CONSTANTS Enumerated constants take the form of a type, and are a useful shorthand for defining a number of what might be related constants. The following code defines the constants `back`, `forward`, `left`, and `right`, where `Move` is the enumeration.

```
enum Move { back=4, forward, left=6, right=3};
```

The `forward` constant is assigned the value 5, an increment (of one) relative to the previously defined constant `back`.

C++ PRECEDENCE In C++, arithmetic operators have a precedence value. These indicate the order in which such operators are implemented is significant with expressions such as:

```
dev = xx + yy * zz + yy;
```

Control over such arithmetic operations is obtained using parentheses, i.e:

```
dev = (xx + yy) * zz;
```

Parentheses may be nested.

C++ IF STATEMENT The If statement determines whether or not the ensuing statement is executed, based on a single condition:

```
{  
if (xxx = yyy)  
    transform = Scale;  
}
```

C++ IF... ELSE STATEMENT The If... else statement is used to implement either one of two statements:

```
{  
if (xxx = yyy)  
    transform = Scale;  
else  
    transform = Scale * adjust;  
}
```

C++ LOGICAL OPERATORS Logical AND, OR and NOT are implemented using the syntax '&&', '||', and '!'.
(See *Java, Object, and OOP.*)

C++ to IDL language mapping A mapping that equates C++ to the IDL equivalent.

Cabbing A method of compressing objects such as Active X controls and Java objects into a single CAB file. This optimises their rate of transfer across networks.
(See *ActiveX.*)

Cable modem A modem that may operate over cable TV networks. The speed of operation is many times greater than the fastest analogue modems. Typically, a cable modem's data transfer rate is considerably greater downstream than it is upstream. For example, the Motorola CyberSurf cable modem offers an upstream rate of 768 Kbps and a downstream rate of 10 Mbps. Competing cable modems have downstream rates approaching 30 Mbps and faster. Cable modems offer high speed access to the Internet, and are offered as extras by such ISPs as Telstra Big Pond (Australia).
(See *Access technology, ADSL and ISDN.*)

Cache 1. A segment of SRAM (Static Random Access Memory) that drives processor performance gains. Its rationale is to expedite the rate at which data may be read from, and written to, memory. It may be an integral part of the processor (internal), or external in the form of dedicated SRAM chips on the PC motherboard. The fast speed of SRAM overcomes the slower speed of DRAM (Dynamic Random Access Memory) making up the system memory. They significantly improve system performance. External memory cache sizes are relatively small, ranging from just 128 KBytes to 1 MByte in size. An algorithm is used to estimate what portions of system memory should reside in the memory cache. The Pentium Pro has an internal cache accommodated on a single die or chip. 2. An area of memory or hard disk used as a temporary store for downloaded HTML files and data, including URLs. The size of the cache may be specified. (*See Browser.*) 3. A hard disk controller that expedites hard disk performance. A hard disk cache controller typically comprises MBytes of RAM, and is usually expandable. It speeds up read/write operations by using its on-board RAM as an intermediate data store between disk and system memory. Based upon which data is most often requested, a caching algorithm estimates which portions of hard disk should reside in on-board RAM, thus making it more readily available. The ingenuity of this technique simply takes advantage of the inescapable fact that a small percentage of disk data is rewritten and accessed most frequently. The decision making process which is insulated from the system processor fuels the view that it is an intelligent controller. Cache controllers are the most expensive of all variants, and in terms of random access and data transfer rate they may be assumed to outperform all others. 4. A RAID often features a cache for improved performance. (*See RAID.*)

Caffeine A programming environment that has similarities with RMI and is produced by Netscape and Visigenic, and requires VisiBroker for Java, and allows developers to create CORBA distributed objects without programming with CORBA IDL.

Capture reversal An event that sees the reversal of a capture response when goods are returned after the completion of a sale.

Carbon A set of programming interfaces for the Mac OS X, derived from earlier versions of the Mac OS. Carbon applications may run on Mac OS X, OS 9, and OS 8.1.

Card association A bank that supports franchise for shown card brands.

Card issuer A card company or bank that has powers to grant credit or bank cards.

Cardholder An authorised owner and user of a credit card or bank card.

Card-not-present A card transaction where there is no physical evidence of the card, and typically exists in a MOTO (Mail Order/Telephone Order) scenario.

Cardshield A service proved by Shielded Technologies Inc. that may be applied in the development of a Web commerce solution that includes credit card transactions.

Carrier A carrier signal is used to transport a signal over media that may be physical or wireless. The carrier might be encoded using frequency modulation (FM), amplitude modulation (AM), or another modulation technique.

CAS China Association for Standardization.

Casting A process where one data type is converted into another.

CBA Canadian Bankers Association.

CBEMA Computer and Business Equipment Manufacturers Association.

CCC Customs Cooperative Council—an international organisation.

CCIR 601 A standard for uncompressed digital video, that also known as D1. Using CCIR 601 in order to digitise a 525-line NTSC signal running at 30 frames per second, its chrominance elements U and V, and its luminance Y elements are digitised individually. The Y element is digitised using 858 samples per line, and the U and V elements each are digitised using 429 samples per line. Each pixel is generated using 10 bits per sample. The digital video is coded at 270 Mbits/sec which is derived as follows:

$$Y: 858 * 525 * 30 * 10 = 135 \text{ Mbits/sec}$$

$$U: 429 * 525 * 30 * 10 = 67.5 \text{ Mbits/sec}$$

$$V: 429 * 525 * 30 * 10 = 67.5 \text{ Mbits/sec}$$

$$270 \text{ Mbits/sec}$$

(See *DCT, MPEG, MPEG-1, MPEG-2, Multimedia and Video.*)

CCITT International Telegraph & Telephone Consultative Committee (that has become ITU-T).

CCITT (Commiss e Consultatif International T lephonique et T l graphique) An international standards organisation that issues recommendations and standards for communications.

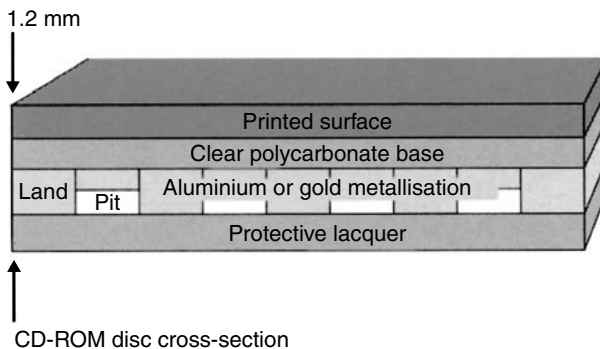
CD (See *CD-ROM.*)

CD-R (CD-Recordable) A drive capable of writing to blank CD-R discs, usually in a variety of different formats including Video CD, Photo CD, CD-ROM XA, CD-I and CD-ROM. The mid 1990s saw the launch of more affordable CD-R drives, bringing low-volume CD-ROM publishing to the desktop. Important factors to consider when acquiring CD-R drives include:

- The maximum data capacities supported.
- The read rate of the drive, which may be single-speed, double-speed, triple-speed, quad-speed or faster.
- The disc recording speed, which may be single-speed, double-speed, triple-speed, quad-speed or even faster. High recording speeds yield saving in terms of person hours consumed.
- The disc formats supported, which might include audio CD, CD-ROM, CD-ROM XA, CD-I, Photo CD and Video CD.
- The interface type; most operate over the SCSI bus variants.
- What type of interface software is provided? It is important that this should be user friendly.

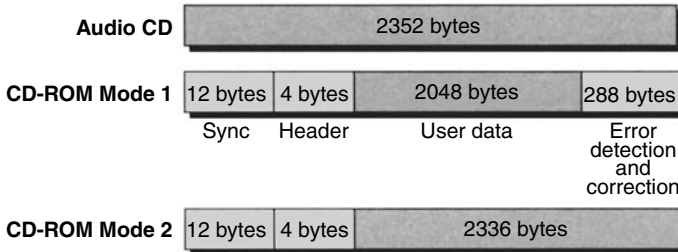
(See *CD-ROM and DVD*.)

CD-ROM (Compact Disc-Read Only Memory) A universal distribution medium based on Compact Disc. It was the first viable multimedia distribution medium. Announced in 1983 it is typically a 12 cm diameter optical disc offering data capacity in the hundreds of MBytes range. The standard 12-cm-diameter CD-ROM supports up to about 660 MBytes (692,060,000 Bytes) data capacity. A single disc is equivalent to between approximately 400 1.44 MByte floppy disks or 1,500 360 KByte floppy disks. 8-cm-diameter CD-ROMs are also available.



Like audio CD, a CD-ROM disc physically consists of a metallic disc bonded to a polycarbonate base. This is coated with a transparent, protective lacquer.

A track spiraling from its centre measures some 5 km long, and is arranged at a density of 16,000 tracks per inch.



CD-ROM/CD block

The CD-ROM physical format includes:

- Mode 1 data blocks that are used to store code and data where accuracy is critical.
- Mode 2 data blocks that are used to store data that might be impervious to minor errors.

Data blocks are supported by all fully specified CD-ROM drives. A one hour Mode 1 disc yields 527 MBytes data capacity and Mode 2 gives 602 MBytes data capacity. A Mode 1 data block will yield just 2,048 Bytes (2 KBytes) user data, while Mode 2 capacitates 2.28 KBytes user data.

(See *CD-ROM data block and DVD*.)

CD-ROM data block A CD-ROM data block has 2,352 Bytes. User data yielded by each block is a function of the Mode of operation.

CD-ROM drive A device for reading CD-ROM discs. It may be portable, external or integral to the computer/multimedia system. Modern drives are able to read Mode 1 and Mode 2 discs, as well as audio CDs. Principal factors which govern the performance of a CD-ROM drive include access time and data transfer rate. In general, a CD-ROM drive may be specified in terms of the following information:

- Access time; highly specified drives may offer access times little longer than 100ms.
- Average data transfer rate may be generally specified in terms of how fast the disc is rotated; a single-speed drive will give a data transfer rate of around 150 KBytes/sec. This data rate is broadly doubled, tripled and quadrupled using double-, triple-, and quad-speed drives.

- The physical interface type may be proprietary, IDE, SCSI, SCSI-2 or use may be made of a PCMCIA card or parallel port. H
- Compatibility in terms of disc formats that may be read is generally specified in terms of 8 cm-diameter CD-ROM, CD-ROM XA, linear CD-I, Video CD and Photo CD.
- Physical characteristics include whether the drive is internal, external or portable.
- The maximum number of drives that may be daisy-chained.

(See DVD.)

Certificate authority A third party that issues digital certificates for creating digital signatures and public/private keys. The CA seeks to guarantee that individuals granted certificates are identified. The CA may have an agreement with a financial institution that provides confirmation of individual's identity.

CFM (Code Fragment Manager) The library manager and code loader for Apple Carbon PEF object files.

(See Carbon.)

CGI (Common Gateway Interface) A protocol that provides bi-directional information flow within the active or dynamic Web model, and may be perceived as permitting users to interact with remote applications such as E-business implementations. It is a protocol that provides bi-directional information flow between a HTTP server and HTTP client. The resulting interactivity on the client side, permits data entry and the editing of HTML documents. The Common Gateway Interface (CGI) may connect the HTTP server and its applications and databases. CGI scripts are created using a scripting language or programming tool. CGI may be used to:

- query databases and post the output to HTML documents.
- generate HTML forms for data entry.
- interact with the indexes of on-line documents to produce searching and retrieval features.
- interact with email.

CGI programming is possible using Unix, Windows and Macintosh servers. CGI scripts may be created using:

- Perl
- Apple Script

CGI programs may be created using almost any high level programming language including:

- C++
- Visual Basic
- et al.

The protocol that is CGI bases itself on standard environment variables that are sometimes extended by the Web server used.

(See *CGI environment variables*.)

CGI environment variables A set of variables that define the CGI (Common Gateway Interface), and are normally set when a CGI script or program is called by using the:

- GET method where the URL defines the CGI program (such as `credit.cgi` for example) and the accompanying data used by the server that follows the question mark:

```
www.FrancisBotto.com/cgi-bin/credit.cgi?subject
=transaction
```

- POST method in which the program is specified as part of the URL, passing data using the requester path: which is a uni-directional link from the client to the server.

```
www.FrancisBotto.com/cgi-bin/credit.cgi
```

`HTTP_ACCEPT` Holds the 'Accept:' headers from the client.

`HTTP_COOKIE` Holds the contents of 'Cookie:' headers from the client.

`HTTP_FROM` Holds the contents of the 'From:' header from the client that may be the client's:

- Correct e-mail address if not withheld
- Incorrect e-mail address which is simply false, or entered in error.

`HTTP_REFERER` Holds the contents of the 'Referer:' header from the client, containing a URL.

`HTTP_USER_AGENT` Holds the contents of the 'User-Agent:' header from the client, containing the Browser's name.

`PATH_INFO` Holds the URL's suffix or that data which follows the script's name.

`QUERY_STRING` Holds the 'query' part of an HTTP GET request that is the URL's suffix portion following '?'.

`REMOTE_ADDRESS` Holds the client's or proxy's IP address from where the request is being made.

`REMOTE_HOST` Holds the hostname of the client or proxy making the request, or its IP address only when `NO_DNS_HOSTNAMES` is defined in the `config.h` file.

`SCRIPT_NAME` Holds the name and path of the CGI script being executed.

SERVER_SOFTWARE Holds the name and perhaps version of the server software.

SERVER_NAME Contains name of host on which server is running.

SERVER_PROTOCOL Contains 'CGI 1.1'.

SERVER_PORT Holds the port on which server is running.

(See *CGI*.)

CGI program (See *CGI*.)

CGI Script (See *CGI*.)

CGI scripting language A language that may be used to create CGI programs or scripts.

(See *CGI*.)

Chargeback 1. An instance when an end-user contests a charge through their bank, and the previous transaction amounts are reversed. 2. An instance when a customer account is credited with a previously charged amount.

Charging gateway A gateway in a mobile network that records service usage on a time-charged or packet-used basis.

Chat 1. A real-time, text-based communications medium, carried out over a network, or over the Internet. (See *IRC*.) 2. A Windows NT-based server that is part of the MCIS. (See *MCIS*.) The Chat server provides real-time text-based communications. The communications may be private (one-to-one), one-to-many, or conferences. It has its own proprietary protocol and supports the IRC protocol. A Chat SDK and ActiveX control, permit the integration of Chat functionality, where a single server may support up to 48,000 users.

Checksum validation A method of validating credit card numbers by using the *mod 10* check digit algorithm and is implemented by:

1. Doubling the value of alternative digits of the credit card number by beginning with the second digit:

1	3	6	5	8	9	7	6	2	4	2	7	6	0	8	7
	6		10		18		12		8		14		0		14

2. Adding the product values to the alternate digits beginning with the first:

$$7 + 16 + 26 + 17 + 10 + 16 + 6 + 22 = 120$$

In this instance the credit card number has passed the validity check because the result is evenly divisible by 10.

Ciphertext An input into a decryption algorithm that sees it returned to plaintext.

(See Ciphertext, Plaintext, Encryption algorithm, SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetric, Transposition and Dictionary attack.)

class A class definition declares data (or instance variables in Objective-C) and defines methods. Objects with the same data (or instance variable) types and with access to the same methods belong to the same class.

Class diagram A pictorial representation of the class hierarchy, including links of inheritance, revealing sub-classes and their superclasses. It illustrates how interfaces and methods are inherited within the class hierarchy of an architecture.

(See C++ and Java.)

Classic An application environment for the Mac OS X that runs non-Carbon Mac OS software.

Classpath A path used by a Java program that points to folders containing classes, and it may be downloaded dynamically to a client using a codebase.

Clicks and Mortar A term used to describe a business that is both physically operating in a traditional high-street or shopping mall, and is selling via an e-business site.

clickstream data A trail of electronic information left at Web sites following user interaction. It can be stored by a Website's server and may be used to provide usage habits.

Click-Through *(See Impression.)*

Client 1. A collective portable or desktop system that provides the human machine interface to a client/server architecture, including:

- e-mail client such as Microsoft Outlook for receiving and sending e-mail messages
- client software such as Web browsers which may be Netscape, Explorer or HotJava
- client operating system which is typically Windows 95/98/2000/NT.

Between clients and servers there may be a number of hardware and software entities, including:

- Access technologies such as ISDN or wireless media such as GSM
- Modems or NIC (Network Interface Cards)
- Protocols such as TCP/IP at the transport layer, HTTP and UDP
- Middleware such as those based on the IDLs of DCOM or CORBA NS that provide a means of exchanging messages
- ORB (Object Request Broker).

(*See OSI, TCP/IP, HTTP and UDP.*) 2. In the context of middleware based on the OMG Notification Services, such client applications are termed consumers, while the server applications become suppliers or publishers. In this context, clients may operate according to the push and pull models within the client/server architecture. (*See CORBA NS.*) 3. A device or appliance that is driven by remote server applications and data. It may be a portable device such as a PDA or palmtop appliance manufactured by enterprises that include Psion, Casio and 3Com. (*See CORBA NS and Client/server.*)

Client/server

A distributed system architecture where client systems are connected to server systems. The client provides an interface to applications and data that is stored on the server. The interface may be provided through a browser such as the:

- Microsoft Explorer
- Netscape Navigator
- Sunsoft HotJava.

Client activity and processing is said to be on the client-side, while server activity and processing is on the server-side. The network that provides connection between clients and servers might be a:

- LAN
- WAN
- Internet
- intranet.

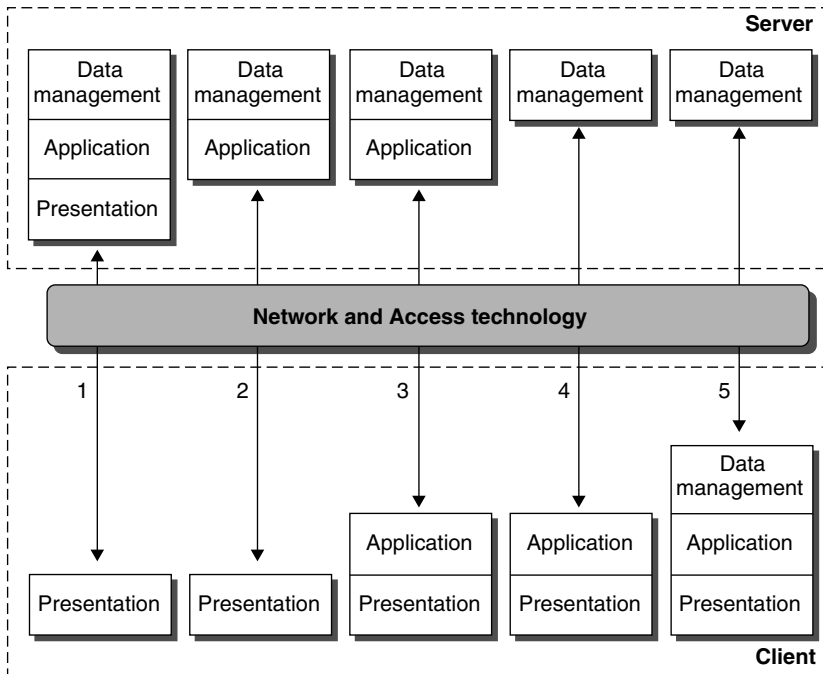
Industry client/server standards for database manipulation include:

- ODBC (Open Database Connectivity), which is the most common
- IDAPI (Integrated Database Application Programming Interface).

Client/server network protocols include:

- IP/TCP
- IPX (Internet Packet eXchange).

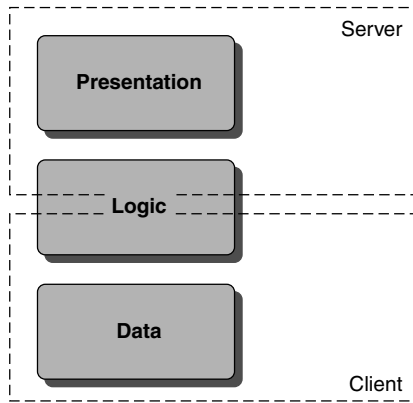
Using the three-element representation of an application, the client/server model (which is observed by the Web) may be explained.



Client/server logical topologies as once defined by the Gartner Group

The five shown topologies are:

1. *Distributed presentation*, which distributes a portion of the user interface (UI), and may be equated to the inactive Web model, where the browser is used only to view documents.
2. *Remote presentation*, which distributes the entire UI to the client system.
3. *Distributed function*, which divides application logic between the server and the client. In Web context this processing distribution may be achieved using appropriate plug-ins and ActiveX controls with Netscape Navigator or Microsoft Internet Explorer.
4. *Remote data access*, which is a model that sees the so-called fat client. This means that the client system is substantial (or 'fat') in terms of application logic.
5. *Distributed database*, which distributes the data management functions between the client- and server-side. This configuration is used in Web-casting, where users are served information that matches their predefined criteria.



Web client/server model with
Java applets/ActiveX
controls or plug-ins

The distribution of the three key application elements (namely Presentation, Logic and Data or Data Management) may be used to explain the many client/server models. This is achieved using the simple diagram below:

(See 2-tier, 3-tier, n-tier, Application, Client, Server and Webcasting.)

Client side A term that indicates the presence of software or data on client systems. Synonym: local.

Client software An application that resides on the client side within a client/server architecture.

(See Client.)

Client system A collective system with which users interact directly, and which is physically located on users' desktops or in similarly close proximity.

(See Client.)

Client/server architecture A hardware infrastructure used to platform client/server applications. It may be 2-tier, 3-tier or n-tier.

(See 2-tier, 3-tier and n-tier.)

Cocoa A set of frameworks for object-oriented development using the Mac OS X and programming with Java and Objective-C to create applications.

Codebase An entity that may be downloaded dynamically to a client and contains a classpath to remote classes.

(See Classpath.)

co-location (of servers) A term that often refers to a physical server located on a network that does not belong to the server's/site's owner(s).

COM (Component Object Model) An object model used by OLE objects and software services. COM-based technologies include Distributed COM (DCOM), COM+, Microsoft® Transaction Server (MTS), ActiveX Controls, and more.

COM+ A COM enhancement that was announced at the 1997 Professional Developers Conference in San Diego, CA. It provides developers with an improved workbench allowing them to program in almost any language, and using many different tools, and offers backward compatibility with COM.

Commerce Server A server solution that provides e-commerce sites, and has business analysis tools to identify business opportunities and to perfect online business promotions.

Command line An editor that is used to enter commands directly. Examples include DOS and Linux command lines.

(See Linux.)

Compaq A large international computer manufacturer and services company.

Compiled A process by which the source code of a high-level language is translated into machine-executable form or machine code. Generally, compiled languages offer better run-time performance than interpreted languages.

(See C++, Java, Object, and OOP.)

Compiler A program or program module able to convert source code into machine-executable code. Unlike interpreter which attaches precise code to high-level statements each time a program is run, a compiler produces machine-executable object code once. Inexpensive to develop, BASIC interpreters were widely used in the microcomputer industry in the 1980s.

Compound document A document that may integrate different document types, and media types that emanate from different sources. The various documents may be OLE objects provided by an appropriate OLE 2.0 server. Alternatively they may be objects of a similar architecture such as the more modern Microsoft ActiveX component architecture. Equally, they may be objects that comply with OpenDoc or JavaBeans component architectures.

(See ActiveX, JavaBeans and OLE.)

Compound object An object that is constructed using multiple objects.

(See C++, Java, OOP and OODBMS.)

Compressed Image An image following compression through hardware and/or software means.

(See *JPEG and MPEG.*)

Compression 1. A method by which data of any sort (often image and video data) is scaled down in size, eventually consuming less storage space and requiring a narrower bandwidth. 2. Video compression optimises both the bandwidth and data storage capacity of media. Popular video compression schemes include Intel Indeo, MPEG-1, MPEG-2 and M-JPEG. (See *MPEG.*) 3. Audio compression serves to reduce the data storage requirements of wave audio files, and optimise the bandwidth of distribution media. (See *Wave audio.*) 4. Disk compression increases the data storage capacity of hard disks. Commercial disk compression programs include Stacker (Stac Electronics) which is also available in hardware form giving improved performance over software-only solutions. Stac Electronics made international news when it won a \$100,000,000 dollar lawsuit, resulting from Microsoft infringing its patents for compression algorithms. 5. Batch file compression is useful for archiving files and compressing them for distribution purposes. Compressed program files have to be unpacked or uncompressed before they may be run. Popular batch file compression programs include Pkzip and Lharc. 6. Data compression to reduce the size of data parcels transmitted and received using a modem. Standard data compression in this context include V.42bis.

Compression parameters A video compressor setting may be used to optimise a video sequence for playback using a target system of a given bandwidth. MPEG compression parameters include the placement of I frames. More general compression parameters might include interleave ratio, frame playback speed, and compression ratio requirements. Generally the quality of video diminishes as the compression ratio increases.

(See *MPEG.*)

Compression ratio A ratio that relates the size of a data file before and after compression. The video compression ratio using fully specified compressors may be altered.

(See *MPEG.*)

Compressor A hardware and/or software solution used to compress motion video or still computer graphics. Using video compressors, it is possible to specify a number of compression settings.

Computer A system or appliance able to process and store digital information. Its many components and subsystems may include:

- Processor or CPU (Central Processing Unit)
- Modem

- DVD-ROM drive
- Graphics engine or card
- Hard disk
- Sound card
- Electronic memory devices including RAM, SRAM, VRAM, ROM and NVRAM
- Colour display
- Video playback device such as MPEG-1 or MPEG-2 decoder
- QWERTY Keyboard
- Mouse
- Microphone
- Television tuner
- Radio tuner
- Set-top box decoder
- Scanner

(See *Client, Thin client and Fat client.*)

Computer graphics A means of displaying images using a computer. The advancement of computer graphics has unleashed numerous computer applications ranging from Computer Aided Design (CAD) to colour desktop publishing (DTP), VR, multimedia and 3-D graphics. Through the coupling of high-resolution colour monitors and high specification graphic controllers, truly photographic quality images are now possible. Built up of digitally defined pixel elements, computer images are invariably complex. For example, a 1024-by-768 pixel image yields 786,432 individual pixels. Digitising such a black and white image requires a corresponding number of bits, or 98,304 Bytes ($786,432/8$), or 96 KBytes ($98,304/1024$). Progressing to a grey-scale arrangement using bits per pixel to give 256 (2^8) grey shades, the same 1024 by 768 pixel image requires 768 KBytes—eight times the storage capacity of its black-and-white equivalent. Such is the complexity of photographic quality images, a minimum of 24-bit colour graphics are required. Red, green and blue are each represented by eight bits, thus facilitating the selection of 256 tones of each. By combining each colour component, over 16.7 million ($256 * 256 * 256$) colours are made available. Yet higher quality results are achieved using 32-bit and 36-bit graphics. Such 24-bit graphics on a 1,024 by 768 pixel resolution monitor means that a single frame consumes around 3,072 KBytes. Large image files of this sort are costly to process, transmit and store. They are also slow to transfer from computer to screen, as well as to and from hard disk. A solution to these problems lies in image compression. Many popular image file formats such as JPEG feature image compression. (See *JPEG.*)

Computer name The name of the computer/system connected to a network. All Windows 98/NT systems have names when connected to a network.

Additionally, their users are given passwords that may be used to log on and retrieve their specified or default Windows configuration.

(See Microsoft Windows.)

Concurrent computing An environment in which processes, or program elements execute simultaneously.

(See MPP.)

Concurrent programming A programming model where processes are implemented in parallel.

Concurrent programming language A programming language that may be used to implement processes in parallel.

Confidence factor A measure of the percentage probability of an event or circumstance being correct. In KBSs (Knowledge Based Systems), it may be applied so as to weigh facts and conclusions that exist in a knowledge base.

Constant An unchanging entity.

Container An entity that is used to hold an object. For example, using Visual Basic a container may hold an object such as the Media Player, and so give dimensions, appearance and physical behaviour to the Media Player.

Content authoring tool A development tool that permits the creation of Web and multimedia content.

(See Multimedia authoring tool.)

Content provider A company or individual that provides usually copyrighted material for inclusion in a hosted Web site or service. Content providers typically include publishers, recording companies, photo libraries and so on.

Controller A generic name for a hardware component which controls a peripheral device, such as a disk drive, CD-ROM drive or monitor.

(See Graphics card and Hard disk.)

Cookie A minor transaction that allows server-side components such as CGI scripts and programs, to store and retrieve data from the client system. It gives Web applications the ability to write data to the client that reflects usage habits. For example, the data may relieve the user from repetitive tasks, such as the re-entry of ID numbers or data each time a Web site is visited. Instead the server-side components may identify the user through cookies on the client system, extract them, and perform the necessary processes.

(See Security gateway and Shopping cart.)

Cooperative multitasking An environment where running processes may receive processing time from other process/programs.

(See *Preemptive multitasking*.)

CORBA (Common Object Request Broker Architecture) An object architecture featuring an IDL (Interface Definition Language) and managed by the Object Management Group (OMG).

(See *CORBA IDL and OMG NS*.)

CORBA IDL (Common Object Request Broker Architecture Interface Definition Language) A language that is based on C++, and may be compiled into Java and C++ using appropriate compilers such as IDL2JAVA and IDL2CPP.

Corel Draw A popular graphics program used by many professional illustrators and graphics artists. Used widely in the production of graphics for multimedia applications/titles.

CosNotification An IDL module which defines the operations (or methods) used by the CORBA Notification Services which supports push and pull models on networks. The collective IDL modules might be referred to as the API of the implementation.

```
module CosNotification {
// The following two are the same, but serve different
// purposes.
typedef CosTrading::PropertySeq OptionalHeaderFields;
typedef CosTrading::PropertySeq FilterableEventBody;
typedef CosTrading::PropertySeq QoSProperties;
typedef CosTrading::PropertySeq AdminProperties;
struct EventType {
    string domain_name;
    string type_name;
};
typedef sequence<EventType> EventTypeSeq;
struct PropertyRange {
    CosTrading::PropertyName name;
    CosTrading::PropertyValue low_val;
    CosTrading::PropertyValue high_val;
};
typedef sequence<PropertyRange> PropertyRangeSeq;
enum QoSError_code {
    UNSUPPORTED_PROPERTY,
    UNAVAILABLE_PROPERTY,
    UNSUPPORTED_VALUE,
    UNAVAILABLE_VALUE,
};
```

```
        BAD_PROPERTY,
        BAD_TYPE,
        BAD_VALUE
};
struct PropertyError {
QoS_Error_code code;
PropertyRange available_range;
};
typedef sequence<PropertyError> PropertyErrorSeq;
exception UnsupportedQoS { PropertyErrorSeq
    qos_err; };
exception UnsupportedAdmin { PropertyErrorSeq
    admin_err; };
// Define the Structured Event structure
struct FixedEventHeader {
    EventType event_type;
    string event_name;
};
struct EventHeader {
    FixedEventHeader fixed_header;
    OptionalHeaderFields variable_header;
};
struct StructuredEvent {
    EventHeader header;
    FilterableEventBody filterable_data;
    any remainder_of_body;
}; // StructuredEvent
typedef sequence<StructuredEvent> EventBatch;
// The following constant declarations define the
// standard
// QoS property names and the associated values each
// property
// can take on. The name/value pairs for each
// standard property
// are grouped, beginning with a string constant
// defined for the
// property name, followed by the values the property
// can take on.
const string EventReliability = "EventReliability";
const short BestEffort = 0;
const short Persistent = 1;
const string ConnectionReliability
    = "ConnectionReliability";
// Can take on the same values as EventReliability
const string Priority = "Priority";
const short LowestPriority = -32767;
const short HighestPriority = 32767;
```

```
const short DefaultPriority = 0;
const string StartTime = "StartTime";
// StartTime takes a value of type TimeBase::UtcT
// when placed
// in an event header. StartTime can also be set to
// either
// TRUE or FALSE at the Proxy level, indicating
// whether or not the
45 // Proxy supports the setting of per-message stop
// times.
const string StopTime = "StopTime";
// StopTime takes a value of type TimeBase::UtcT when
// placed
// in an event header. StopTime can also be set to
// either
// TRUE or FALSE at the Proxy level, indicating
// whether or not the
// Proxy supports the setting of per-message stop
// times.
const string Timeout = "Timeout";
// Timeout takes on a value of type
// TimeBase::TimeT
const string OrderPolicy = "OrderPolicy";
const short AnyOrder = 0;
const short FifoOrder = 1;
const short PriorityOrder = 2;
const short DeadlineOrder = 3;
const string DiscardPolicy = "DiscardPolicy";
// DiscardPolicy takes on the same values as
// OrderPolicy, plus
const short LifoOrder = 4;
const string MaximumBatchSize = "MaximumBatchSize";
// MaximumBatchSize takes on a value of type long
const string PacingInterval = "PacingInterval";
// PacingInterval takes on a value of type
// TimeBase::TimeT
interface QoSAdmin {
QoSProperties get_qos();
void set_qos ( in QoSProperties qos)
raises ( UnsupportedQoS );
void validate_qos (
    in QoSProperties required_qos,
    out PropertyRangeSeq available_qos )
raises ( UnsupportedQoS );
}; // QoSAdmin
// Admin properties are defined in similar manner as
// QoS
```

```
// properties. The only difference is that these
// properties
// are related to channel administration policies, as
// opposed
// message quality of service
const string MaxQueueLength = "MaxQueueLength";
// MaxQueueLength takes on a value of type long
const string MaxConsumers = "MaxConsumers";
// MaxConsumers takes on a value of type long
const string MaxSuppliers = "MaxSuppliers";
// MaxSuppliers takes on a value of type long
```

The Notification Module

Counter program A program which records the number of occasions (or hits) a Web page or URL is opened. Such program variants may count Web pages that are opened and served to the client, and not merely count URLs. The program may be embedded in a HTML script.
(See *CGI*.)

Coupling A term used to describe efficiency of communication between network hardware and software components. Tight coupling between two network components indicates comparatively high speed communication capabilities. Loose coupling indicates the exact opposite.

crawler (search engine) Crawler programs may be deployed by Search engines so as to gather metadata (such as indexes) from Web sites.
(See *Search engine*.)

CRC (Cyclic Redundancy Check) An error detection scheme used on CD variants as well as other devices.

Cray, Seymour A computer scientist made famous by his work in the field of MPP.
(See *MPP*.)

Creative Labs A Singapore-based company specialising in sound cards and video capture cards. Its SoundBlaster card became an industry standard. Its video capture cards include the VideoBlaster range which extends to video conferencing. It also marketed and sold the rather dated VideoSpigot video capture card, though it did not develop it.

Credit card fraud An illegal use of a credit card.
(See *Anti fraud detection*.)

Credit Card Merchant Account A POS feature that enables an e-business Web site to process credit card transactions. Numerous companies

offer such facilities over the World Wide Web where users are required to complete on-line forms, and produce relevant evidence of their on-line business.

(*See POS.*)

Credit card number A number assigned to a credit card.

(*See Checksum validation.*)

Critical error An error resulting from a hardware or software bug. Using DOS, the user will be prompted by R(etry), I(gnore), F(ail), or A(bort).

Cropping A process of trimming an image or frame. In terms of video or picture editing, image or video data is cropped as you would snip a photograph using a pair of scissors. Most editing programs provide an Undo Crop command (on the Edit menu) in order to cancel a previous cropping operation.

Cross platform A software program, module or object that may be run on more than one platform. Java applications are cross-platform. Such applications may be described as platform or hardware independent. For instance, a platform independent program might run on Windows, OS/2 and 386 Unix.

(*See Java.*)

CRT (Cathode Ray Tube) A display device used in desktop colour monitors, consisting of a screen area covered with phosphor deposits (or pixels) each consisting of red, blue and green phosphors. The CRT was the first optronic device. The distance between the phosphors is termed the dot-pitch. Most monitors feature a dot-pitch of .26, while more highly specified versions offer a smaller dot-pitch. An electron beam is projected from the back of the CRT on to the inner screen, using an electron gun. To help focus the electron beam a fine mask is included behind the screen phosphors. This fine gauze separates the three-colour phosphors allowing the electron beam to shine more accurately upon them while improving picture definition in the process. The electron beam scans each of the phosphor-lines horizontally. The rate at which the electron gun scans a single line is termed the horizontal frequency, or the line frequency. There are two methods of scanning the lines:

- interlaced
- non-interlaced.

In a non-interlaced arrangement all the lines are scanned one after another. The rate at which all lines are scanned is termed the refresh rate or the vertical frequency. Using an interlaced configuration the lines making up the screen are scanned in two separate fields. One field is used to scan even numbered lines and the other to scan odd numbered lines. This interlaced technique was introduced in television broadcasting specifically to reduce screen flicker.

Today, however, a monitor that operates at high resolutions in a interlaced mode is thought to be one that will flicker. Non-interlaced monitors with sufficiently high screen refresh rates are preferred. They provide flicker-free images, with improved stability, and are least likely to cause eye strain. The minimum acceptable refresh rate, or vertical frequency, for a non-interlaced monitor is around 70 Hz.

Cryptoanalysis A subject/science which addresses attacks on cryptosystems.

(See *Brute Force*, *cryptosystem*, *RSA*, *public key encryption*, *asymmetric* and *Dictionary attack*.)

Cryptography A process that ensures data or information is read or used only by its intended readers or users. This is achieved through:

- encryption that disguises input information or data, so it may not be read or used. Resulting encrypted information or data may only be read or used following decryption
- decryption that returns the decrypted data or information to its original usable and readable form.

Implementations of cryptography are called cryptosystems, and take the form of algorithms. Cryptosystems may be categorised in two main groups:

- secret-key, where the processes of encryption and decryption each require the use of a single key which is the same. The key is a number, and preferably a large one, hence the phrase 56-bit key etc. Unless the recipient of the encrypted data already knows the key, it may be left to the sender to transmit its details unencrypted. This is a notable flaw of secret-key encryption, because it exposes the key to unintended users such as eavesdroppers. A remedy is found in public-key encryption that is described below.
- public-key, where the sender need only know the recipient's public key. This may be obtained in unencrypted form, because it may not be used to decrypt data, rather all it may do is encrypt data. In order to decrypt data, the recipient uses a private key that is the mathematical inverse of the public key. It may be considered impossible to determine the private key from the public key in so far as most security requirements are concerned.

The mathematics that underline public-key encryption have a simple goal: namely, to make difficult the derivation of the private key from the public key. This is achieved through a one-way function that describes the difficulty of determining input values when given a result. RSA is among the best-known cryptosystems or algorithms. This was developed by MIT professors Ronald L. Rivest, Adi Shamir, and Leonard M. Adleman.

(See *RSA* and www.rsa.com.)

Cryptology A subject/science that addresses cryptography and cryptanalysis.

(See *SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetric and Dictionary attack.*)

Cryptosystem A means of securing data so as it is read only by its intended users.

(See *RSA, SET, asymmetric and Public key.*)

Cryptosystem Operation (See *Symmetric Cryptosystem Operation.*)

Crystal Reports A reporting engine.

CSS (Cascading Style Sheets Language) A styling language used to create style sheets that may be attached to HTML documents, and declares the appearance of entities/properties that include margins, positioning, colour or size. Such stylesheets may be included in HTML using:

- <LINK>
- <STYLE>
- the CSS @import syntax.
- <STYLE>

```
<HTML>
  <HEAD>
    <TITLE>title</TITLE>
    <LINK REL=STYLESHEET TYPE="text/css"
      HREF="http://botto.com/cool" TITLE="Cool">
    <STYLE TYPE="text/css">
      @import url(http://botto.com/basic);
      H1 { color: blue }
    </STYLE>
  </HEAD>
  <BODY>
    <H1>Headline is blue</H1>
    <P STYLE="color: green">While the paragraph is
      green.
    </BODY>
</HTML>
```

Currency convertor An on-line service that provides real-time conversion between currencies.

Current directory An active directory whose files may be listed or executed directly. Using DOS current directory files may be listed by entering DIR at the command prompt. Directories may be changed by entering CD

followed by the directory name. Using Windows dialogue boxes it is possible to change directories by double-clicking the directory name shown in the Directories box; a root directory is indicated as ‘.’.

Cursor A visible bitmap that indicates the point of data entry or user-interaction on screen. It may take the form of a pointer, hand, or even hour glass when the underlying software is busily computing.

CU-SeeMe An enterprise within Cornell University that produces an Internet videoconferencing solution.

Customer facing An interface with potential customers. A brochure or flier describing a product or service may be prefixed ‘customer facing’.

Customer relationship management (CRM) The systems and infrastructure required to analyse, capture and share all parts of the customer’s relationship with the enterprise.

Cut A technique where video footage is switched from one sequence to another.

Cut and paste A process by which a section of a screen image or video sequence is removed (cut) and implanted (pasted) elsewhere.

CVS (Concurrent Versioning System) A Linux repository that permits multiple users to work on the same files. Files may be checked out and returned to the repository where their contents may be merged with other versions of the same file. For Windows systems, access to the CVS is provided by WinCVS, or alternatively a Telnet and ftp session may be established between the Windows system and the system hosting the CVS. Consider a scenario where you want to write files from a Windows system to the CVS:

Establish a Telnet session with the network system (such as lin3) holding the CVS. This requires Telnet software on the Windows machine, where the command used would logically following the pattern:

```
Telnet lin3
```

Respond the prompts:

```
username:  
password:
```

Open a DOS window and change to the directory holding the file(s) you wish to write to the CVS. To do this use the standard `cd` and `cd/` commands. Establish an ftp session with the network system (such as lin3) holding the

CVS. Again this requires software on the Windows system. Typically you would type in a DOS window:

```
ftp lin7
```

In the DOS window change to the directory on lin3 where the files are to be copied. By default Linux is now primed for an Ascii transfer, but if the files are to be read using an intranet, and are perhaps PDFs, they will be corrupt, and the intranet will not work for local and for remote workers. A binary transfer is therefore necessary, and this is achieved simply by typing 'binary'.

Copy the file(s) by typing:

```
put
```

Or

```
mput outerwall.*
```

Type:

```
cvs commit
```

Finally in the Telnet window type:

```
cvs update
```

Cybercafe A cafe that provides customers with access to the Internet usually via coin (or card) operated computers.

Cyberspace A term used to describe the Internet (or Net).

Cyclic redundancy check (*See CRC.*)

Cyrix A chip maker, and manufacturer of PC processors.

D

D channel A 16 Kbps signalling channel that supports two 64 Kbps data channels, according to the ISDN standard.

(See ISDN standard.)

D1 *(See CCIR 601.)*

Daemons A program or process dedicated to perform what is usually a singular given task, such as sending mail. TCP/IP daemons include those added by third parties that include SCO.

(See TCP/IP.)

Daisychain A method of uniting a number of CD-ROM drives or other connected devices.

Darwin An alternative name for the Mac OS X core.

Database An electronic information storage system offering data storage and retrieval. A generic term that describes the storage of information on a record by record basis. Records are divided into fields of different types including text, numeric, date, graphic, and even BLOB (Binary Large Object). The records are stored in tables or files. Databases types include flat-file and relational. The flat file database model embodies no links between different files or tables. A relational database is quite different in that records from one file may be linked to records stored in a separate file or table. Codd's standard text about relational databases published in the sixties specified different types of relational links. Types of link include one-to-one, one-to-many, and many-to-many. There are many commercial examples of the relational database that base their design on the original writings of Codd. Relational databases are formally referred to as RDBMSes (Relational Database Management Systems) which flat-file databases are termed simply DBMSes (Database Management

Systems). Commercial examples of software products that permit the development of RDBMSes include Paradox for Windows, dBase, Microsoft Access, Oracle and Ingress. Relational databases are used to store tabular information in the form of records, and useful versions are able to generate graphs. Popular PC relational databases include Microsoft Access, Borland Paradox, dBase, Q & A and DataEase. Because they are relational, an invoice can extract information from a number of different tables or files. Flat-file databases are used to store isolated records, and cannot be used to link files or tables. They are used for simple applications such as card files. Text databases are used to store documents such as articles and even complete books. Documents may be indexed where the user-interface simply allows users to search for documents that contain target words, phrases or sentences.

(See Data warehouse, DBMS, DSS and RDBMS.)

Database middleware *(See Glue and Middleware.)*

Database server *(See Server.)*

Data compression *(See Compression.)*

Data cube An information storage model. In the context of a data warehouse, data cubes area evolved as a result of extractions from operational data. They may be assumed to be static entities that do not change, and may not be altered or even built from query data. A cube cache is used to store them in memory. If grown beyond three dimensions, the cube becomes a hyper-cube.

(See Data warehouse.)

Data dictionary A type of metadata that defines stored data along with its relationships. Typically the database dictionary is dynamic, updating its contents as data structural changes occur.

(See Data warehouse and DBMS.)

Data extraction A process that abstracts data from one or more sources, in order to build a static database of unchanging data.

(See Data warehouse.)

Data flow A sequential record or diagram (called a 'data flow') showing the flow of data through an IT solution.

Data hiding A means of making the underlying workings of types or classes transparent to the programmer. The programmer merely has to understand the behaviour and functionality of the class.

(See C++, Java and OOP.)

Data link A direct serial connection between two nodes or devices, and is devoid of intermediate switches or devices.

(See *MPP*.)

Data mart A single-subject (and generally small-scale) data warehouse that provides DSS for a limited number of users.

(See *Data warehouse*.)

Data mining A data analysis technique, sometimes referred to as data or knowledge discovery, and implemented using an appropriate tool that may be used to generate summaries, and information overviews that place data in perspective to time, usage, geographical location or places it in another category. It follows that it is a useful technique for analysing patterns of business operations, and the use of enterprise data, as well as data derived from external sources and entities that may be monitored for behaviour and cyclic patterns that influence decision making process. A practical revelation discovered by data mining may be as simple as the realisation that cutting trading hours of a chain of stores in the evening results in significant savings.

Data partitioning A method of segregating data, so it is distributed across different systems. It may serve to store selected records in more secure (and often expensive) mass storage (such as SRAM or an appropriate level of RAID), while storing less important data in conventional storage media, namely hard disk.

(See *RAID*.)

Data replication A dynamic and changeable, verbatim copy of data. A multiplicity of such replicas may exist.

Data schema A term that describes a database structure, such as the entity relationship (E-R) diagram of an RDBMS. The E-R diagram shows the links that unite the database tables.

(See *Data warehouse, Database, and RDBMS*.)

Data sonification A general term used to describe the process of enhancing data through the addition of audio.

Data transfer rate A rate at which data is transferred from a mass storage device, such as hard disk, or from removable media, or over a physical or wireless medium.

(See *Hard disk and RAID*.)

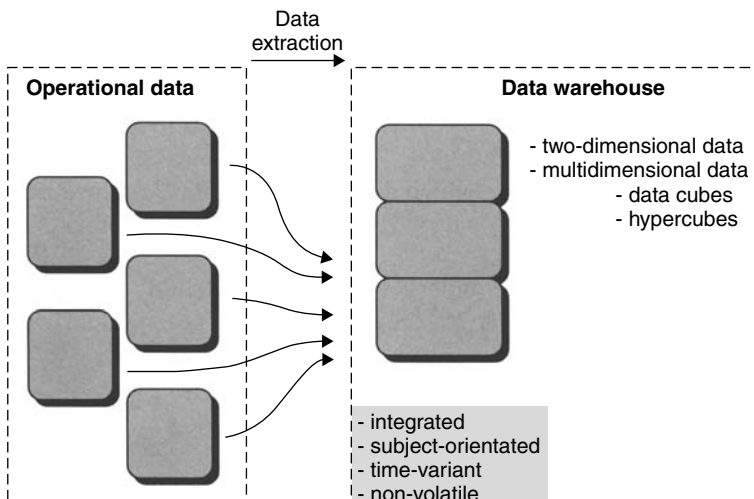
Data type A classification for data. Modern relational databases commonly store the following different data types including currency, numeric, date, alphanumeric, Boolean, graphical and BLOB (Binary Large Object).

(See *OODBMS, Data warehouse, BLOB, and Boolean*.)

Data warehouse ‘An integrated, subject-oriented, time-variant, non-volatile database that provides support for decision making.’ (Bill Inmon). A unified data repository extracted from multiple data storage structures that may emanate from various data sources. It provides a single interface with relational and/or multidimensional data. It is the rebirth of what IBM termed the Information Warehouse in the 1980s. Data warehouses form the information storage methodology in modern decision support systems (DSS). Collectively these systems provide a means of querying data that emanates from disparate information storage models. On-Line Analytical Processing (OLAP) is a crucial facet of the data warehouse architecture, providing a means of abstracting and analysing data in a manner that makes transparent the multiple data sources and data storage models used. The data mining system (DMS) is also a key DSS component. Data mining is an attempt to embed intelligence into the interrogation of stored data, and may automate the querying of data, and provide user access to new data structures whose information is in close proximity in terms of related subject matter, and may assist in solving defined problems. The underlying storage metaphors of a data warehouse may be:

- two dimensional, where values are stored using the table metaphor, adhering to the established formal RDBMS model for information storage
- multidimensional, where data is perceived as a three-dimensional cube or a data cube, where values have x , y and z coordinates.

Data cubes are evolved as a result of extractions from operational data. They may be assumed to be static entities that do not change, and may not be altered



Data warehouse overview

or even built from query data. A cube cache is used to store them in memory. If grown beyond three dimensions, the cube becomes a hyper-cube. According to Inman's definition, a data warehouse is characterised as:

- integrated, providing a unified interface to multiple data sources that may use disparate information storage models
- subject-orientated, revealing data which is in close proximity in terms of subject matter, providing related information, that may be dedicated to specific analysis.
- a time-variant, permitting data retrieval and analysis using the dimension of time.
- nonvolatile, making the collective data entities static in definition, except during the periodic instances where updates are driven through the data by the integrated operational systems. On-line updates are impermissible, and the data warehouse may be considered as being read-only.

(See *Database, DBMS and DSS.*)

Further Reading

Inmon, Bill & Chuck Kelley, *The 12 Rules Of Data Warehouse For A Client/Server World*, Data Management Review, Vol 4, May 1994, pp 6–16.

DBMS (Database Management System) A system that provides the operations necessary to manage stored data that may be two-dimensional or multidimensional. A DBMS:

- requires a data dictionary that defines stored data along with relationships. The database dictionary is dynamic, updating its contents as data structural changes occur.
- ensures that entered data undergoes pre-defined validity checks.
- transforms entered data so it may be stored by the underlying data structure.
- provides storage for data, its relationships, forms, reports, queries and miscellaneous files.
- includes security features, such as the password protection of files, allocated user access rights, and prohibits certain users from accessing certain files and from making data changes.
- may maintain data integrity in a multi-user environment.
- may provide a database communications interface that might permit users to submit forms-based queries through Web browsers, publish reports and data using various media that include the Web, E-mail and Lotus Notes.
- provide features pertaining to backup and recovery.
- provide access to data using a query language (such as SQL or a variant thereof), or a querying mechanism which might involve the completion of tables using defined query statements (such as the Borland Query By Example (QBE) technique).

(See *Data warehouse.*)

DBS (Direct Broadcast Satellite) A communication and broadcasting technology, where information is transmitted (from a geostationary satellite) and received by a satellite dish that is typically 18 in to three feet in diameter. It can also be applied as an access technology that offers downstream bandwidths of perhaps 400 Kbps. Hughes Network Systems (US) offer such service and implementation. Up to 200 television channels may be chosen using many DBS or Direct To Home (DTH) services. MPEG-2 encoding is used for many DBS services.

(See *MPEG-2 and Satellite.*)

DCOM (Distributed Component Object Model) A protocol that glues software components on networks such as those that use HTTP, and is based on the Open Software Foundation's DCE-RPC specification. It is compatible with Java applets and ActiveX components, and was formerly called 'Network OLE', though it has since been evolved.

DCT (Discrete Cosine Transform) A widely used mathematical technique for image compression. It provides the basis for lossy image compression where redundant image data is omitted. It is part of the JPEG algorithm, and is also used in videotex. (See *JPEG and Videotex.*)

The DCT process operates by converting image data from the *spatial* to the *transform* domain. The complex underlying mathematics are transcribed to matrix manipulations. The resulting intensive arithmetic operations are best implemented using dedicated image processors, or general purpose processors that have multimedia capabilities such as those integrated into Intel MMX. Image energy in the *spatial* domain is defined as the square of the pixel values. This energy is spread evenly over pixel blocks and resulting coefficients. Following the transformation, the energy is confined to a fewer coefficients. The process involves dividing the image data into 8×8 pixel blocks and performing a forward DCT:

$$F = [T] [P] [T]$$

Where [T]

0.3536	0.3536	0.3536	0.3536	0.3536	0.3536	0.3536	0.3536
0.4904	0.4157	0.2778	0.0975	-0.0975	-0.2778	-0.4157	-0.4904
0.4616	0.1913	-0.1913	-0.4619	-0.4619	-0.1913	0.1913	0.4619
0.4517	-0.0975	-0.4904	-0.2778	0.2778	0.4904	0.0975	-0.4157
0.3536	-0.3536	-0.3536	0.3536	0.3536	-0.3536	-0.3536	0.3536
0.2778	-0.4904	-0.0975	0.4157	-0.4157	-0.0975	0.4904	-0.2778
0.1913	-0.4619	-0.4619	-0.1913	-0.0193	0.4619	-0.4619	0.1913
0.0975	-0.2778	-0.4157	-0.4904	0.4904	-0.4157	0.2778	-0.0975

(See *JPEG and MPEG.*)

DDE (Dynamic Data Exchange) A standard technique by which data may be exchanged between running Windows applications. For example, a database tool might have a DDE interaction with a spreadsheet in order to draw graphs based on spreadsheet data. A DDE interaction is occasionally called a conversation. Nowadays most Windows users harness OLE (Object Linking and Embedding) rather than DDE. OLE 2.0 compatible applications may be assumed to be considerably less difficult to link.

(See ActiveX and OLE.)

Debit Card A card issued by a bank that enables transactions. Internationally agreed debit card standards include Switch and EFTPOS.

Debugger A program or feature that permits program code to be corrected or debugged. It assists the process through appropriate prompts and indications as to where the bugs exist in the source code listing.

Decode A process by which encoded data that may be compressed, is interpreted and delivered to the receiving system or device. For example, the process may involve the decoding of MPEG video.

(See MPEG.)

Decoder 1. A device which is able to interpret an encoded signal. An MPEG decoder is able to uncompress digital video, as is an MPEG-2 STB. *(See DCT and MPEG.)* 2. An electronic device that is able to decode digital addresses. A simple two-input device may set up to four digital outputs. Such devices may form part of the address decoding between the processor and connected electronic devices.

Decryption A process by which encrypted data is unlocked to become readable.

(See Encryption.)

Defragmentation program A program used to defragment a hard disk. It ensures that used data blocks are arranged in a contiguous stream.

Dell A large multinational computer manufacturer that uses the direct selling channel.

Delta channel

(See D channel and ISDN.)

Demand paging A process where pages of data are read from disk into physical memory when required.

Density A measure of how densely packed data bits are on a storage medium.

DES (Data Encryption Standard) An encryption technique; a symmetric cryptosystem. Both senders and receivers use a common 56 bit key to encrypt and decrypt messages and data. The US government backed DES in 1977, and has since recertified every five years.

(See *Encryption*.)

Design A cryptosystem that uses symmetric key cryptography.

(See *SET, Ciphertext, Plaintext, Encryption algorithm, SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetric, Transposition and Dictionary attack*.)

Design pattern A software pattern may be a vocabulary of methods and guidelines, or a reusable element, or a set of elements that reveal themselves as common denominators when developing e-business applications. A resulting reuse strategy may involve the use of pre-built components at the micro level that include methods and functions, and those at the macro level that include complete objects and interfaces. It follows then that a design pattern is a consistency, or an unchanging software component or code fragment that may require little or no modification to be applied in a different client or service implementation, though this interchangeability may be reliant upon the client or service application context. The pattern may obviously bring together one or more classes, interfaces, methods, functions, modules or objects that may:

- Compress the development lifecycle.
- Permit the bypass coding the reuse elements.
- Introduce a consistency in the design of clients and services.
- Help adhere to official or naturally evolved, unofficial software standards.
- Simplify maintenance procedures.
- Provide efficiencies in terms of shared source in a team collaborative environment.

A replicated worker pattern deals with the implementation of processes through concurrent processes, and therefore has application in the domain of parallel computing. It is a distributed computing concept and may consist of a *master* process that executes in control of a number of *workers*, and this terminology is key to the synonym *master-worker* pattern.

The origins of software patterns are traced reliably to notable texts like *Design Patterns: Elements of Reusable Object-Oriented Software* by Richard Helm, Erich Gamma, Ralph Johnson, and John Vlissides, and more recently to *Pattern-Oriented Software Architecture: A System of Patterns* by Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, and Michael Stal. These and the many other texts have a link with the pattern language

concept put forward by Christopher Alexander that addresses architectural design, and his works include *Notes on the Synthesis of Form*, Harvard University Press, 1964, and *A Pattern Language: Towns, Buildings, Construction*, Oxford University Press, 1977.

(See *Pattern language*.)

DESX A version of DES encryption.

Device driver A software component that controls, and reads and writes data to and from a connected device.

DHTML An object model and scripting language for creating object oriented Web pages.

Dialup password file A file used to store passwords, authenticating access to networks via dialup links.

(See *TCP/IP*.)

Dictionary Attack An attack on a cryptosystem using the iterative technique of comparing the key with a dictionary of possibilities, usually beginning with those that are most likely to match the key.

(See *Brute Force Attack and Cryptosystem*.)

Digital A device such as a computer that processes and stores data in the form of ones and zeros. In a positive logic representation, 'one' might be '+5' volts and zero '0' volts. This lowest of levels at which computers operate is known as machine code. Binary arithmetic and Boolean algebra (named after Irish mathematician George Boole) permit mathematical representation. Boolean algebra and Karnaugh maps are used widely for minimisation of logic algebraic expressions. Though digital signals exist at two levels (one or zero), an indeterminate state is possible.

Digital audio An audio signal recorded in digital form. The most common standard digital format is that defined in the CD-DA Specification. Digital audio is used widely in modern multimedia through wave audio files. Audio may be digitised using either video capture boards or sound cards. Audio sources can take the form of a microphone, CD player, audio tape, audio cassette, and even electronic musical instruments. Audio cards may be regarded as Analogue to Digital Convertors (ADCs) where the accuracy of digitisation and subsequent quality achieved largely depends upon the sample rate and number of bits used per sample. The audio quality required can also be preset from within many authoring programs. The memory capacity consumed by a sequence is a function of quality. If it is necessary to calculate

the exact memory/data capacity consumed, then the following simple formula may be applied:

$$\begin{aligned} \text{Memory capacity required (bits)} \\ &= \text{Sequence duration (secs)} \\ &\quad * \text{Sampling rate (Hz)} \\ &\quad * \text{bits per sample} \end{aligned}$$

For example, if an 8-bit sound digitiser with a sample rate of 11 KHz were used to digitise a 15-second sequence, then:

$$\begin{aligned} \text{Data capacity required (bits)} &= 15 * 11,000 * 8 \\ &= 1,320,000 \text{ bits} \\ &= 165,000 \text{ Bytes} \\ &= 161.13 \text{ KBytes} \end{aligned}$$

Memory or disk data capacity required naturally increases linearly with increased sample rates.

(See Wave audio.)

Digital camera A camera able to store pictures in digital form. A popular range of digital cameras is the Kodak DC series.

Digital certificate A means of linking an entity's identity with a public key and carried out by a trusted party.

(See Certificate.)

Digital ID *(See Signature.)*

Digital signature A digital signature may be applied to an encrypted message. A message digest is ciphered using the sender's private key and then appended to the message, resulting in a digital signature.

(See Signature.)

Digital video A video sequence that is stored and played in digital form. Digital motion video is the most animating feature of modern multimedia. Using videodisc players it has been possible to incorporate colour full-motion, full-screen video (FMFSV) in a computer environment for some time. Because multimedia is a blend of concurrent processes, its storage on a single optical disc requires various elements to be interleaved on the same track. Before this concept could be addressed, the inability of conventional (serial) desktop computers to play motion video stored on CD-ROM, represented a significant hurdle. Reasons as to why this is not possible lie in the inadequate rate at which data is transferred from CD-ROM to computer, and in inadequate data storage capacity. A blanket solution to both problems lies in image-compression. For

example, if frames of video are compressed significantly, then the need for large data storage capacity and, more importantly, high rates of data transfer is reduced. Intel refined such a technology that it acquired from General Electric in October 1988. Called Digital Video Interactive (DVI) its home was the Intel Princeton Operation that is part of the Microcomputer Components Group. It originally began in the David Sarnoff Research Center, New Jersey – the once RCA laboratories.

Using DVI up to 72 minutes of FMFSV (at 30 fps) may be stored on a single 12 cm-diameter CD-ROM disc.

(See MPEG, M-JPEG, Video and Streaming Video.)

Digital wallet An element of a cardholder that creates the protocol and assists in the acquirement and management of cardholder digital signatures.

Direct Broadcast Satellite *(See DBS and Satellite.)*

Direct channel A sales channel where the consumer purchases products off the page, or uses another medium such as television, and usually involves payment using a credit card or bankcard.

Direct connection A modem connection without error connection, compression and overflow control. It may be assumed that in such a situation the modem rate equates precisely to the connection rate.

Direct3D A data stream that encapsulates the user's public key and Certificate Authority's (CA's) endorsement.

(See Certificate and SET.)

Director A tool used to create interactive movies, and produced by Macromedia. Resulting productions may include Lingo scripts, and may be deployed over the Web using Macromedia Shockwave technology.

(See Lingo, Shockwave and Streaming.)

Display *(See Monitor.)*

Dissolve A cut from one image or video sequence to another. More precisely, it is the fading of an image into a background colour or image, or the fading of an image while one image is faded up.

Distributed computing An OO system that sees concurrent processes interact with shared resources, and inter-component communications implemented in an efficient and co-ordinated way. It involves leasing distributed events such as those of store and forward agents, and protocols that define

processes and sub-processes required to make the collective system operational and reliable using persistent stores of states that are recoverable following failure.

(See *Store and forward agent*, *JavaSpaces*, and *Jini*.)

Distributed debugging A methodology for debugging client/servers, where the collective distributed system is perceived as a single system.

(See *Distributed computing*.)

Distributed events (See *Store and forward agent*.)

Distributed glue A name given to the collective entities that bind together (dynamically) running components that are on the client and on the server. As is the case with local glues, standard OO component architectures use different distributed glues.

(See *ActiveX*, *Glue*, *JavaBeans*, *OLE*, and *OpenDoc*.)

Dithering A process by which the image-depth of a graphic is altered. Programs such as PaintShop Pro are able to dither images, and may be useful for:

- targeting a system that may be limited to simple 8 bit graphics
- improving the quality of displayed graphics (particularly where a machine will attempt to display 24-bit images at a 16 bit image depth)
- reducing the size of image files, so improving the response of a Web application.

Djinn (Gin) A community of users, devices and resources that are held together with Jini software infrastructure, and have agreed policies of trust and administration.

DLL (Dynamic Link Library) A file that contains a number of functions that may be called by different applications. The Windows architecture is itself based on DLLs. DLLs may be:

- dynamic, where programs interacts with it at runtime
- static, where the DLL is embedded into the application when compiled.

Static libraries tend to make applications fat, requiring more memory than their dynamic counterparts. A DLL has a:

- file which contains its source code, and entry and exit functions.
- module definition file.
- resource definition file.

Typically DLLs offer:

- leverage program investment through improved reusability
- better code compatibility
- easier migration paths

- cost-effective system renovations
- better program performance
- improved memory management.

(See C++ and Java.)

DNA (Distributed iNternet Architecture) A Microsoft solution for a Windows-based, three-tier enterprise and business architecture that is based on COM, and includes various other Microsoft solutions and technologies including ASP (Active Server Page). There are many variations of a DNA architecture, and the programming logic may be:

- Visual Basic components on the client side.
- Visual Basic components on the server side.
- Visual Basic code in forms.
- Scripting languages for server side ASPs.
- Scripting languages for client side.
- ActiveX components.
- Scripting languages such as HTML, DHTML and CSS (Cascading Style Sheets).
- XML and XSL.
- Procedures like Transact-SQL for SQL Server and PL-SQL for Oracle.

(See 3-tier, Client server, Visual Basic.Net and Visual Studio.NET.)

DNS (Domain Name Service) A server that converts domain names (such as www.digital.com) into IP addresses.

(See TCP/IP.)

DNS Negotiation A process by which the DNS address is determined by the PPP server and passed to the PPP client.

(See TCP/IP.)

DOM (Document Object Model) A standard object model for ECMA scripting languages such as HTML and JavaScript.

Domain category A collection of servers on the Internet that share the same suffix in their URLs. For example, http://www.cia.com.au is in the domain com.au (which is a mnemonic for commercial site in Australia). Other domains include .edu (educational), .gov (government), .mil (military) and .net (network).

(See Domain name, E-mail, TCP/IP and URL.)

Domain name A name of a domain. For example, in the URL www.microsoft.com, Microsoft is a domain name.

(See E-mail, TCP/IP and URL.)

Dot pitch A measurement of the distance between addressable pixels on a monitor screen, indicating the clarity of picture and maximum resolution supported.

DoubleClick A user interaction where the right-mouse button is clicked twice in succession.

Double double An item of data that consists of 64 contiguous bits. It is twice as long as a double word.

(See C++.)

Double word An item of data that contains 32 contiguous bits. It is twice as long as a 16 bit word.

(See C++.)

DoubleSpace A real-time disk compression program built into MS-DOS 6.0 to MS-DOS 6.2. Depending upon the file types stored on a hard disk it theoretically doubles disk data capacity. There are numerous other so-called on-the-fly data compression programs on the market for both the PC and Apple Macintosh. Foremost among these is Stacker from Stac Electronics.

(See *Compression*.)

Dow Jones A share index that moves upward or downward, and averages the top US Company's share performance throughout trading.

Downloading A process of copying files from a remote server to a local computer. The reverse process is called uploading.

(See *Browser and FTP*.)

Downsizing A process of reducing the complexity of software so as it may be ported to a less powerful system. For instance, a client/server database application could be simplified to run on a PC-based LAN. Equally an operating system originally developed for a mainframe or workstation may be downsized to run on a PC.

DriveSpace A Microsoft, real-time disk compression utility that is integrated in Windows 98. It increases the data capacity of a hard disk, and of removable magnetic media, by around two-fold. The compression ratio attained is a variable, and:

- increases with data files that are largely uncompressed such as BMP and text files.
- diminishes with pre-compressed files such as JPEG and WinZip.

Dropped 1. A packet that does not reach its destination. 2. A frame in a video source recording that does not appear in a captured digital video file is said to be dropped.

(See *Video capture*.)

DSA An encryption technique.

(See *Encryption*.)

DSL (Digital Subscriber Line) A digital access technology that can be wireless or physical based on twisted pair, or modern media.

(See *Access technology*.)

DSM (Digital Storage Medium/Media) A medium used to store digital data. Commercial examples include audio CD, CD-ROM, CD-ROM XA, CD-I, Digital Versatile Disc (DVD), floppy disk, Sony Mini disc, Philips DCC (Digital Compact Cassette) and DAT (Digital Audio Tape).

(See *CD-ROM and DVD*.)

DSN (Data Source Name) A means of identifying, and connecting to, a database. A DSN is required for many Web applications that interact with and query databases that are typically ODBC compliant.

(See *IDC and ODBC*.)

DSS (Decision Support System) (See *Data warehouse*.)

DTD (Document Type Declaration.) A DTD provides applications with names and structures used by a document type. It is also a description in XML Declaration Syntax that declares names used for element types and where they may occur.

```
<!ELEMENT List (Item)+>
<!ELEMENT Item (#PCDATA)>
```

The above DTD defines a list as an element type holding items. It also defines items as element types holding plain text (Parsed Character Data – PCDATA).

DTP (Desktop publishing) A term used to describe the use of a desktop computer to design and produce documents of the sort distributed by the publishing sector. Fully specified DTP packages provide the user with a choice of fonts, formatting tools, page make-up features, drawing tools, and a means to import pictures into documents. Professional DTP packages include PageMaker and Ventura.

Dual-homed host (See *Firewall*.)

Dumb terminal A client device that is restricted to the presentation element of the application. It has no more application logic than that which is

required to send requests, and receive visual information. Physically it consists of a keyboard, display, and a network interface.

(See *Client/server*.)

DUN (Dial-up Networking) A connection to a remote computer or network.

DVD An optical disc technology that provides a sufficiently wide bandwidth to play MPEG-2 video. DVD was once an acronym for Digital Video Disc and Digital Versatile Disc. It offers maximum data capacities of 4.7 Gbytes, 8.5 Gbytes and 17 Gbytes, and exists in four forms:

- DVD-ROM, which provides the same functionality as CD-ROM, but with a wider bandwidth and considerably more data capacity
- DVD, which is aimed at the consumer market as a replacement for VideoCD and VHS video
- DVD-RAM, which is a rewritable format able to support data capacity of 2.6 Gbytes
- DVD+RW, which is rewritable format offering a data capacity of 3.0 Gbytes.

The general DVD specification includes a:

- 1.2 mm thick, 120 mm diameter disc
- 4.7 Gbytes for a single layered, single side
- track pitch of .74 micrometers
- 650/635 nanometer laser
- RS-PC (Reed Solomon Product Code) error correction scheme
- variable data transfer rate yielding an average of 4.69 Mbits/second.

DVD-ROM drives offer backward compatibility with CD-ROM, and the important factors that apply to the performance of a dedicated CD-ROM drive are applicable. Features which drive the DVD-ROM specification include the:

- supported data capacities, i.e. 4.7 Gbytes, 8.5 Gbytes and 17 Gbytes
- interface type
- ability to record CD-R discs
- burst transfer rate
- MTBF (Mean Time Between Failures.)
- DVD disc average access time
- CD-ROM disc average access time
- average CD-ROM data transfer rate, i.e. 16-speed, 24-speed, 32-speed et al
- CD-ROM burst transfer rate
- disc spin modes that may be either CAV and CLV
- MPC3 requirements are met
- installation may be vertical or horizontal.

(See *CAV*, *CD-ROM*, *CLV*, *LED* and *MPC*.)

DVD video An alternative term of MPEG-2 video stored on DVD disc.
(*See MPEG.*)

DVD-ROM (*See DVD.*)

DVI (Digital Video Interactive) A largely obsolete, but nonetheless pioneering, video compression and decompression technology for the AT and MCA bus, thus aimed at PC ATs and PS/2 systems (beginning with model 50). Intel Indeo superseded DVI. It is specified as being able to generate full-colour full-screen, full-motion video (FSFMV). The original specification embodied 8 bit digital video. The MPEG were presented with the DVI compression algorithm but it was rejected. However, compression techniques used in DVI were influential in the development of the MPEG compression schemes. Digital Video Interactive (DVI) was demonstrated at the second Microsoft CD-ROM conference of 1987. An image-compression technology, DVI permits full-screen, full-motion video in the PC environment. DVI offered full-colour FMFSV at 10 to 30 fps and a frame size of 512-by-480 pixels resolution.
(*See MPEG. and MMX.*)

Dynamic A language that may accept a class while running. Java has this capability.

Dynamic class handling A name given to the ability of the Java Application Environment (JAE) to download classes from a HTTP server at runtime.

Dynamic Data Exchange (*See DDE.*)

Dynamic HTML (*See DHTML.*)

Dynamic language A programming language that supports an incremental compiler where code changes may be made to running programs.

Dynamic Link Library (*See DLL.*)

Dynamic load balancing (*See MPP.*)

dynamic shared library A library shared by concurrent programs.

E

e-Bay An on-line auction service.

e-business A generic term used to describe business processes implemented in electronic or virtual environments like the World Wide Web.

e-business (Electronic Business) An application of the Internet that sees it used in a point-of-sale (POS) guise. One of the earliest e-business Web sites was the Amazon on-line book store. A key concern of companies contemplating e-commerce solutions on the Web, and of users also, is the security of transactions using credit cards and other electronic funds transfer systems such as Switch. Encryption plays an important role in the maintaining the privacy of customer details. SET is seen as the internationally agreed standard solution for providing such confidentiality.

(See Encryption and SET.)

e-business hybrid CD-ROM A CD-ROM production that features hyperlinks to e-business Web sites for transaction processing, and has POI applications that may include video.

e-business site development lifecycle A collection of processes and sub-processes required to create an e-business Web site. A Web server facility is required, and may be:

- An acquired, leased or rented in-house Web server solution featuring an ISDN or T1 connection, necessitating personnel to maintain and run the server. It may be chosen for security reasons, or when it is important to evolve the Web server in house.
- Platformed on a Web host, or a company dedicated to providing turn-key Web server solutions. The Web server is hosted on a remote site.
- Platformed on a public server such as those offered to its subscribers by AOL, CompuServe, Prodigy and the many others. Other public servers

include Geocities and Angelfire offering businesses a low-cost migration path to architecting a low-cost e-business presence on the World Wide Web.

- Co-located on a server farm, where ISDN or T1 connection technologies, maintenance and day-to-day running take place off site.

Dell, Hewlett-Packard, IBM, Olivetti, Compaq and the many other computer manufacturers produce server implementations, many of which are turn-key solutions. Such servers are specified in terms of processor types, number of processors, mass storage capacity, bundled operating systems and server software, as well as the many other such common features. Generally, it may be assumed that much of the low-level technical descriptions of servers may be ignored when purchasing off the major producers such as those mentioned earlier; it may be assumed that they will always bring the latest technologies to market – at a time when perhaps budget computer makers are not. Web servers run either the Windows NT or UNIX operating systems (OSes), and there are many differentiating features that separate them (See Operating System). A Web server hosted off-site should allow you to include a domain name of your choice, and for security purposes, to restrict user access to directories or files. It must also allow you to conduct transactions in a secure mode using mainstream encryption techniques such as SHTTP. This may be verified by adding the ‘S’ prefix to the collective Web address, and by then opening the site using a Web Browser. You may also require a site certificate, confirming your ownership rights. It may also be necessary to permit you to run your own programs and scripts, including CGI variants, as well as accommodate any additional requirements imposed by the Web site authoring software you may have used such as the FrontPage extensions. More complex e-business sites require programming in languages such as Perl, C++, Java Visual Basic, et al. Such languages may be used to create feedback forms, etc. An e-business site typically comprises many components like CGI scripts, counters, and applets. Many of these may be gathered from public domain resources on the World Wide Web, or shareware versions may be used, also.

A e-business site may be secured using many different technologies including SSL, RSA and the many products that offer everything from password protection to firewalling.

(See Application development, Security and Firewall.)

e-business site domain name A name of a domain. For example, in the URL www.microsoft.com, Microsoft is a domain name.

(See E-mail, TCP/IP and URL.)

e-business site map A map of an e-business site.

e-business site security *(See Security.)*

e-cash A currency metaphor that may be *online* or *offline*. Online e-cash allows consumers to purchase using locally stored cash amounts. Offline e-cash uses smartcards that downloaded electronic units of cash. Online e-cash is remembered as having been commercially launched by *DigiCash*.

e-commerce (Electronic Commerce) (*See e-business.*)

EDGE EDGE is an overlay solution for existing ANSI-136/TDMA networks, and may use the existing ANSI-136 30 kHz air-interface. EDGE is on the migration path to UMTS, and may even co exist with it so as to provide services for wide-area coverage. EDGE standards support mobile services in ANSI-136/TDMA systems with data rates of up to 473 kbps. A significant change in the ANSI-136/ TDMA standards to support higher data rates is the use of modulation schemes including 8-PSK (Phase Shift Keying) and GMSK (Gaussian Minimum Shift Keying). GMSK provides for wide area coverage, while 8-PSK provides higher data rates but with reduced coverage. EDGE provides high data rates over a 200 kHz carrier, giving up to 60 kbps/timeslot that may equate to 473 kbps. EDGE is adaptive to radio conditions, giving the highest data rates where there is sufficient propagation.

(*See 3G.*)

EDI (Electronic Data Interchange) A standard set of formats and protocols for exchanging business information over networks and systems. Translation programs may play the role of converting extracted database information into the EDI format so as it may be transmitted to appropriate entities such as banks that have appropriate EDI capable IT implementations.

EDI Trading Partner An EDI entity/establishment able to receive or transmit EDI data.

EDI Transaction Set A message or block of EDI information that relates to a business transaction.

EDI Transaction Set Standards A formal standard that dedicates syntax, data elements, and transaction sets or messages.

EDI Translation An EDI conversion to and from the X12 format.

EDI Translator An entity that converts between the flat file to EDI formats.

EDIFACT (Electronic Data Interchange For Administration, Commerce and Transportation.) A standard for electronic data interchange that is approved by the UN.

e-exchange An industry spot market for commodity products

EFT (Electronic Funds Transfer) A transfer of funds from one account to another using an EFT implementation.

Egg A credit card and Internet bank.

EGPRS (Enhanced General Packet Radio Service) From the end user's point of view, the EGPRS network is an Internet sub-network that has wireless access. Internet addressing is used and Internet services can be accessed. A new number, the IP.

(See 3G and UMTS.)

EIGRP (Extended Interior Gateway Routing Protocol) A protocol developed by Cisco for routers.

EJB (Enterprise JavaBeans) A server-side implementation of the JavaBean component model. EJBs may be used to build applications using appropriate tools, and are CORBA compliant.

EJB to CORBA mapping A mapping that equates EJB to the CORBA equivalent.

Electronic mail *(See E-mail.)*

Electronic publishing A term used to describe information made available through electronic means. Through the Internet, hypermedia and hypertext marked the beginning of a renaissance in electronic publishing, radically altering the manner in which information is presented and used. Other media for electronic publishing include CD-ROM and DVD-ROM.

(See Web.)

E-mail A method of communicating documents and digital files electronically; a computer-based equivalent of a letter. E-mail addresses generally conform to the format: name@domain.domain_category.country:

- name – might be a login name.
- domain – might be a company name such as Microsoft.
- domain category – is the type of domain *(See domain category)*.
- country – is the geographic location of the server that might be uk (United Kingdom), nz (New Zealand), au (Australia) and so on.

For instance, subscribers to Compuserve have e-mail addresses that have the syntax: 123456.7654@compuserve.com. Other ISPs (Internet Service Providers) allow users to use their name as an ID. Examples include

F_Botto@compulink.co.uk, or fbotto@cia.com.au. E-mail messages may be sent using browsers (such as Netscape Navigator and Microsoft Explorer), though these are not e-mail applications or clients such as Microsoft Outlook or Endora Mail. The latter offer folders such as inbox, outbox and sent messages, and are dedicated applications that support such e-mail protocols as SMTP and POP3. Compuserve (owned by AOL) offers e-mail functions and features, as well as options dedicated to its own services. The MIME (Multipurpose Internet Mail Extensions) are applicable to such transmission, permitting the integration of program and video files within e-mail documents and communications. Typically, a computer fitted with a modem (Modulator Demodulator) is used for transmission and reception of e-mail, though within organisations NICs are more common. E-mail messages may be sent over LANs, intranets and the Internet. Users generally read their e-mail messages by downloading them from a server, and there is often an option within the e-mail program that allows them to choose whether or not leave a copy of the e-mail message on the mail server.

(See POP-3.)

E-mail autoreply A reply to an e-mail message that is created automatically using an e-mail autoresponder such as MReply. In an e-business context, such responses are useful for conveying the receipt of orders, advertising related products and promotions, publicising trading hours, and so on.

E-mail responder A program that replies automatically to received e-mail messages.

e-marketplace A broad term that encapsulates all targets of e-business sales channels.

Embedded style A style attached to one specific document using the form:

```
<HEAD>
<STYLE TYPE="text/css">
<!--
P {text-indent: 10pt}
-->
</STYLE>
</HEAD>
```

Encapsulation A term which describes hiding the internal workings of an object. Resulting objects encapsulate code and data that is hidden from the user and the remaining collective OO system. Essentially it becomes a black box, and all that matters are its responses to stimuli, such as defined events that are intercepted and processed by the object's public interface.

(See C++, Java and OOP.)

Encode A process of converting data, or an analogue signal, into another form in terms of data representation. For example, Video-on-Demand services often use MPEG-2 video that is encoded using uncompressed source recordings that may be analogue or digital. Equally, streaming video/multimedia sites store video encoded according to the MPEG-1 specification.

(See *MPEG*.)

Encryption A process of ciphering messages or data so as it may be deciphered and read only by intended recipient(s). Encryption techniques include:

- DES
- TripleDES
- DES X
- RSA
- DSS.

(See *Decryption, DES, TripleDES, DES X, RSA and DSS*.)

End-user A user of a system, software solution, device, or service.

End-user identification A set of procedures and protocols required to identify the user.

Enterprise computing A general term used to describe the application of computers and Information Technology (IT) in medium-size to large businesses. Only larger small businesses are considered to be enterprises.

Enterprise JavaBeans (See *EJB*.)

Entity Relationship diagram A diagram that illustrates the design structure of a relational database, together with all its data tables and links. Programs that may be used to draft such diagrams include EasyCase. Entity relationship diagrams rarely include reports and query information, though some relevant notes might be included.

(See *Database*.)

Entry A group of object references in a class package such as `net.jini.core.entry.Entry` interface.

Enumerated constants A type of constant that is supported by C++. Enumerated constants take the form of a type, and are a useful shorthand for defining a number of what might be related constants. The following statement defines the constants `back`, `forward`, `left`, and `right`, where `Move` is the enumeration.

```
enum Move {back = 4, forward, left = 6, right = 3};
```

The forward constant is assigned the value 5, an increment (of one) relative to the previously defined constant back.

(See C++.)

e-procurement An application of an automated purchasing system that may be Web or Internet based. Buyers may log on to the system to view supplier catalogues, and to place orders.

ERP – Enterprise Resource Planning An integration mechanism that encapsulates business and management processes to give a birdseye view of organisation activity. It may address:

- company financials
- human resources data
- manufacturing information and logistics.

E-purse A value that may be stored on a SmartCard and represents the amount that may be used to make small purchases.

Error log A log of errors experienced by a server.

e-tailer A retailer that uses sales channels that rely on electronic media such as the Internet.

Ethernet A Local Area Network (LAN) standard. Ethernet adapters included on computers may comprise thin-Ethernet or more expensive thick-Ethernet connectors and cables. Ethernet may be considered as being put forward in 1974 by Robert Metcalfe through his Harvard Ph.D. thesis.

Event A change in state that may be invoked by responses or series of processes and sub-processes that may be implemented by objects. The event may be a simple message sent from one object to another, and its origins may be anything from another message from an agent to a physical mouse click or key press. Applications and operating system environments that respond to such events are termed event-driven.

Event driven 1. A concept where state changes of entities such as objects may be relayed to other listeners or objects in what might be a collective OO system. Almost all modern software implementations and systems and environments are event driven. 2. An environment or program that responds to external events such as mouse clicks. Modern event-driven applications may be assumed to be object oriented. Objects such as buttons respond to events, triggering a method or item of code that is attached to them. Windows is an event-driven environment.

(See Store and forward agent.)

Event generator An object whose state changes are relevant to another object, and may send notification messages to compliant objects when events are generated.

Event listener An object that responds to events, or more specifically responds to one or more event types.

exception An interruption to the normal flow of program control caused by the program itself.

(See Exception handling.)

Exception handling A process where exceptions are detected and efforts made to suppress them.

Expansion bus A bus used to provide a means of expanding a PC to include various peripheral devices that might range from graphics cards to MPEG players. Standard expansion buses include 16 bit ISA (Industry Standard Architecture), IBM MCA (Micro Channel Architecture) and EISA (Enhanced Industry Standard Architecture).

Expert System *(See KBS.)*

Explorer A program which is part of Windows 95 and Windows NT, and is used to peruse files, open files, launch programs, and perform file management functions. It shows file details such as their size in Bytes, the date and time they were last modified, and their attributes including whether they have read, write or read/write status. It is commonly used to move, rename, copy and delete files and even complete directories. The move, copy and delete commands work with multiple selected files, so you can copy and move batches of files without having to go through the monotony of dealing with one file at a time. Windows applications may be run from Explorer by double-clicking them, or by double-clicking files that were created with them. Explorer may be used to:

- connect to shared directories on other network users' drives.
- declare directories as shared.
- give shared directories password protection.
- monitor who on the network is using shared directories.
- stop sharing shared directories.

(See Windows.)

Export Management Company (EMC) A company that exists in foreign markets as a sales entity, and offers such sales services to client companies.

External Style Sheet A template/document/file containing style information that may link with one of a number of HTML documents, permitting a site to be re-styled by editing one file. They may be linked to a HTML document using the form:

```
<HEAD>
<LINK REL=STYLESHEET HREF="style.css" TYPE="text/
css">
</HEAD>
```

Extranet A controlled non-public-access network based on IP technologies such as the Web. Using extranets, companies may allow trusted clients or partners to view certain information that is firewalled. They also provide employees with remote access to company information.

e-zine An electronic magazine.

F

Factory object An object that instantiates objects.
(*See Object, and OO.*)

Failover A contingency measure that provides an alternative service provider, should a failure occur.

FAQ (Frequently Asked Questions) A list of questions asked most often by users and developers.

Fat client A system within a client/server architecture (such as that of the Web) which features:

- presentation, which is typically in the form of a Web browser
- complete application(s)
- a data cache, which is used to store information from a server-side database, or back-end database.

Many systems connected to the Web may be described as thin clients. Fat clients depend heavily on client-side processing and resources, while thin clients do not. This higher demand for hardware results in higher client system costs. Generally fat clients may integrate:

- improved intelligence, because the user's interaction can be personalised through the local customisation of the application. Additionally, intelligence features such as those associated with KBSs are more feasible.
- additional local applications, such as industry standard products from companies such as Microsoft, Lotus, Inprise Corporation.
- data verification, prior to sending messages to the client side, thus improving system responsiveness, while reducing network traffic.
- security on the client-side, through password checks, and restricted access to documents, data, and applications.

(*See Application, Client/server, KBS, Thin client and NC.*)

FAT32 (File Allocation Table) A filing system used by the Windows 98 operating system. It is an advancement of the FAT16 implementation, and is

able to address hard disks with up to a 2 Gbyte formatted data capacity. It is more efficient than FAT16, because it uses smaller clusters of 4 Kbytes that are used to store files. Clusters are used to store data from a single file. The larger 32 Kbyte-clusters of FAT16 are comparatively inefficient. For example, when a 34 Kbyte file is written to the hard disk, two 32 Kbyte clusters are used. The second cluster has some 30 Kbyte of unused payload. So even though the file is just 34 Kbytes, it consumes 64 Kbytes of hard disk that equates to two of its 32 Kbyte clusters. Clearly, FAT32's dependence on 4 Kbyte clusters helps eradicate the unused data capacity of clusters. This yields considerably storage capacity gains.

(See *Hard disk*.)

Fatbrain.com An online entity that is engaged in book selling.

FDI (Fiber Distributed Data Interface) A computer-to-computer fiber link technology, and an internationally agreed ANSI standard. The topology comprises a dual multi-mode optic fiber, LED (or laser) and Token ring network. Data rates of up to 100 Mbps are possible. Without repeaters, transmission distances up to 2 Km are attainable, at a data transfer rate of 40 Mbps. (See *LED and Optic fibre*.)

Feedback form A form that may be used to gather information about visitors to e-business sites and may be created simply by using HTML.

Fibre Channel A high-performance communications pathway, which was introduced by the Fibre Channel Association (FCA). An open standard, it is a protocol that supports data transfer rates from 133 Mbits/sec up to 100 Mbytes/sec.

Fibre channel can be used to connect sites up to 10 Km apart using a 9-micrometer single mode optic fibre. The fibre channel protocol may also propagate along traditional copper-based transmission media.

Typical data transfer rates, and maximum transmission distances for a 9-micrometer single mode optic fibre are:

- 100 Mbytes/sec 10 Km
- 50 MBytes/sec 10 Km
- 25 MBytes/sec 10 Km

For a 50-micrometer multi-mode optic fibre:

- 100 Mbytes/sec 0.5 Km
- 50 MBytes/sec 1 Km
- 25 MBytes/sec 2 Km

For a 62.5-micrometer multi-mode optic fibre:

- 25 Mbytes/sec 500 m
- 12.5 MBytes/sec 1 Km

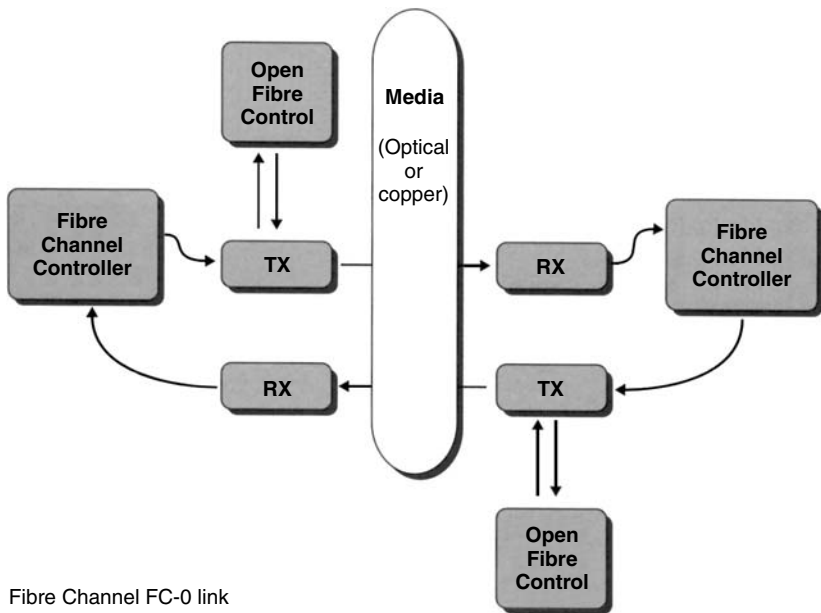
For video coax:

- 100 Mbytes/sec 10 Km
- 50 MBytes/sec 10 Km
- 25 MBytes/sec 10 Km

Applications of Fibre channel include mass storage interface and control, and high-speed networks. Network topologies may be point-to-point, ring, or a Fibre Channel – Arbitrated Loop (FC-AL), which requires neither switches nor hubs. Frames are used to send and receive data, each having the fields:

4 bytes	24 bytes	0 to 2112 bytes (payload)		4 bytes	4 bytes
Start of frame	Frame header	64 bytes Optional header	2048 bytes (Maximum payload with <i>optional header</i>)	32 bit CRC	End of frame

Fibre channel frame format



Fibre Channel FC-0 link

- start-of-frame delimiter
- frame header
- optional header
- payload, which is the user data, and may be between 0 to 2112 Bytes
- 32 bit CRC error detection
- end-of-frame delimiter.

The Fibre Channel Physical (FC-PH) standard consists of the levels:

- FC-0, which covers physical media, cables connectors, LEDs, short- and long-wave lasers, transmitters and receivers.
- FC-1, which covers the encoding and decoding protocol, to cater for the adopted serial transmission techniques.
- FC-2, which covers the signaling protocol, and defines the shown frame format (or framing protocol) for data transfer.

Upper FC layers include FC-3, whose common services include:

- *multicast*, for transmissions to multiple destinations.
- *striping*, for transmitting to multiple N_ports concurrently, and supports multiple links.
- *hunt groups*, which is a collection of N_ports, which is assigned an alias. Frames containing the alias are routed to any non-busy N-port within the defined group.

Upper layer protocols (ULPs) are defined by FC-4, covering industry network standards, which may be transported using Fibre Channel. These include:

- Internet Protocol
- ATM Adaption layer
- IEEE 802.2

Channel protocols supported by FC-4 include:

- SCSI (Small Computer Systems Interface)
- High Performance Parallel Interface (HIPPI) framing protocol
- Intelligent Peripheral Interface (IPI)
- Single Byte Command Code Set Mapping (SBCCM).

(See *Access technology, ADSL, DSL, ISDN and LED.*)

Field A column in a database table or a container for data entry in a form. Entries within fields are termed field values.

(See *Data warehouse.*)

Field value A data item in a database.

FIFO (First In First Out) A queue whose operation hinges on regurgitating items in the order in which they were deposited. An analogy is that of a vending machine used to sell chocolate bars that are stored in a vertical dispensing tube.

Fifth Generation Language A fifth generation languages is non-procedural. They are declarative in that actions are not implemented through fixed procedures. They are also known as AI languages and include PROLOG (PROGRAMMING LOGic).

(See *AI, Procedural.*)

Financial EDI An exchange of payment information in standard formats between business partners.

Find and Replace A phrase used to describe the automated process of replacing a specified word or phrase with another. The phrases find-and-replace and search-and-replace are interchangeable.

Finger A UNIX user information lookup program that is used via a 'shell account'. It displays the user's login name, real name, terminal name and write status, idle time, login time, office location and office phone number.

Firewall A software/hardware implementation that partitions a network or system, so restricting access to selected users; it appropriately isolates a network. A firewall may be perceived as physically existing

- between the Web server(s) and the ISP's physical site
- or between the network and the Internet
- or between one or more networks.

It may perform the simple functions of checking client connections and requests, securing server-side applications and data.

The firewall's collective components may intercept inbound data packets, and perform a number of security checks. These may revolve around the origins of the packet, checking such packet information as its:

- source IP address
- source IP port that identifies the originating application.

Firewalls are key to many organisations' security strategy. Other adopted security facets include:

- passwords for logging on to networks
- client-side password checks for connecting to Web sites
- client-side password checks for connecting to E-mail applications and services
- password protected compressed hard disks, made possible using Stac Electronics disk compression programs.

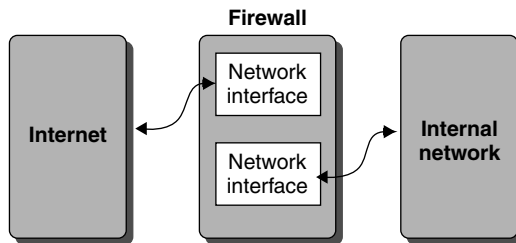
Firewalls may also include the ability to virus check, and to screen, incoming documents and executables such as ActiveX controls, Plug-ins, Java applets and any other code that is downloaded and intended to be processed. Cookies may also be filtered.

Firewalls may be at the network level that harness packet filtering techniques using routers. The routers are intelligent in that they may be programmed to behave as a selective barrier to unwanted network traffic.

Dual-homed host firewall A dual-homed host has two network interfaces that connect with disparate networks, while a multi-homed host typically interfaces with

two or more networks. The term gateway was used to describe the routing functions of such dual-homed hosts. Nowadays the term gateway is replaced by router. A dual-homed host may be used to isolate a network, because it acts as barrier to the flow of TCP/IP traffic. The implementation of a Unix dual-homed firewall requires (among other things) that:

- IP forwarding is disabled, thus yielding a protective barrier
- unrequired network services are removed
- programming tools are uninstalled.



Firewall – in the form of a dual-homed host

Bastion Host A host that is critical to a network's security. This is the focus of network management, security monitoring, and is a network's principal defense against illegal usage. A dual-homed host may play the role of a bastion host.

Screened subnets A subnet which restricts TCP/IP traffic from entering a secured network. The screening function may be implemented by screening routers.

Commercial firewall products include FireWall-1 that is a commercial gateway product, from the Internet Security Corporation, and uses:

- application gateway
- packet filtering.

ANS InterLock that is a commercial gateway product from Advanced Network Services. Gauntlet that is a firewall product from Trusted Information Systems.

(See Security gateway, ATM, Cookies, Encryption, Packet filtering, Risk exposure, Screening Router, Security, SET, STAC Electronics and Subnet.)

Firewire A high performance interface that permits the connection of peripheral devices such as mass storage devices, modems and printers. It is otherwise known as IEEE1394, and as such it is an internationally agreed standard.

Firmware A program or data stored using a ROM variant (*See ROM, EPROM, PROM and EAROM*). Firmware is thus involatile and permanent.

Flame and Flame War A conflict that revolves around the exchange of insults, and personal attacks.

Flat-bed scanner *(See Scanner.)*

Flat-screen display A display that is not based on a CRT (Cathode Ray Tube), but on flat-screen technologies that include:

- TFT (Thin Film Transistor) or active matrix that currently offers the best response and performance. The response time is the lowest of all current flat-screen displays and the performance level approximates CRT-based designs most closely. Screen sizes and screen resolutions vary, as do the number of colours offered at various resolutions. The latter is a function of the video chipset implementation. Notebook and Subnotebook screen sizes vary from about 10.3 in upwards, though larger screen sizes are desirable.
- HPA (High Performance Addressing), which is an enhanced implementation of passive display technology, offers slightly lower response times, though the number of colours and resolution is the same. The lower response time results slight shadows and trails in the case of moving screen images and sprites.

Low-end notebooks are most likely to be:

- DSTN or a passive display.
- CSTN (Colour Super-Twist Nematic), which is a passive display technology.

Flat-screen technologies are currently displacing CRT-based desktop monitors at the upper end of the desktop monitor market, and are the standard display technology used in notebooks.

Floating-Point Data Types A data type that may represent fractional numbers which maybe the:

- float type, which is allocated a 32-bit single-precision number
- double type, which is allocated a 64-bit double-precision number.

Such data types are implemented using the statements:

```
float altitude;  
double angle, OpenRoad;
```

Flowchart A symbolic representation of the flow of program execution. Flowcharts can also be applied to objective decision making, such as choosing a computer, sound card, monitor or anything in fact. Windows programs capable of generating flowcharts including Visio, ABC Flowchart and AllClear.

FMFSV (Full Motion Full Screen Video) A term used to describe video that may be assumed to fill the entire screen, or a greater part of it, and provides the illusion of a frame rate of not less than 25 frames per second (fps) without the use of duplicated frames. MPEG-2 or DVD video is FMFSV. 25 fps is the frame rate delivered by PAL and SECAM broadcast standards. The American

NTSC broadcast standard provides 30 fps. Ideally the frame rate should be greater than 25–30 fps. The frames that make up an FMFSV may be full frames as in the case of an M-JPEG video stream or a combination of full frames and partial frames as is the case with MPEG video. The full frames or reference frames occur at regular intervals, and dictate the number of authentic random access points provided by an encoded MPEG video sequence. The frame resolution of what may be described as FMFSV varies, but it should not fall below around 720-by-360 pixels. Larger standard frame resolutions may broadly equate to 640-by-480 pixels, 800-by-600 pixels, 1024-by-768 pixels, 1,240-by-1,024 pixels and 1,600-by-1,240 pixels.

(See *MPEG and Video*.)

Folder A metaphor for a directory, and is used to store files which are usually of a specific type.

Fork A data stream that may be accessed individually using a common filename. The BSD `fork` system call creates a process.

Form 1. A metaphor for a paper form that is used by client Browsers in order to interact with programs and data that may be on the client- or server-side. Typically forms permit users to enter (among others):

- signup details with Web sites
- contact details
- password details
- credit or Switch card details for purchase from e-business sites.

(See *MCIS*.) 2. A metaphor for a paper form, used for data entry and viewing data in a database. RDBMS development tools, such as Excel, DataEase for Windows, Paradox for Windows, may be used to create table-based applications. (See *Data warehouse and DBMS*.) 3. A data sector type on a CD-I disc. Like CD-ROM blocks, CD-I sectors are 2,352 bytes long – including headers, sync information, error detection and correction data. Like Mode 1 block, Form 1 sector yields 2,048 bytes user data. Unlike Mode 2 block, however, Form 2 sector yields 2,324 bytes user data. (See *CD-ROM*)

Form method A method of gaining customer information and for taking orders. Forms may be created using HTML and by using scripting languages:

```
<FORM> NAME="Customer" ACTION="http://botto.com/cgi-bin/  
form/cgi  
METHOD=get>  
  
</FORM>
```

The <FORM> tag may have the attributes:

- NAME, which is the form's name.
- ACTION, which indicates the URL where the form is sent to.
- METHOD, which indicates the submission method that may be POST or GET.
- TARGET, which indicates the windows or frame where the output from the CGI program is shown.

Fortune 100 A league table of the top 100 American companies.

Fortune 1000 A league table of the top 1000 American companies.

Fps (Frames per second) A measure of the speed at which frames making up a video sequence are played or captured.

Frame 1. A tiled area of a Browser's window. A frame provides an efficient method of presenting information without using a separate Web page. For example, a frame might be used to play a video sequence or animation. A frame enabled Web application reduces the complexity of designing multiple pages at design time, and is toured more easily by users. Frames are supported by many Web page design, and Web application development tools such as Microsoft FrontPage, for instance. (*See FrontPage and Visual InterDev.*) 2. A single image making up a video sequence. Digital video sequences may consist predominantly of partial frames called interframes, or full frames called intraframes. (*See MPEG and Video.*) 3. A single item of transmitted data using the Frame Relay protocol that is designed for modern digital networks, and does not integrate the demanding error detection and correction schemes prevalent in older protocols. (*See Frame Relay.*)

Frame rate A measure of the speed of video capture or playback typically using units of frames per second.

Frame relay A protocol designed for modern communications networks. Typically it may be operated at speeds between 9600 bits/sec and 2 Mbits/sec, though higher speeds are possible. Compared to X.25 it makes better use of network bandwidth as it does not integrate the same level of intense error detection and correction. That is not to say that frame relay is unreliable; it is simply optimised for modern networks which do not impose the same level of error on transmitted data – which is the case with older network technologies for which X.25 was designed. The frame relay protocol may be applied in WAN and backbone implementations, and integrated into solutions that require high data transfer speeds. Each frame consists of a:

- flag that separates contiguous frames
- address field that stores the data link connection identifier (DLCI) and other information

- control field that contains the frame size, and receiver ready (RR) and receiver not ready (RNR) information
- information field that contains up to 65,536 bytes
- frame check sequence that is a CRC for error correction.

(See *CRC and X.25*.)

Framework A suite of interfaces, and code that define the behaviour of objects or components in an application. The application may be local, or a client/server implementation.

Freeware Software that is free of charge and may be freely included in e-business sites, and include entities like ActiveX controls, CGI scripts and various programs.

Fremont A Hewlett-Packard e-business development environment that requires Java programming.

Frequency band A range of frequencies used by a given wireless network or device.

Front-end A name given to the client application or system that may be served by a server-side or back-end application. Between the back- and front-end applications is middleware or glues that exist at a number of levels. These may bind together and coordinate application logic, data and presentation distributed across the back- and front-ends.

(See *Application, Back-end, Client/server and Glues*.)

FrontPage A Web page development package marketed and sold by Microsoft, and:

- includes Explorer that is used to display the navigation scheme integrated in your Web pages
- includes Editor that is used to design Web pages
- includes Web Server that is used to publish and test Web pages before their deployment over the Internet or compatible IP network
- may be used to integrate ActiveX controls and Java applets in Web pages
- does not require programming skills
- may be used to create Web pages that interact with ODBC compliant databases.

FrontPage includes the:

- Personal Web Server that provides a testbed for Web applications before deploying them on the Web
- Server Extensions that are building blocks for driving predefined functionality gains through your Web site implementation

- Explorer and Editor that permits the developed Web design to be navigated, browsed and edited.

FrontPage is bundled with Windows NT Server, and is available separately.

(See *PWS, Visual InterDev, Web Server and ToolBook.*)

FTP (File Transfer Protocol) A protocol used to transfer files between FTP servers and client systems. It is a standard method for distributing files across IP/TCP networks. Using an FTP client program, users are able to link with FTP sites, and browse the remote directories and files as if they were on a local hard disk. Users can then download files from the ftp server.

(See *Anonymous FTP.*)

ftp client A client that is used to login to ftp sites, and permits files to be uploaded and downloaded.

ftp site A Web site that is accessible using the ftp protocol and an appropriate ftp client.

FTSE 100 A share index that moves upward or downward, and averages the top 100 companies' share performance throughout trading. It is the equivalent to the American Dow Jones.

Full duplex A simultaneous bi-directional transmission of different data streams.

Full frame updates A video sequence that is composed of full frames. Any such frame can provide a valid entry point for non-linear playback or editing. Such video sequences are also known as intraframe.

(See *M-JPEG and MPEG.*)

Functional specification A document outlining the functions offered by a service or implementation.

G

Garbage collection A memory management feature that reclaims the space occupied by an object at such times when there are no references it.

(See C++, Java and OOP.)

Gates, Bill An entrepreneurial technologist who along with Paul Allen co-founded Microsoft. Microsoft's most significant milestone product in its early development was MS-DOS, an operating systems for the IBM PC and compatible computers, and was based on Digital Research's CP/M operating systems. Prior to this, he and Paul Allen had written a Basic interpreter for the Altair, one of the world's first affordable microcomputers. The Windows family of products has proved the most successful revenue generating of all Microsoft products.

(See Windows.)

Gateway A core solution that unites disparate networks. A WAP gateway, for example, connects an IP network with a mobile network.

(See WAP.)

gateway page (multiple on a web site) A page designed for Search engine ranking. AltaVista may prefer 700-word pages, and Excite might favour 300 words, so different pages would be submitted to each.

Gcc A compiler program.

Geocities A resource on the World Wide Web that offers among other things hosting services for Web sites.

GET method A means of running a CGI script or program where the URL defines the CGI program (such as `credit.cgi` for example) and the accompanying data used by the server that follows the question mark:

```
www.FrancisBotto.com/cgi-bin/credit.cgi?subject  
=transaction
```

(See CGI environment variables.)

GGSN (See *2.5G, GPRS and 3G.*)

GIF (Graphics Interchange Format) A standard graphics file format that produces relatively compact files.

GIF98 A file format used in animated sequences.

Gigabit Ethernet An upscaled version of the Fast Ethernet network standard. It may deliver up to 1,000Mbps access speeds, and is backwardly compatible with 10Base-T and 100Base-T Ethernet standards. It may be used over the media:

- multimode fibre optic cables over a maximum distance of 500 metres
- single- or mono-mode fibre optic cables over a maximum distance of 2 kilometres
- coaxial cable over a maximum distance of 25 meters.

(See *Optic fibre.*)

GIOP (General Inter-ORB Protocol) A protocol or set of message formats and data structures for communications between ORBs.

(See *IIOF.*)

Global roaming A term used to describe the process of reading email messages other than by using your local ISP's point-of-presence. The ability to access e-mail for subscribers for international ISPs such as Compuserve is unimportant, due to the availability of worldwide points of presence. Web-based, global roaming e-mail services are available that simply provide users with a PIN. Mail may then be read using any Internet access device, such as those available in so-called Cybercafes.

The term global roaming is also applicable to mobile telephony, in which major digital carriers offer the ability to use services in specified countries. Which may be assumed to include all first-world countries.

(See *2.5G, 3G, E-mail, POP3, mobile networks and GSM.*)

Glue A term given to the entities that provide communications between distributed and local application components. In a client/server context, is an alternative name for middleware. The underlying client/server system architecture may be that of the Web. Object-oriented glues include all the collective entities that provide the communications between distributed components. Glues in the Web architectural model include the protocols:

- TCP/IP
- HTTP
- SMTP
- miscellaneous low-level protocols including UDP.

Glues in LANs might include Ethernet and even proprietary protocols. Protocols are the lowest level glues in both traditional and modern OO systems. The next level is the programming models that are of concern to systems programmers, systems architects and programmers. This dictates the method of communications between components that include:

- remote procedure call (RPC)
- message queuing, where messages are exchanged between components normally using queues, buffers or even pipes which interface more loosely coupled components, perhaps via a WAN
- peer-to-peer, where either component can be the server (sending a message) or the client (receiving the message).

Local glue A collection of entities that unite client components, so they may operate collectively. OLE, OpenDoc, ActiveX, JavaBeans components require local glues so their running operations may be coordinated. These common OO component architectures use different local glues, where:

- OLE uses ODL (Object Definition Language)
- ActiveX uses COM
- OpenDoc uses CORBA IDL (Interface Definition Language.)
- JavaBeans uses a subset of the Java programming language.

(See ActiveX, JavaBeans, OLE, and OpenDoc.)

Scripting A scripting language such as VBScript or JScript may also be perceived as a glue, as may be HTML.

(See JScript and VBScript.)

Distributed glues A name given to the collective entities that bind together (dynamically) running components that are on the client and on the server. As is the case with local glues, standard OO component architectures use different distributed glues.

(See ActiveX, JavaBeans, OLE, and OpenDoc.)

GNUstep An open source development environment for Objective-C programmers.

(See www.GNUstep.org)

Gopher A menu based interface that permits Internet navigation and connects to any other gopher, web, telnet, or ftp site.

Gold code A final build of a program that is released for end users. It is the final stage of development, and will have been alpha and beta tested. Programs that are sold conventionally, such as those from Microsoft, and those that are shareware or freeware are termed gold code.

GPRS (General Packet Radio Service.) The GPRS overlay increases the GSM and TDMA user data rate to a maximum of about 171 Kbps, and includes the following physical network overlay core solutions:

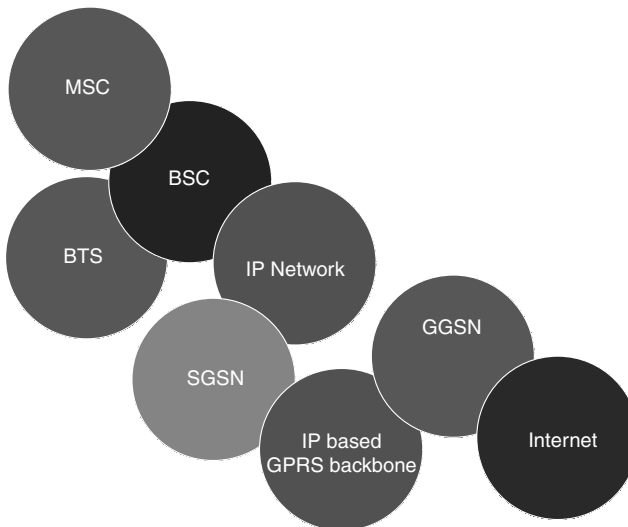
- IP-based GPRS backbone
- GGSN (Gateway GPRS Serving Node)
- SGSN (Server GPRS Serving Node).

Principle features are:

- Packet based transmission
- Packet-based charging as opposed to time-based charging
- Always-on – so a VPN connection for example does not require constant logging in to the remote/enterprise network/intranet.
- Eight time slots
- A maximum user data rate of about 171 Kbps when all time slots are used.

GPRS Architecture:

- alleviates capacity impacts by sharing radio resources among all mobile stations in cells.
- lends itself to bursty traffic.



GPRS Applications include

- E-mail; fax; messaging; intranet/Internet browsing
- Value-added services (VAS); information services; games
- m-business: retail; banking; financial trading, advertising
- Geographic: GPS; navigation; traffic routing; airline/rail schedules

- Vertical applications: freight delivery; fleet management; sales-force automation.

GPRS Terminal Classes A GPRS terminal phone may be:

- Class A: supports GPRS, GSM and SMS, and may make or receive calls simultaneously over two services. In the case of CS services, GPRS virtual circuits are held or placed on busy as opposed to closed down.
- Class B: supports either GSM or GPRS services sequentially, but monitors both simultaneously. Like Class A, the GPRS virtual circuits will not be closed down with CS traffic, but switched to busy or held mode.
- Class C: make or receive calls using the manually selected service, with SMS an optional feature.

GPRS Architecture The GPRS architecture is an overlay network for 2G GSM networks, and provides packet data for user data rates between 9.6 and 171 kbps. GPRS' air-interfaces are shared among multiple users.

GSM entity	GPRS overlay
BSC	BSCs require software upgrades and packet control unit (PCU) hardware that directs data to the GPRS network.
Core Network	Nodes and gateways that are essentially packet switched MSCs are required, including: <ul style="list-style-type: none">• Serving GPRS Support Node (SGSN)• Gateway GPRS Support Node (GGSN).
Databases (HLR and VLR)	Databases require software upgrades to handle GPRS functions and call models.
Subscriber Terminal	New subscriber terminals are required to access GPRS services.

GPRS BSS To become a GPRS BSC, each GSM BSC requires the installation of one or more PCUs that give interfaces for packet data out of the BSS. Like GSM, when either voice or data traffic originates at the subscriber terminal, it goes over the air interface to the BTS, from where it goes to the BSC. Unlike GSM however, the traffic is separated; voice is sent to the MSC (like GSM) and data is sent to the SGSN, through the PCU using a Frame Relay interface.

GPRS Network 2G GSM MSCs are circuit switched (CS) and cannot therefore handle packet data, so Nodes are introduced:

- Serving GPRS Support Node (SGSN)
- Gateway GPRS Support Node (GGSN).

The SGSN acts like a packet router or packet-switched MSC that directs packets to MSs.

SGSN A 2.5G GPRS SGSN performs the following functions:

- query home location registers (HLRs) to get subscriber profiles
- detect new GPRS MSs
- process registration of new subscribers
- keep records of subscribers' locations
- performs mobility management functions such as mobile subscriber attach/detach and location management
- connect to the base-station subsystem using a Frame Relay connection to the BSC's PCU.

GGSN A 2.5G GPRS GGSN performs the following functions:

- interface with IP networks like the Internet and enterprise intranets, and with other mobile service providers' GPRS provisions
- maintain routing information used to tunnel protocol data units (PDUs) to SGSNs that serve MSs
- network and subscriber screening
- address mapping
- support multiple SGSNs.

GPRS Mobility Management

1. GPRS mobility management functions track the location of an MS as it moves within a given area.
2. Visitor location registers (VLRs) store the MS profiles that are accessed by SGSNs via the local GSM MSC.
3. The MS and the SGSN are connected via a logical link in each mobile network.
4. When transmission ends, or when an MS moves out of an SGSN's area, the logical link is released.

Graphical user interface (*See GUI.*)

Graphics card An electronic assembly used to generate graphics and text. Occasionally it is referred to as a graphics engine or graphics controller. A VGA card is a graphics engine, but is more commonly referred to as a graphics adapter or card. Standard IBM graphics cards include Monochrome Display Adapter (MDA), Colour Graphics Adapter (CGA), Enhanced Graphics Adapter (EGA), Video Graphics Array (VGA), Multi Colour Graphics Array (MCGA – used on PS/2 30) and 8514/A. The fastest graphics controllers are of the local bus variety. These connect more directly to the processor's data bus. The graphics card specification of a PC is influential in determining the quality digital video

playback attainable. A video card comprising dedicated hardware for decoding and playing MPEG, VideoCD or Intel Indeo will generally yield improved video playback. The many areas that separate graphics cards include the following:

- The expansion bus type
- 3-D graphics capability
- Screen resolutions supported
- Screen refresh rates at each resolution – particularly important at higher resolutions and it should not fall below 70 Hz.
- The number of colours possible
- Speed of operation
- Does it require the presence of another graphics card? If yes, what type of connector does it require? A special features connector or Vesa Media Channel connector?
- What refresh rates can it deliver at the desired resolutions and will these be supported by the attached monitor?
- Does it accelerate Video for Windows playback?
- Does it scale up Video for Windows video?
- Does it have the ability to play Intel Indeo video at high speed?
- Does it accelerate 3-D graphics?
- Does it have the ability to play video compressed according to one or more standards that might include MPEG1 or MPEG2?
- Obvious factors that drive a graphics card performance include the bus width of the graphics processor used, the amount of Vram (Video RAM) it has, and its interface type.

Graphics engine An alternative name for a graphics card, or for the chipsets responsible for generating graphics.

Graphics format An image file may be produced and stored according to a number of different graphics file formats that include CompuServe GIF, PCX, Windows BMP, PIC, TIFF, IMG, EPS and others. The efficiency of various image file formats in terms of the data capacity they consume tends to vary significantly.

Grey list (*See Blacklist.*)

Groupware A name given to a software implementation that provides collaboration and communication across an enterprise's (business') network solution, or even over the Web. Orfali, Harkey and Edwards define groupware as 'Software that supports the creation, flow, and tracking of nonstructured information in direct support of collaborative group activity.' Conventional modern groupware integrates:

- e-mail
- conferencing such as whiteboards

- telephony including voice mail
- scheduling
- workflow
- shared document databases
- Internet access.

The best known groupware product is Lotus Notes

GSM (Global Service Mobile) Typically a 2G GSM network provides users with data rates of 9.6 kbps or 14.4 kbps. Two GSM variants include Digital Cellular Systems 1800 (DCS-1800 or GSM-1800) and PCS-1900 or GSM-1900 that is used in North America and Chile. The different frequency is used because of the lack of capacity in the 900 MHz band. The 1800 MHz band accommodates a larger number of mobile users particularly in densely populated areas. The coverage area of 1800 MHz networks is often smaller, and therefore dual band phones are used, able to roam between either network. ETSI has also published GSM-400 and GSM-800 specifications, with the former suited to large geographic area coverage, and can therefore be used in conjunction with higher frequency band networks in sparsely populated regions. Comparable to GSM, DCS-1800 (Digital LPC Cellular System) is used in the UK. It operates in the uplink radio band between 1710 MHz and 1785 MHz and can be assumed to provide a user data rate of 9.6 kbps, and exhibits a 250 km/hour speed threshold on the mobile station.

GSM Network Operation

1. When a mobile phone is switched on, it registers its presence with the nearest MSC that is then informed of the location of the mobile user.
2. If the user is outside the geographical area of the home MSC, the nearest MSC will implement a registration procedure. This procedure uses the home MSC to acquire information about the mobile device. This information is held by the home MSC in a database called the home location register (HLR) that holds mapping information necessary so calls can be made to the user from the PSTN (Public Switched Telephone Network). The local MSC duplicates part of this information in the VLR (Visitor Location Register) for as long as the caller is in the MSC area.
3. Normally one HLR and one VLR is associated with each MSC that provides switching, and a gateway to other mobile and fixed networks.
4. Mobile devices have SIM chips holding user identification and configuration data. SIM chips permits an authorisation procedure to be implemented between MSCs and EIRs (Equipment Identification Register). The EIR has a black list of barred equipment, a grey list of faulty equipment or for devices that are registered for no services, and a white list for registered users and their service subscriptions.

5. When either voice or data traffic originates at the subscriber terminal, it goes over the air interface to the BTS, from where it goes to the BSC.

GUI (Graphical User Interface – ‘gooey’) A user interface consisting of icons, usually facilitating interaction via a mouse, resulting in minimal keyboard use. Sometimes referred to as graphical front-end. The most widespread commercial examples include those of the Microsoft Windows continuum, though others exist in the form Apple System, OS/2 Warp, and X Windows.

Originally when the Windows concept was originated at Xerox PARC (Palo Alto Research Center), the UI was called a WIMP (Windows, Icons Mouse and Pointer) environment.

H

Hacking An illegal intrusion into a system where its services, programs and data are used without authority, and may involve:

- Eavesdropping or sniffing where the hacker taps into a connection
- Brute force factoring of a public key in a cryptosystem
- Dictionary attacks.

(See Brute Force, cryptosystem, RSA, public key encryption, asymmetric and Dictionary attack.)

Handset A mobile phone/device.

(See 2.5G, 3G, and GPRS.)

Hard disk A magnetic mass storage device consisting of fixed disks. Removable versions are available but most are fixed. Storage capacities are increasing all the time. The usefulness of a stand-alone PC is greatly enhanced following the installation of a magnetic hard disk drive. This presents a practical solution to re-writable mass storage for the present, yielding data capacities many orders of magnitude greater than can be held on floppy disk. All hard disks must be paired with an appropriate controller, with which they must be 100 percent compatible. Popular commercial variants include IDE, E-IDE or ATA-2, SCSI, SCSI-2, Fast Wide SCSI, and Ultra SCSI. There are basically three ways in which a controller may be supported. One, it is included on the motherboard itself. Two, it is combined with a hard drive in the form of a hard card where the complete assembly is plugged into an expansion slot. Three, it represents a single card which plugs into an expansion slot. Controllers capable of accepting multiple devices provide an economical path to vast data storage capacity in future. An inexpensive array of drives may be built up, thus lowering the considerable cost of a single high capacity drive bought at the outset. Where a number of drives in an array exhibit comparatively lengthy access times, it may be more practical to replace them with a single large disk, or several larger ones. More expensive controllers

are often expandable in terms of additional daughter boards. For example, SCSI daughter boards can increase the number of drives in standard multiples of seven. Such controllers can easily yield tens of GBytes using inexpensive drives. Some controllers are also capable of mirroring, i.e. writing the same data to two disk drives simultaneously, thus making the data more secure. Controller technology and performance has advanced considerably in recent years, giving rise to an array of commercial devices ranging from scant MFM implementations to caching variants comprising on-board processors. The main thrust of advancement bases itself on the need to expand data capacities, lower access times, and increase data transfer rates. In addition, the emergence of multiple device controllers reveals a secondary aim. Cache controllers speed up read/write operations by using on-board RAM as an intermediate data store between disk and system memory. Based upon which data is requested most often, a caching algorithm estimates which portions of hard disk should reside in on-board RAM. The ingenuity of this technique simply takes advantage of the inescapable fact that a small percentage of disk data is rewritten and accessed most frequently. The decision making process regarding which data should reside in RAM may suggest that they are 'intelligent controllers'. Cache controllers are the most expensive of all variants, and will outperform standard implementations. It is most often these types of controllers that are able to support increasing multiples of drives through the addition of daughter boards. High performance cache controllers can offer access times as low as a fraction of one ms.

(See *RAID*.)

Hard disk controller A device that interfaces a hard disk with a computer. Numerous commercial variants exist including IDE, E-IDE, SCSI, SCSI-2, Fast Wide SCSI, and Ultra SCSI.

(See *Hard disk*, *RAID* and *SCSI*.)

Hardware event queue A Windows buffer used to store keyboard and mouse events.

Hash An element that reduces the number of possible values using a hashing function such as the Secure Hashing Algorithm (SHA-1).

Hash signature A hash signature is generated by scrambling data blocks sequentially, and produces a unique value for a given message or a file's contents. The signature:

- Uses a hash function to create a hash value from a file
- Concatenates a user's secret key with the file
- Creates a hash file that may be sent to the receiver who may decrypt the file with a copy of the secret key.

HDSL (High bit rate DSL) A data transmission line that uses two pairs of copper wire as its medium. It offers T1 data speeds of up to 1.544 Mbps. (See *ADSL*.)

HDTV (High Definition Television) An emerging television broadcast technology that produces superior quality images using advanced high resolution digital video technologies like MPEG-2. (See *MPEG-2*)

Help system An on-line information system that provides guidance on software usage through hypertext, hypermedia or multimedia. Such systems are usually context sensitive where information regarding a current program operation may be produced immediately. Windows Help systems are essentially hypermedia applications. They may be authored using a word processor that is able to produce standard RTF (Rich Text Format) files together with a Help compiler such as that supplied with Borland programming tools. Numerous other Help compilers exist.

Hertz A unit representing the number of cycles or pulses per second. The Alternating Current (AC) supply in the UK is distributed at 50Hz or cycles per second.

Heuristic An if ... then rule that may exhibit weighting in the form of confidence factors.

Hexadecimal A base 16 counting system that is used widely in computing. Four binary digits represented by a single number or letter: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F.

HFS (Hierarchical File System.) The Mac OS Standard file-system.

HFS+ (Hierarchical File System Plus.) A Mac OS Extended file system that supports long file names, and Unicode file/directory names, and improved efficiency on large disks.

Hierarchical A hypertext structure in which objects are only accessible through a parent object. Hierarchical or tree structures are well known and are normally represented using unidirectional links. Strict hierarchy demands that objects are only accessible through a parent. Compromised hierarchy, however, is less formal, permitting links to bypass children objects.

Hierarchy An inverted tree with the highest level component as its root. Examples of hierarchies include:

- Class diagram where the root class is parent to subclasses.
- Hypertext structures.

(See *Class*.)

High-level language (See *HLL*.)

Hit 1. An event when a Web site is visited by a user. 2. In terms of processor cache memory, hit rate is the percentage of memory requests that may be satisfied by the cache memory.

HLL (High Level Language) A programming language consisting of easily-remembered commands, constructs and statements. OOP (Object Oriented Programming) languages and visual programming languages are highly evolved HLLs.

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

HLR (Home Location Register) (See *2G*.)

Home page A highest level page in the hierarchy of Web pages at a Web site. It has a URL such as www.homepage.com. A home page may consist of a single page or a number of linked pages. It may include links to other sites, graphics, sound bites, video, an e-mail address, and various forms for user feedback; it may also include a counter that records the number of hits or times it is visited.

(See *ActiveX*, *Java*, *HTTP*, *DHTML*, *HTML*, *Visual InterDev*, *Web*.)

Host A computer or network running a particular application or service.

Host name A name designated to a network device that permits it to be addressed without using its full IP address. The Internet Request for Comments (RFC) No. 1178 provides guidelines for naming hosts. Using host names, there is a requirement to perform translations between host names and their respective IP addresses, using a lookup file containing host names and related IP addresses, or the Domain Network Service (DNS).

(See *IP address* and *TCP/IP address*.)

Host-Based Processing An architecture where a host computer is connected to dumb terminals. Typically the terminals do not have GUIs such as Windows, but are text-based. They are sometimes termed green screens, because many earlier terminals had screens bearing green phosphor. The terminals are said to be dumb, because they lack processing capabilities. They

HTML (HyperText Markup Language)

merely accept user commands, pass requests to the host, and receive information from the host. Many host-based processing architectures are being renovated, or migrated to client/server architectures. A coexistence strategy is also being adopted, using mainframe and client/server based architectures to form collective IT solutions.

(See Application Renovation, Client/Server and Mainframe.)

HotDog Pro A Web site development tool.

(See CGI, Web Server and HTML)

HotJava A Web Browser produced by Sun Microsystems. It does not enjoy the popularity of Netscape Navigator or Microsoft Internet Explorer, but is nonetheless equally sophisticated.

(See Browser.)

Hotmail (MS) A Internet e-mail service.

HP Fremont *(See Fremont.)*

HP-UX A Unix operating system variant.

HTML (HyperText Markup Language) A standard language consisting of formatting commands and statements that may be used to create Web pages. HTML may be used to include hyperlinks leading to Web pages, frames or sites, and many other functions including visitor counters. HTML has its roots in SGML, and is the standard language of the World Wide Web. When the Web was first introduced, almost all Web sites depended heavily on HTML. Today, however, HTML is almost a framework used to hang other components such as:

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

The HTML syntax is similar to old word processor formatting languages such as LaTeX and even that which was included in the Borland Sprint word processor. The Web Browser interprets the HTML first by reading the tags:

```
<HTML>
<HEAD>
<BODY>

</BODY>
</HEAD>
</HTML>
```

These basic tags form the basis of all HTML listings, and encapsulate such entities as VBScript code, JScript code, ActiveX Controls, and Java applets. Such components are enclosed between the <BODY> tags.

(See *DHTML and Web*.)

HTML 3.2 ‘*The HyperText Markup Language (HTML) is a simple markup language used to create hypertext documents that are portable from one platform to another.*’ World Wide Web Consortium (W3C)(Raggett, 1997).

HTML 3.2 replaced HTML 2.0 (RFC 1866) and is a variation of SGML Standard Generalized Markup Language. (ISO 8879), and we now have HTML 4.0.

Raggett, D. (1997). HTML 3.2 Reference Specification W3C Recommendation 14-Jan-1997.

Raggett, D., Le Hors, A., Jacobs, I. (1998). HTML 4.0 Specification W3C Recommendation, revised on 24-Apr-1998.

(See *HTML*.)

HTML Help An on-line Help development tool from Microsoft.

HTML Template A template file that a Web server uses to display information. The information may originate from a query submitted to a database.

(See *HTML*.)

HTML validator A testing program used to validate HTML documents at various levels, including 2.0, 3.2 and future versions of HTML as specified by the W3C.

HTML2WML conversion Real-time or batch conversion of HTML to WML.

HTTP (HyperText Transfer Protocol) A standard protocol that allows Web browsers to communicate with Web servers. The transport protocol is provided by TCP.

(See *HTML, Web and TCP*.)

HTTP connection A connection to a HTTP server.

HTTP server A Web server that may connect with client systems and with back-end applications and data.

(See *Server*.)

HTTP_ACCEPT A CGI variable that holds the ‘Accept:’ headers from the client.

HTTP_COOKIE A CGI variable that holds the contents of 'Cookie:' headers from the client.

HTTP_FROM A CGI variable that holds the contents of the 'From:' header from the client that may be the client's:

- Correct e-mail address if not withheld
- Incorrect e-mail address which is simply false, or entered in error.

HTTP_REFERER A CGI variable that holds the contents of the 'Referer:' header from the client, containing a URL.

HTTP_USER_AGENT A CGI variable that holds the contents of the 'User-Agent:' header from the client, containing the Browser's name.

Hybrid (CD-ROM/DVD-ROM) A CD-ROM or DVD-ROM which possesses hyperlinks to Web pages, as well as having its own data and media files. For example, MPEG-2 video might be stored on the DVD-ROM for improved video quality, while text, graphics and other less dynamic content may be stored on the Web.

(See CD-ROM and DVD.)

Hyperlink A link in a hypertext-based navigational scheme that permits the user to browse from once document to another, or from one Web site to the next.

Hypermedia An extension of the hypertext concept where text is combined with images. The terms hypermedia and multimedia are often regarded interchangeable but they are *not*. In French media circles the ludicrous and ridiculously extravagant term hypermediatisation was coined in 1991. It was used to describe the immediacy with which news began to be transmitted, brought about by satellite broadcasting technology. With time normally required by the reporter to prepare an informed report sacrificed, the concept of resulting often confused, reports became known as hypermediatisation. Available to Macintosh users through HyperCard since 1987, hypermedia is a relatively mature area of multimedia. HyperCard for the Apple Macintosh may be considered as the earliest commercially successful hypermedia authoring tool that combined text, graphics, animated sequences and sound. It made the Macintosh an effective personal computer for multimedia. A plethora of hypermedia authoring tools has since emerged, including ToolBook for the Microsoft Windows environment on the IBM PC and compatible machines. Hypermedia applications developed using such tools can be thought of as interactive books that combine images, text and sound.

Hypertext A term coined in the 1960s by Ted Nelson to describe the concept of linking textual information and presenting it in a non-linear fashion so it can be navigated and browsed. The Web is synonymous with hypertext. Just as modern multimedia led to a re-evaluation of the way we communicate information in the 1980s and 1990s, hypertext had a similar impact in the 1960s. In a few cases, the birth of what is now known as hypertext also had a similar effect in the 1940s. The rationale behind the development of hypertext was a simple one: to optimise the processes of writing, storing textual information, and accessing that information. It improves accessibility of stored information by eliminating the need to follow rigorous set sequences. It allows the user to reference masses of related material through the pursuit of ad hoc paths. Advantages of this are easily understood when considering traditional methods. A word unknown to the reader of a book first leads to the index being searched. Failing this, the reader naturally attempts to find reference to the word in another book. The many references required to research a subject or satisfy curiosity is time consuming. With information linked, indexed and stored on computer, hypertext expedites this process, and gives users the opportunity to take regular excursions to satisfy references. It also makes information available that would not otherwise occur to the casual reader. The word car, for instance, might be linked to numerous options such as: combustion engine, Henry J. Ford, Detroit, Rolls-Royce, Catalytic Converter, and a whole host of relevant texts. Hypertext is equally useful when writing or simply arranging gathered information. An appropriate hypertext tool, may be used to implant and manifest links between related items of text automatically.

(See Multimedia and Web.)

I

IBM VisualAge Enterprise Suite V3.0 This is an e-business application developers and traditional mainframe developers solution, and includes:

- VisualAge for Java™ V4.0 Enterprise Ed.
- WebSphere Studio Professional Ed., V4.0
- VisualAge Generator Developer, V4.5
- VisualAge COBOL V3.0
- VisualAge PL/I, V2.1
- Versata Studio Client V5.1 (a product of Versata Inc., an IBM Business Partner).

iBook An Apple laptop computer that supports the Mac OS X.
(*See Apple.*)

ICANN (Internet Corporation for Assigned Names) An organisation created in October, 1998 that controls allocations of Internet entities such as domain names and IP addresses. It developed the Shared Registry System, which is a domain name registration system for competitive registrars in the .com, .net, and .org domains. ICANN also accredits registrars that register domain names using a shared, central registry. (*See <http://www.icann.org>.*)

Idempotency An attribute of a message that sees repetition yield a constant result.

IDL (Interface Definition Language) A language that may map to others and is neutral in terms of providing interfaces and operations to applications written in compliant languages. Examples include CORBA IDL that is used widely to create middleware implementations.

IDL to C++ language mapping A mapping that equates IDL to the C++ equivalent.

Idl2java A compiler which converts IDL programs into Java.

IEEE1394 (*See Firewire.*)

IETF (Internet Engineering Task Force) An international standards organisation dedicated to the maintenance, ratification and publication of Internet related technologies.

IIOP (Internet Inter-ORB Protocol) A standard specification for transmitting GIOP messages over TCP/IP networks such as the Internet.

(*See GIOP.*)

Impact statement A document that outlines and describes the effects of introducing a new technology or solution.

i-MODE (Japan always-on mobile phone) A mobile applications service standard that provides 2G network users with i-mode handsets to access i-Mode Web sites. I-Mode was introduced in Japan by NTT DoCoMo and is used primarily in 2G PDC networks, but 3G handsets in Japan retain I-Mode functionality. I-Mode is an alternative to WAP, or to be more precise, an equivalent to WAP over GPRS, and features packet data and packet volume charging. I-Mode is used to access Internet sites using a scripting language based on HTML and is very successful in Japan. I-Mode is essentially a precursor to 2.5G and 3G services, and offers many of the advantages of GPRS 2.5G, but at the same time it uses inexpensive, and established robust 2G networks. There are no teething problems therefore, and it is proven in the field, unlike many of the newer services such as GPRS/2.5G services that experienced rather less demand than was initially predicted.

When compared with WAP, we see I-Mode winning a technical battle in the perspective of 2G networks. However, WAP over GPRS is a rather different proposal, with WAP being a little more attractive – but there is the overhead of GPRS handsets and GPRS contracts. Generally the momentum gained when 3G is rolled out more completely, should consign these technologies to history. Why? Because they are essentially 2G narrow-bandwidth services and are without the display that is required to deploy and deliver 3G services including multimedia etc.

Essentially both WAP and I-Mode are solutions for 2G networks, and they remedy bottlenecks that are redundant in 3G networks and services, and much of their infrastructure will be no longer required. I-Mode could still provide a cost-effective North American solution to deploying mobile Internet services in the mass market telecommunications sector. The notion that everyone has the means or the desire to buy and to own leading edge products, that are normally

the preserve of executives and high-level decision makers, is an erroneous one. Trailing edge proven technologies like I-Mode could conceivably win North American interest particularly when considering the slow down of the US economy (2001) and with emerging evidence that American mobile users are beginning to decline the opportunity to purchase the very latest technology such as 3G handsets for example.

I-Mode services maybe official and NTT DoCoMo approved, or unofficial. The former appear on the i-menu, whereas the latter are accessed by entering their URL or by sending bookmarks to phones using e-mail. Official sites are of many genres (See <http://www.nttdocomo.co.jp/i/corp/teikyou.html>). I-Mode displays may be monochrome or 256-level greyscale, and may have animated GIFs measuring from 96 × 108 pixels to 120 × 130 pixels. i-Mode phones and microbrowsers are optimised for Japanese, so wrapping is rather difficult as it occurs at the lines' end and may occur in the middle of a word. POP3 e-mail may be read using i-Mode, and e-mail may be forwarded to an i-Mode e-mail address using the phone number followed by @docomo.ne.jp. Messages may be up to 250 (double-byte) Japanese characters or 500 Latin characters, and received attachments are deleted.

Imported Style Sheet A style sheet that can be imported to (combined with) another sheet, combining:

- main sheet that applies to the whole site
- partial sheets that apply to specific documents.

Form:

```
<LINK REL=STYLESHEET HREF="main.css" TYPE
    ="text/css">
<STYLE TYPE="text/css">
<!--
@import url(http://www.botto.com/fast.css);
@import url(http://www.botto.com/fast.css);
    ... other statements
-->
</STYLE>
```

Impression (web page (advertisement) counting) An instance when an advertising banner is displayed on a Web page. Click-through is the action of clicking on a displayed banner, and click-through rate (CTR) is calculated as:

$$\text{CTR}\% = (\text{Click-throughs}/\text{impressions}) * 100$$

Indeterminate A Boolean floating condition that is neither yes or no.

Information property list A configuration information file (Info.plist) for bundles, and is used in Cocoa and GNUStep development environments.

ING Barings *(See Barings.)*

Inheritance A feature of OOP languages that sees superclasses pass methods and data (or instance variables) to subclasses.

Inline style An attached style that affects one element and is specified in the start tag as a value of the `STYLE` attribute:

```
<P STYLE="text-indent: 14pt">Indented  
paragraph</P>
```

Inner class A class that is local to a given block of Java code.

instance An object created or instantiated at run time and which adheres to the appropriate class definition.

Instance variable A data entity that may be inherited by objects using an OOP language such as Objective-C.

Instantiate A process where an object is built using an OOP language.

Instant Messenger (MS) A program/service that allows the transmission of text messages that may be responded to immediately.

Intangible asset An asset that is not physical.

Intelligent AML An anti money laundering solution that uses software intelligence.

Intelligent business solution A business solution that can make intelligent decisions without human intervention. The decisions may lead to alerts informing human users, rather than leading to an automatic or preprogrammed action or response.

Interactive Television A form of television broadcasting where the user is presented with a non-linear medium, and is able to select content using on-screen options to control what screened matter is shown. Depending on the implementation the viewer may be able to select camera angles, and replay selected footage and scenes. Interactive television services may offer TV shopping services also, and Internet related facilities that include e-mail.

Interchange A banker's interchange exchanges data and money between banks to which it is connected, and which are managed by such organisations as Visa and Mastercard.

internationalisation The implementation or modification of software so as to localise it.

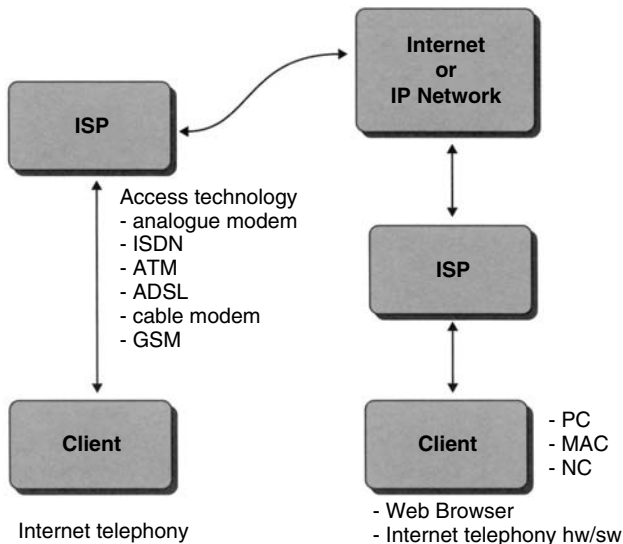
Internet A network of computer networks based on the TCP/IP protocol and that has the World Wide Web as its foundation.

Internet analyst An analyst specialising in Internet services.

The Internet Engineering Task Force (IETF) A publisher of specifications of Internet protocols such as TCP/IP. Further information may be obtained at www.ietf.cnri.reston.va.us.

Internet investor An investor specialising in Internet related businesses.

Internet telephony A method of making telephone calls using packet switched IP networks. In 1997, low-cost Internet telephony began to change the face of telcos, Internet Service Providers (ISPs), and corporations; the largely unregulated Internet became interwoven with telephony. For the first time ISPs could mine revenue rich long-distance and international calls businesses, which were once the preserve of telcos like BT and Mercury. Corporations and government departments may also 'toll bypass' the telcos by using Internet telephony over their own networks such as intranets, and significantly reduce their operating costs in the process. Similarly, since VocalTec launched the Internet Phone in 1995, growing numbers of ISP subscribers have been making long distance and international calls for the cost of a local phone call.



Internet telephony theoretically means that an ISP could become an international telco. The domestic long distance calls business presents ISPs with one opportunity to compete with telcos, as does the international calls business. The technology is also being embedded into existing switched network, where it will become transparent to the user. The successful proliferation of Internet telephony also hinges on emerging internationally agreed standards, such as H.323, which collectively will unify ISP's services globally.

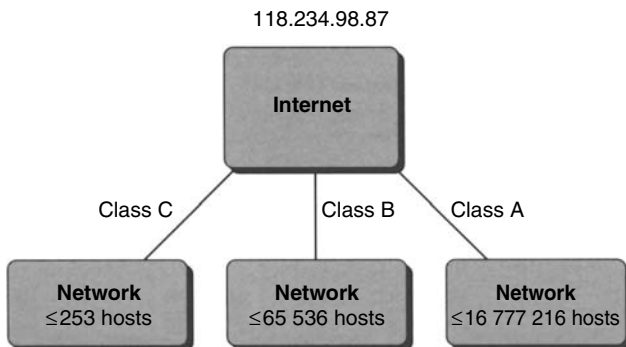
Interoperability A software or hardware attribute that indicates compatibility between products from different vendors, and is normally based on a standard specification.

Interpreted A programming language where resulting programs are converted into an executable form each time they are run. Java for example, is interpreted at run-time from byte-codes that are the result of compilation. Java then is both compiled and interpreted, but as it does not result in native machine code in the case of execution using JVMs, it is often considered an interpreted language.

Interpreter A program that converts source code into runtime code each time a program is executed.

Intranet A TCP/IP network that is accessed by a user group that is usually from the same company, and is based on Web-based technologies.

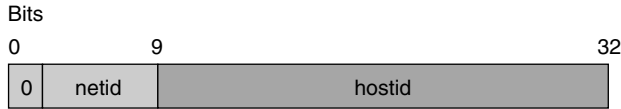
IP Address A physical IP address consisting of 32 bits, which identifies networks and its connected computers. The syntax for such addresses consists of four bytes each written in decimal form, and separated by a full stop: 118.234.98.87



Class A, B and C addresses

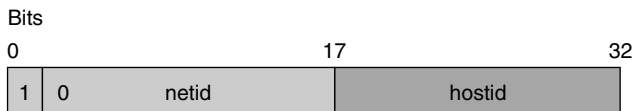
The three types of IP address include:

IP Address Class A A networks may have between 2^{16} (65,536) and 2^{24} (16.7 million) hosts.



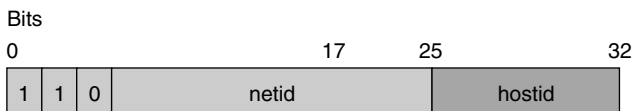
Class A address format

IP Address Class B B networks may have between 2^8 (256) and 2^{16} (65,536) hosts.



Class B address format

IP Address Class C C networks may have up to 253 hosts, and not 255 because two values are reserved.



Class C address format

The addresses consists of a network address (netID) and a host address (hostID). The leftmost digits represent the netID address. This is set to zero when addressing hosts within the network.

(See Subnets.)

IP backbone *(See 2.5G and GPRS.)*

IP multicast An IP addressing system that is known as class D, and was developed at Xerox PARC. A multicast packet addresses a multicast group of nodes or hosts. The first multicast tunnel was implemented at Stanford University.

(See Mbone.)

IPv6 (Internet Protocol) An advancement of the IP protocol that introduces 128 bit addressing, and other improvements. The scaling of IPv4 32 bit

addressing to 128 bit is intended to accommodate future growth of the Internet, in terms of the growing number of network addresses. IPv6 is also called IPng (IP Next Generation), and is specified by the Internet Engineering Task Force (IETF). IPv6 supports addressing of the types:

- multicast, which connects a host to multiple addressed hosts
- unicast, which connects a host to a single other addressed host
- anycast, which connects a host to the nearest of multiple hosts.

(See IP addressing.)

IRC (Internet Relay Chat) A means of communicating using text in real-time across the Internet. The emergence of Internet Relay Chat or IRC in the late eighties started a quiet revolution in the way people communicated globally. Allowing users to chat in real time using text, it surfaced as an ideal tool for spreading news updates, and particularly those about regions of war or unrest – of which the Persian Gulf is remembered as one of the first.

Average users see IRC as a way of talking to people irrespective of their geographical location, or joining debates with IRC users that might be in different parts of the world. The debates take place in one of a number of channels, which you can change on the fly using an IRC client program.

IRC clients include mIRC, TeleCafe, Mirc, PIRCH, Visual IRC96, Secure Communicator, WinTalk, and NetPopup. Most popular IRC client programs are shareware or freeware, and can be downloaded from various ftp and Web sites. Modern IRC clients like mIRC offer the user easy methods for navigating through channels, for connecting with selected IRC servers, and for talking with people in general.

The many networks of IRC servers include EFnet (Eris Free net), UnderNet, DalNet, ChatNet, NewNet and IRCNet. Once connected to one of the IRC networks, you can communicate with its users through the many channels it provides. EFnet, IRCNet, UnderNet and DalNet have a global presence, and you will find their servers in many major cities.

Using most IRC clients the user is required to provide a nickname, the IRC server to which to connect, an IP address, a local host name, and an email address if the user wishes to be contacted. An alternative nickname may also be provided, and is used should a first nickname choice be in use on the connected network.

Commercial IRC servers are rarely password protected. Many users advise reading the message of the day (MOTD), which might provide useful updates about the server. Having joined a channel, you might like to read the text messages for a while just to get the feel of things. If someone asks a question and you want to answer it, simply enter a reply and don't forget to include the person's nickname. Alternatively you can ask a question yourself, or simply

say ‘hello all’ or something similar, in which case you might begin talking with an IRC user that is known to you. If this leads to a one-to-one conversation, using mIRC you can double-click the person’s nickname to produce a private window in which only your text appear. It’s possible to set up multiple conversations like this, which is quite a good idea when you consider the lags in getting responses from user, and the times when users simply stop talking to you – or so I’ve heard.

In regards to IRC etiquette, if you decide to be offensive in any way, and you are caught by the operator, or reported by other users, the operator may eject you instantly from the channel. The channel operators’ nicknames have @ signs as prefixes. Serious offences will lead to you being banned from an IRC server.

When connected to IRC networks, you can use IRC commands to perform various tasks, such as joining, leaving and even creating channels. You don’t have to know IRC commands, because most modern IRC clients provide such functionality through a single click. If you want to get the most out of IRC, however, it helps to be familiar with the more common IRC commands. Equally, if you are a budding programmer and you want to write a IRC client program of your own, you will certainly need to know IRC commands. IRC commands begin with a forward slash ‘/’ and range from the simple such as /help, which is used to get basic help information, to the /list #channel command, which shows the topic, and the number of users, but does not show hidden and private channels.

To join a listed channel you would type /join #channel_name, and to leave it you would type /part #channel_name. The /join command can also be used to create your own channel, by specifying a new channel name. If you create your own channel, it is a good idea to use the /topic command to indicate what the channel is about; you might type /topic #genealogy, for instance. The topic will be shown when someone lists your channel, and will help you get the channel participants you want. The /invite command allows you to ask specified users to join you in conversation. For example, you would type /invite edwinstreet #hottub if you wanted to talk to edwinstreet in the hottub channel. You can also send private messages to other such IRC users by typing /m nickname. To speak privately with another user, simply type /query nickname, following which only the named user will see what you type. Gaining the email addresses of channel participants can be obtained using the /whois and /whowas commands, provided the users’ email addresses have been included in their IRC client program. The command /whois #instant will list the email addresses of users on channel #instant, while /who shows the email addresses of all those connected with the IRC server. You can also gain the email address of a specific user with the /whois nickname statement, or the email addresses of all users using the /whois command. The /whowas

command is used in a similar way to /whois, but produces the email addresses of users that have recently signed off IRC.

IrDA (Infrared Data Association) A wireless interface technology that is able to drive compatible peripheral devices. It is supported by Windows, and is integrated in numerous laptop computer designs.

ISDN (Integrated Services Digital Network) An access technology introduced by the CCITT, which is able to support reasonably sophisticated videoconferencing, and high-speed access to the Internet and other networks. A BRI (Basic Rate Interface) ISDN line may have two 64 Kbits/sec B-channels able to carry video, voice or data. ISDN uses PCM for encoding data in digital form, for transmission.

Used in the Integrated Services Digital Network (ISDN) standard, PCM involves creating a data stream consisting of 8 bit PCM blocks. The blocks are created every 125 micro seconds. By interleaving the blocks with those from other encoders, the result is time division multiplexing (TDM). In North America ISDN typically interleaves data from 24 64 Kbits/sec sources or channels. This results in connections that provide 1.536 Mbits/sec. Although in actual fact the connection has a bandwidth of 1.544 Mbits/sec, because each channel's frame has a marker bit 'F', adding 8 Kbytesec.

Europe sees ISDN typically interleave 30 64 Kbits/sec channels, giving 2,048 Mbits/sec. This and the 1.544 Mbits/sec connection are known as primary rate multiplexes. Further interleaving of primary rate multiplexes sees:

- 6, 45, 274 Mbits/sec in North America
- 8, 34, 139, and 560 Mbits/sec in Europe.

While analogue modem speeds increased steadily throughout the 1980s and early 1990s, the arrival of the Web placed greater demands on available bandwidth. This encouraged telcos to provide ISDN services that were defined by the CCITT in 1971, and published in 1984 in the Red Book. ISDN was based on PCM (Pulse Code Modulation) that was conceived by A. H. Reeves, and experimented with in the Second World War, and was used in American telecommunications in the 1960s so as to increase network capacity. In 1986, a pre-ISDN service named Victoria was offered by Pacific Bell in Danville, California, offering RS232C ports that were configurable from 50 bits/second to 9.6 Kbits/second. In the same year, official ISDN systems were introduced in Oak Brook, Illinois, and by 1988 some forty similar pilot schemes were installed. ISDN digital networks eventually developed into B-ISDN where multiple lines could be used to provide data rates in increments of 64 Kbits/sec, and videoconferencing and high-speed Internet access were made possible. B-ISDN implementations could even be used to implement the lower data rates of 1.544 Mbits/second offered by modern T1 digital links that arrived some time later.

(See Access technology.)

ISO/TC 154 A technical committee that addresses documents and data elements in administration, business and industry.

ISO9736 A standard set of UN/EDIFACT syntax rules.

ISP (Internet Services Provider) A company that provides users with access to the Internet and may offer a variety of access technologies. ISPs may time charge users, or they may offer fixed charges that may be monthly, for example.

Issuer bank A bank that provides credit to its customers usually through credit cards.

J

JAE Java Application Environment A source code release of the JDK.
(See *JDK*.)

JAR A Java Archive file format used for concatenating files, which have the .jar extension.
(See *JAR File Format*.)

JAR file format A platform independent file format that may be used to store applets and their components including images, sounds, resource files, and class files. JAR files can be used to download Java related data more efficiently using HTTP, and offers support for compression and digital signatures.

Java A general purpose, high level language (HLL) which is:

- not platform or operating-system sensitive, yielding ‘write-once-run-anywhere’ code
- object-oriented
- general purpose
- multi-threaded
- class-based.

The resulting compiled bytecode may be run on Windows 3.x, Windows NT, Windows 95/98, Macintosh environments, UNIX, et al. OS independence is a key characteristic of Java¹, making it suitable for deployment of applets, where client OSs are of a heterogeneous nature. Web-based Java applets:

- are interpreted by Java-enabled browsers
- may access code libraries on the client machine
- may download class libraries from the server.

Development tools for Java include:

- the Java Development Kit JDK
- Microsoft J++ that is included in Microsoft Visual Studio

- VisualAge for Java
- Java Servlet Development Kit.

The Java language semantics, and high-level instructions are similar to C and C++. It is considered a static programming language², but is likely to be given a dynamic functionality through appropriate development environments and compilers. Compilation of Java source code yields in a bytecoded instruction set and binary format³. Java may also be used to develop client-side and server-side applications, perhaps using the CORBA-based Notification Services as its middleware or glue. Such Java code may be generated automatically from IDL files using an IDL2JAVA compiler.

References:

1. *The Java Language Specification*, Sun Microsystems, 1996
2. *Dylan Reference Manual*, Apple Computer, 1995
3. *Java Virtual Machine Specification*, Addison-Wesley, 1996

(See other Java.)

Java applet A program created using the Java programming language, and typically deployed over the Web. It resides on the server side, and is downloaded to a Java enabled Web Browser. It is then interpreted and run. The Browser must feature the Java Virtual Machine that is a software-based processor.

(See Java.)

Java Application Environment (JAE) A source code release of the JDK.

Java array A matrix of entities of the same type that may be simple or composite. The matrix or array may be multidimensional, and is declared using square brackets ([]).

```
int meters[];
char[] table;
long transform[][];
```

The size of an array is not specified at its declaration.

JavaBeans A standard component architecture offering *beans* that can be used to build applets, servlets and applications. The components are referred to as *Beans*, and compliant development tools provide access to the beans using a toolbox. Visual programming plays an important role when architecting a Beans-based program; the developer simply selects Beans and modifies their appearance, behaviour and interactions with other Beans. JavaBeans compatible development tools include:

- JavaSoft JavaBeans Development Kit (BDK)
- Lotus Development BeanMachine
- IBM VisualAge for Java

- SunSoft Java Workshop
- Borland JBuilder
- Asymetrix SuperCede
- Sybase PowerJ
- Symantec Visual Cafe.

JavaBeans-ActiveX Bridge A Microsoft OCX control that permits the integration of Java Beans as if they were ActiveX controls.

(See www.splash.javasoft.com/beans/bridge/)

JavaBeans Development Kit (BDK) A JavaSoft BDK aimed at Bean and tool developers, and not applications developers.

Java Blend A database application development tool that is an environment for combining Java objects with enterprise databases. Applications may be developed by coding in Java, and resulting objects may be mapped to databases, and vice versa. It does not require knowledge of SQL. Java Blend was codeveloped by The Baan Company and Sun Microsystems.

(See *Java*.)

Java Card A smart card implementation that uses Java technology. The Java Card specifications can also be applied to devices that have:

- 16 KBytes ROM
- 8 KBytes EEPROM
- 256 Bytes RAM.

(See *Java*.)

Java casting types A process of converting one data type into another. Casting is often necessary when a function returns a type different than the type you need to perform an operation. The `int` returned by the standard input stream (`System.in`) is *cast* to a `char` type using the statement:

```
char k = (char)System.in.read();
```

Java Comments and whitespace A textual comment, and whitespace consists of spaces, tabs and linefeeds.

```
/* multiple line comment */  
// a single line comment  
/** a multiple-line comment that may be used with the  
    javadoc tool to create documentation**/
```

Java data type A means of defining a storage method for information, such as the storage of variables in memory. The following statement declares a variable, a variable type, and identifier:

```
Type Identifier [, Identifier];
```

The statement:

- allocates memory to a variable type `Type`
- names the `Type` `'Identifier'`
- uses the bracketed identifier to indicate that multiple declarations of the same type may be made.

Java data types may be:

- simple, which include integer, floating-point, Boolean, and character
- composite, which are based on simple types, and include strings, arrays, classes and interfaces.

Java development tool A tool/environment that allows programmers to create Java applets, Java programs, JavaBeans, and possibly Java Servlets.

Java Electronic Commerce Framework A point-of-sale (POS) application framework.

(See Java.)

Java floating-point data types A data type that may represent fractional numbers which can be the:

- float type, allocated a 32-bit single-precision number
- double type, allocated a 64-bit double-precision number.

Such data types are implemented using the statements:

```
float altitude;  
double angle, OpenRoad;
```

Java floating-point literals A means of storing and processing fractional numbers expressed in decimal (i.e. 200.76) or in scientific notation (2.00.76e2). Floating-point literals default to the double type that is a 64-bit value. The 'f' or 'F' suffix harnesses the 32-bit value.

JavaHelp A software product that allows the creation of on-line Help for Java applets, applications, OSs and devices. It can also be used to deploy on-line Help over the Web and intranets. JavaHelp is:

- written using the Java language
- implemented using JFC components
- platform independent
- browser independent
- supported by browsers that comply with the Java Runtime Environment.

Java identifier A Java token that stores names, which are applied to variables, methods, and classes.

Java integer data types A means of representing signed integer numbers, including:

- byte (8 bit)
- short (16 bit)
- int (32 bit)
- long (64 bit).

Integer variables are declared thus:

```
int x;
short; scale
long lumin, light;
byte alpha, beta, gamma;
```

Java integer literals A literal may be:

- decimal (base 10)
- hexadecimal (base 16) that have the 'OX' prefix
- octal that have the '0' prefix.

By default, integer literals are stored in the `int` type that has a 32-bit value. They may be stored in the `double` type that has a 64-bit value, using the 'l' or 'L' suffix.

(See *Java Literal*.)

Java keywords A meaningful vocabulary of entities that perform specific functions and include:

abstract	double	int	super
boolean	else	interface	switch
break	extend	long	synchronized
byte	false	native	this
byvalue	final	new	threadsafe
case	finally	null	throw
catch	float	package	transient
char	for	private	true
class	goto	protected	try
const	if	public	void
continue	implements	return	while
default	import	short	

Java lexical translation A process by which Java source code¹ is converted into Java tokens. It is implemented by the lexical analyser facet of the compiler that:

- translates Unicode escapes into Unicode characters, allowing the Java listing to be represented using ASCII characters
- generates a stream of input characters and line terminators
- generates Java input elements, or Java tokens that are terminal symbols.

Reference:

1. *The Java Language Specification*, Sun Microsystems, 1996

(*See Java.*)

Java literal An element that maintains a constant value and may be:

- numeric
- integer
- floating point
- Boolean
- characters
- strings.

Character literals refer to a single Unicode character. Multiple-character strings that are implemented as objects are also literals.

JavaMail An API used to build Java-based mail and messaging applications.

Java Management API (JMAPI) A library of objects and methods used for the development of network, and service management solutions targeted at heterogeneous networks.

(*See Java.*)

Java Media and Communication APIs, including 2D, 3D, and Java Telephony A Sun Microsystems' product family that allows developers to develop interactive multimedia applications for the Web.

(*See Java.*)

Java Naming and Directory Interface (JNDI) A connectivity API that provides an interface with enterprise, heterogeneous naming and directory services. It is a JavaSoft API, and a Java Standard Extension.

JavaOS A compact operating system dedicated to running Java programs/applets. The JavaOS family includes:

- JavaOS for Network Computers (NCs), which is described as a standalone Java Application Platform for NCs
- JavaOS for Appliances, which is intended for communications devices
- JavaOS for Consumers, which is aimed at consumer electronics devices.

Java package A set of Java classes that address specific functions where, for instance, `java.io` addresses input and output functions, and `java.net` addresses Internet and network operations.

JavaPC A software solution for migrating PCs to Java platforms. JDK 1.1 compliant Java applications can be stored locally or on a network, and may be run on DOS and Windows 3.x platforms.

JavaScript(TM) An object-orientated scripting language optimised for the Web. Using JavaScript, Web pages/HTML documents can be given:

- dynamic content such as animations
- integrated Java applets and ActiveX controls
- interactive content
- data entry forms.

Microsoft's implementation of JavaScript is JScript. The rationale behind JScript is echoed by VBScript: it is intended as a quick method of creating and tailoring applications. Unlike JScript, VBScript is not an OOP language. Like other objects, JavaScript objects have properties and methods, and include the:

- *window*, which is at the top of the HTML document's object hierarchy
- *frame*, which is a window
- *location*, which stores URL information
- *document*, which stores document characteristics such as its URL and title
- *form*, which stores form characteristics
- *text* and *textarea*, which store text information
- *checkbox*, which is standard Windows UI object
- *radio*, which refers to a single UI radio button
- *select*, which is an array of option objects
- *button*, which stores button information
- *password*, which is a text-entry box that disguises keyboard entries using asterisks
- *navigator*, which stores a visitor's version number of Netscape Navigator
- *string*, which provides methods for string manipulation
- *date*, which is dedicated to calendar date information
- *math*, which facilitates common constants and calculations
- *image*, which indicates image information on the current page
- *array*, which is dedicated to arrays.

JScript listings are integrated in HTML code by enclosing them between the following tags:

```
<SCRIPT LANGUAGE = "JavaScript" >  
<SCRIPT>
```

Development environments and applications that support JScript are numerous, and include the Microsoft ActiveX Control Pad which also supports VBScript.

(See *VB Basic*.)

Comments Single and multiple line comments may be included using the syntax:

```
// A single line comment
/* Multiple lines comment
require this syntax */
```

JScript operators

```
++ increment
_ decrement
* multiplication
/ divide
% modulus
+ addition
- subtraction
<< shift left
>> shift right
> greater than
<= less than or equal to
>= greater than or equal to
== equal to
!= not equal to
&& logical AND
! logical NOT
|| logical OR
^ bitwise
| bitwise OR
& bitwise AND
```

FOR The for statement has three optional expressions:

```
for( initial.Expression; condition; update.Expression) {
statement
statement
statement
}
```

- initial.Expression initializes the counter variable that may be a new variable declared with var
- condition expression is evaluated on each pass through the loop. If the condition is true, the loop statements are executed
- update.Expression is used to increment the counter variable.

WHILE A statement used to implement a conditional loop, based on a true or false validation:

```
while (condition) {
statement
statement
statement
}
```


Break A break statement stops for or while loops, and diverts program execution to the line following the loop statements.

for...in A for...in statement executes the statement block for each object property:

```
for (variable in object) {
  statement
  statement
}
```

function A statement which allows you to create a named JScript function together with parameters. The return statement may be used to return a value. Nested functions are not supported.

```
function name ([parameter] [...,parameter]) {
  statements...
}
```

if...else A conditional statement that offers one of two conclusions.

```
if (condition) {
  statement
  statement
} [else {
  statement
  statement
}]
```

return This is used to Specify a returned value from a function.

var The var statement is used to declare a variable that may be local or global.

```
var variableName [=value] [..., variableName [=value]]
```

while Repeats a loop while an expression is true.

```
while (condition) {
  statements...
}
```

with Declares a default object as the focus of a set of statements.

```
with (object) {
  statement
  statement
}
```

(See *CGL*.)

JavaSpaces(TM) write method A JavaSpaces method that is used to write entries to spaces. The following code segment uses the `write` method to copy a Creditcard requirement to a space:

```
public void writeCreditcard(CarCreditcard Creditcard) {
    Try {
        space.write(Creditcard, null, Lease.FOREVER);
    } catch (Exception e) {
        e.printStackTrace();
    }
}
```

The `write` method as defined in the `JavaSpaces` interface is of the form:

```
Lease write(Entry e, Transaction txn, long lease)
    throws RemoteException, TransactionException;
```

An entry is manipulated using the `write` method that may use the arguments transaction and lease time. If given a `null` value the transaction is a singular operation and is detached from other transactions. The lease time argument simply specifies the entry's longevity in the new space. When the lease expires the space removes it, but if a `Lease.FOREVER` value is used the entry exists in the space indefinitely, or until it is removed by a transaction process or operation. The lease time may also be expressed in milli seconds like the three minute lease shown below:

```
Long time = 1000 * 60 * 3; // three minute lease
Lease lease = space.write(entry, null, time);
```

Leases can also be renewed using the `renew` method:

```
void renew(long time)
, ,
```

The time value is added to the lease time remaining. The `renew` method can raise the exceptions: `LeaseDeniedException`, `UnknownLeaseException` and `RemoteException`. The former is raised should the space be unable to renew the lease that may be caused by lack of storage resources. The `UnknownLeaseException` is thrown if the entry or object is unknown to the space, perhaps because its lease has already expired. In real world scenarios the use of `Lease.FOREVER` is considered an uneconomical use of resources. The intelligent solution to leasing is to use `Lease.ANY` which leaves it up to the space to decide when expiry occurs. But when building `JavaSpaces` services the use of `Lease.FOREVER` may compress the development life cycle, so it can reduce the probability of thrown exceptions. The `write` method also throws two types of exceptions including `RemoteException` and `TransactionException`. The former is raised when a communication breakdown occurs between the source process and the remote space, or when an exception occurs in the remote space while an entry is written to it. The `RemoteException` returns the `detail` field that holds the exception type. If the space is

unable to grant a lease, a `RemoteException` is thrown. A `TransactionException` is thrown when the transaction is invalid or cannot be rolled forward or committed.

Java separator A means of categorising Java source code that directs the compiler appropriately, and includes:

```
{ } ; , :
```

JavaSoft(TM) A company formed by Sun Microsystems in 1995 and maker of Java language products and technologies that include Jini.

JavaSpaces A SunSoft technology that provides a means of writing, reading and transferring objects or entries between spaces. The `JavaSpace` interface defines methods to read or copy entries from a space, and to take or copy entries from a space while removing them from spaces also. Locating entries in spaces is carried out using associative lookup, and a template is used to match entry contents. For example, you may use a template like:

```
CarCreditcard anyCreditcardTemplate = new
    CarCreditcard();
AnyCreditcardTemplate.name = null;
AnyCreditcardTemplate.cost = null;
```

The null fields operate like wildcards and any *Creditcard* entry will be matched regardless of its name or cost. Null may also be used for the template so all entries in a space are matched. The match may be narrowed merely by adding values and name strings like:

```
AnyCreditcardTemplate.name = "Shell";
```

The `JavaSpaces` interface has two read methods:

```
Entry read(Entry tmpl, Transaction txn, long timeout)
```

And,

```
Entry readIfExists(Entry tmpl, Transaction txn, long
    timeout)
```

Both require three parameters: a template, transaction and a timeout value that may be expressed in milli seconds. When a matching entry is found, a copy of it is returned, or it is merely read shall we say. Where multiple matches are found the space returns a single arbitrary entry. This clearly must be borne in mind when developing `JavaSpaces` services. The `Read` method waits for the timeout if no matching entries are found in a space, or until a matching entry is found. If no matching entry is found, a `null` value is returned by the `read` method. The `Long.MAX_VALUE` may be used as a timeout value, causing the read operation to block until a matching entry is found. Alternatively using

the `JavaSpaces.NO_WAIT` value for the timeout causes the read operation to return immediately. The `readIfExists` method is non-blocking, and returns immediately when no matching entry is found, irrespective of the timeout parameter value. The timeout parameter is relevant only when the read operation takes place under a transaction. So with a `null` transaction the timeout value is equivalent to `NO_WAIT`. Both read operations may throw the:

`InterruptedException` when the thread implementing the read operation is interrupted.

`RemoteException` when a failure occurs on the network or in the remote space.

`TransactionException` when the supplied transaction is invalid.

`UnusableEntryException` when an entry retrieved cannot be deserialized.

The `take` method defined in the `JavaSpaces` interface is of the same form as the read operation:

```
Entry take(Entry tmpl, Transaction txn, long timeout)
```

The `take` method removes entries from spaces provided no exception is thrown. The aforementioned exceptions for `read` and `readIfExists` may also be thrown by the `take` method. These include `InterruptedException`, `RemoteException`, `TransactionException`, and `UnusableEntryException`.

Java string literals A string, or number of characters, within a pair of double quotation marks. String literals invoke an instance of the `String` class that is assigned the character string.

Java Studio1.0 A development environment that does not require Java coding on a line-by-line basis. It harnesses the `JavaBeans` object architecture, and is typically used to build Web applications. It is a product of Sun Microsystems.

(See *Java*.)

Java swing A set of interfaces and components that permit the easy creation of GUI components, which include menus, dialogues and toolbars, and includes the items `JsplitPane` and `Jtree`.

Java to IDL language mapping A mapping that equates the Java to the IDL equivalent.

Java tokens A meaningful element of a Java program when compiled. The five categories of token include:

- identifiers
- keywords

- literals
- operators
- separators.

Tokens are compiled into Java bytecode, which can be interpreted by a Java Virtual Machine.

Java Unicode A predominant character set with which Java source code is represented, and is:

- 16 bit, which gives up to 2^{16} or 65,536 possible characters
- used exclusively by Windows NT at the system level
- a worldwide standard.

In Java, three lexical translations¹ convert a raw unicode character stream into a sequence of Java tokens

Reference:

1. *The Java Language Specification*, Sun Microsystems, 1996

Java(TM) Electronic Commerce Framework A POS (Point-of-sale) application framework.

Java(TM) Remote Method Invocation (RMI) A technology used in Jini and designed by Ann Wollwrath of SunSoft that permits object to object communications where the methods invoked may be on a remote application object.

JavaWorld An on-line magazine dedicated to Java.
(See www.javaworld.com.)

Java.net A package that has classes designed for networks, and includes the URL class that allows remote objects to be downloaded, and can be used to read and write streams to and from the object.

```
java.rmi.RMI SecurityManager
```

(See *RMI Security*.)

Jaz drive A removable storage device manufactured by Iomega. Jaz disks offer 1 GByte data storage capacity.

JBuilder A Java based development software suite from Inprise.

JDBC (Java Database Connectivity) A Java package that allows Java programs to interact with compliant databases, and also includes a bridge to provide backward compatibility with ODBC databases.

JDK (Java Development Kit) Sun Microsystems' development tool for creating Java applets and applications. It is freely available from JavaSoft (www.javasoft.com), and includes:

- `appletviewer` for viewing Java source code listings
- `jar` for compressing an packaging applications
- `java` for executing applications
- `javadoc` for documenting Java programs
- `javac` for compiling Java programs.

Jetsend A wireless connection technology for home appliances.

Jini A SunSoft standard for distributing services over local and remote networks, which can be applied to implement self-configuring tier 0 devices sometimes called smart devices that include cell phones, DVD drives, palm PCs and organisers. The connection between a Jini device and a Jini service takes place using the TCP/IP transport protocol, and other Jini protocols include Discovery that is based on UDP. Jini networks comprise lookup services that act as directories containing the network's registered services. A client may receive a proxy object from these services that is downloaded to a JVM, and may also use UIs specific to services. Applications of Jini are varied and exist at every tier including tier 3 where transaction processing can be carried out, and may be applied to devices ranging from servers to simple household appliances as simple as a light switch with a single input and no JVM of its own. Docking stations are also possible where Jini clients share a JVM. Mobile Jini applications can include smart devices able to connect with remote Jini services in the home or in the office.

(See *JavaSpaces*, *Jini* and *jini.org*)

Jini client A client that provides access to one or more Jini services.

Jini Community A community at jini.org dedicated to the development of Jini, its framework, applications, services and marketplaces.

The Jini Community Summit An annual meeting of members of the Jini Community that takes place each year in Aspen Colorado.

Jini docking bay A docking bay that has a JVM that may be shared by multiple docked devices.

(See *Jini*.)

Jini Multicast Response Service A transparent connection that occurs between Jini devices and services, and communities, and relies upon simply communicating messages and protocols. It is the intention of this section to

provide an explanation of the protocols and communications that occur between new Jini entities and the network lookup services. Jini has protocols to:

- Discover lookup services on LANs which may be in your office or in your home, or even installed in a hotel room.
- Broadcast the presence of lookup services.
- Forge communications with a lookup service using WANs.

A new entity uses the multicast request protocol to find lookup services, and then uses the multicast announcement protocol to receive multicast lookup announcements. This communication requires that the requesting entity has a multicast request client, and a multicast response server that listens to the lookup services. Both may be run on a single JVM implementation. The lookup service has a listening multicast request server, and a multicast response client that responds to requesting entities by providing them with a proxy that is used to converse with the lookup service. The multicast request service uses the transport layer of the network protocol so lookup services may push their information to a requesting host. The actual protocol used is a version of UDP (User Datagram Protocol), and a multicast discovery packet has a maximum 512-byte payload. It may contain architecture neutral parameters and should be simple to decode. The packets form a contiguous stream like that from a `java.io.DataOutputStream` to a `java.io.ByteArrayOutputStream` object.

Jini Nested Transactions A series of multiple transactions using Jini. At times, a transaction requires the implementation of subtransactions for its successful completion. These nested transactions provide a logical hierarchy where a parent transaction is dependent on a nested transaction. Nested transactions are implemented using `TransactionManagers` that use the `NestableTransactionManager` interface:

```
package net.jini.core.transaction.server;

import net.jini.core.transaction.*;
import net.jini.core.lease.LeaseDeniedException;
import java.rmi.RemoteException;

/**
 * The interface used for managers of the two-phase
 *   commit protocol for
 * nestable transactions. All nestable transactions
 *   must have a
 * transaction manager that runs this protocol.
 *
 * @see NestableServerTransaction
 * @see TransactionParticipant
 */
```

```
public interface NestableTransactionManager extends
    TransactionManager {

    /**
     * Begin a nested transaction, with the specified
     * transaction as parent.
     *
     * @param parentMgr the manager of the parent
     * transaction
     * @param parentID the id of the parent transaction
     * @param lease the requested lease time for the
     * transaction
     */

    TransactionManager.Created create(NestableTransac-
        tionManager parentMgr,
        long parentID, long lease)
        throws UnknownTransactionException, CannotJoin-
            Exception, LeaseDeniedException,
            RemoteException;

    /**
     * Promote the listed participants into the
     * specified transaction.
     * This method is for use by the manager of a sub-
     * transaction when the
     * subtransaction commits. At this point, all par-
     * ticipants of the
     * subtransaction must become participants in the
     * parent transaction.
     * Prior to this point, the subtransaction's manager
     * was a participant
     * of the parent transaction, but after a successful
     * promotion it need
     * no longer be one (if it was not itself a partici-
     * pant of the
     * subtransaction), and so it may specify itself as
     * a participant to
     * drop from the transaction. Otherwise, partici-
     * pants should not be
     * dropped out of transactions. For each promoted
     * participant, the
     * participant's crash count is stored in the cor-
     * responding element of
     * the crashCounts array.
     *
     * @param id the id of the parent transaction
     * @param parts the participants being promoted to
```



```
        the parent
    * @param crashCounts the crash counts of the par-
      ticipants
    * @param drop the manager to drop out, if any
    *
    * @throws CrashCountException the crash count of
      some (at least one)
    * participant is different from the crash count the
      manager already
    * knows about for that participant
    *
    * @see TransactionManager#join
    */

void promote(long id, TransactionParticipant[]
    parts,
              long[] crashCounts, TransactionParticipant
    drop)
    throws UnknownTransactionException,
           CannotJoinException, CrashCountException,
           RemoteException;
}
```

When a nested transaction is created, the originating manager joins the parent transaction using the join method when the managers are different. The create method may raise the `UnknownTransactionException` if the parent transaction manager does not recognize the transaction because of an incorrect ID, or has become inactive, or has been discarded by the manager.

Jini smart device A Jini enabled device that usually has its own JVM and is able to consume Jini services.

(See *Jini*.)

Jini transaction creation A process where a Jini transaction is created. To create a transaction it is necessary for the client to use a lookup service (or a similar directory services metaphor) in order to reference a `TransactionManager` object. A new transaction may be initiated using the `create()` method and by specifying a `leaseFor` period in milliseconds. The `leaseFor` duration is adequate for the transaction to complete, and the `TransactionManager` may forbid the lease request by throwing the `LeaseDeniedException`. Expiration of a lease before a `TransactionParticipant`'s vote with a commit or abort leads the `TransactionManager` to abort the transaction. Constants provide the currency of the described communications between `TransactionParticipants` and `TransactionManagers` and are defined in the `TransactionConstants` interface:

```
package net.jini.core.transaction.server;

/** Constants common to transaction managers and
    participants. */
public interface TransactionConstants {
    /** Transaction is currently active */
    final int ACTIVE = 1;
    /** Transaction is determining if it may be com-
        mitted */
    final int VOTING = 2;
    /** Transaction has been prepared but not yet
        committed */
    final int PREPARED = 3;
    /** Transaction has been prepared with nothing to
        commit */
    final int NOTCHANGED = 4;
    /** Transaction has been committed */
    final int COMMITTED = 5;
    /** Transaction has been aborted */
    final int ABORTED = 6;
}
```

Jini transaction join A process where a participant joins a transaction. To join a transaction, a participant invokes the `join` method held by the transaction manager using an object implementation of the `TransactionParticipant` interface. The `TransactionManager` uses the object to communicate with the `TransactionParticipant`. If the `join` method results in the `RemoteException` being thrown, the `TransactionParticipant` relays the same (or another exception) to its client. The `join` method has a crash count parameter that holds the `TransactionParticipant`'s storage version that contains the transaction state. The crash count is changed following each loss or corruption of its storage. When a `TransactionManager` receives a join request it reads the crash count to determine if the `TransactionParticipant` is already joined. If the crash count is the same as that passed in the original join, the join method is not executed. If it is different, however, the `TransactionManager` causes the transaction to abort by throwing the `CrashCountException`.

Jini transactionserver A two-phase commit using Jini. The two-phase commit protocol is implemented using the primary types:

1. `TransactionManager` that creates and coordinates transactions.
2. `NestableTransactionManager` that accommodates nested transactions or sub-transactions.
3. `TransactionParticipant` that allows transactions to be joined by participants.

The two-phase commit protocol coordinates the changes made to system resources that result from transactions. It tests for their successful implementation, in which case they are committed. If not, and any one fails, they are each rolled back. In transaction processing (TP) this is left to a transaction coordinator whose function is integrated in the `TransactionManager` using Jini. The `TransactionManager` is key to the two-phase commit protocol. This requires that all `TransactionParticipants` vote in order to indicate their state. The vote may be prepared (or ready to commit), not changed (or read only), or aborted (when it is necessary to abort the transaction). Having received information of the readiness to commit through a prepared vote, the `TransactionManager` signals `TransactionParticipants` to roll forward and commit the changes resulting from the transaction. `TransactionParticipants` that vote aborted are signaled to roll back by the `TransactionManager`.

Jini(TM) API Jini is made of numerous Jini packages that combine to make the collective API that implements the many required interfaces. These include the methods and exceptions that make light work of developing Jini applications and include the shown `TransactionManager` interface.

```
package net.jini.core.transaction.server;

import net.jini.core.transaction.*;
import net.jini.core.lease.Lease;
import net.jini.core.lease.LeaseDeniedException;
import java.rmi.Remote;
import java.rmi.RemoteException;
public interface TransactionManager
extends Remote, TransactionConstants {

    /** Class that holds return values from create
        methods. */

    public static class Created implements java.io.Serializable {
        static final long serialVersionUID = -4233846033
            773471113L;
        public final long id;
        public final Lease lease;
        public Created(long id, Lease lease) {
            this.id = id; this.lease = lease;
        }
    }

    Created create(long lease) throws LeaseDeniedException,
        RemoteException;

    void join(long id, TransactionParticipant part, long
```

```
    crashCount)
        throws UnknownTransactionException, CannotJoin-
            Exception, CrashCountException, Remote-
                Exception;

    int getState(long id) throws UnknownTransaction-
        Exception, RemoteException;

    void commit(long id)
        throws UnknownTransactionException, Cannot-
            CommitException, RemoteException;

    void commit(long id, long waitFor)
        throws UnknownTransactionException, Cannot-
            CommitException, TimeoutExpiredException,
                RemoteException;

    void abort(long id)
        throws UnknownTransactionException, CannotAbort-
            Exception, RemoteException;

    void abort(long id, long waitFor)
        throws UnknownTransactionException, CannotAbort-
            Exception, TimeoutExpiredException,
                RemoteException;
}
```

(See *Jini*.)

JIT compiler for Java (Just in time compiler for Java) A compiler which converts OS-independent Java bytecode and optimises it for execution on the target OS. The conversion naturally takes place on the client side.

JIT debugging A method of detecting bugs in a running program, and responding by running an appropriate debugging process.

Jobs, Steve A co-founder of Apple Computer, who later founded NeXT. His most significant achievements are those at the early years of Apple Computer, an era when a clutch of American companies largely run and owned by college drop outs (including Bill Gates) revolutionised the computer industry by designing affordable microcomputers and accompanying software. Steve Jobs and Steve Wozniak revolutionised the world of computing by mass producing one of the world's most affordable PCs known simply as the Apple, and later the Apple II. It was designed by Steve Wozniak, whose dream was always to own a computer. This was a dream that he almost single handedly made reality for himself and for millions of people around the world.

(See *Apple Computer*.)

Join A process of combining records from different tables/files in an relational database management system (RDBMS).

JPEG (Joint Photographics Experts Group) An internationally agreed standard for still-image compression and decompression that was devised by the JPEG – a specialist group set up by the ISO and CCITT. It is a symmetrical algorithm in that the processes required for compression mirror those of decompression. The processes include forward and reverse DCTs (Direct Cosine Transformations). It can be used to compress 8 bit, 16 bit and 24 bit graphics. Motion-JPEG (M-JPEG) video uses individual frames compressed according to the JPEG algorithm, giving full frame updates as opposed to the predominantly partial frame updates of standard MPEG video. The JPEG standard compression scheme for still photographic quality images began development in 1986. Compression and encoding techniques were evaluated during 1987 and 1988, until eventually the components of the symmetrical compression cycle were agreed, with DCT (Direct Cosine Transform) proving a central theme of the JPEG design.

(See DCT.)

Jump A moment in a running program when execution is diverted from one point to another. The jump may be conditional, where it will occur because of a given event, or variable value. An unconditional jump does not require such preconditions.

Just-in-time (JIT) compiler A Java runtime environment which is encapsulated by the Java Developer Kit and permits redistribution of the runtime environment. JRE consists of the JVM, core classes, and miscellaneous files.

JVM (Java Virtual Machine) A software solution that yields an environment for running Java applets. Browsers such as Netscape Navigator and Microsoft Internet Explorer feature Java Virtual Machines. JVMs may be run on clients such as desktop and notebook systems or even consumer appliances so they connect with Jini networks and consume compliant services.

(See JavaPC.)

K

Kaband A range of frequencies between 18 GHz to 30 GHz.

Kannel An open source WAP gateway.
(See www.kannel.org.)

Katakana A character set used in a Japanese phonetic alphabet.

KB (*See Kilo Byte.*)

K-band A range of frequencies between 10 GHz to 12 GHz.

Kbps (Kilo bits per second) A unit of data transfer that equates to 1,000 bits/second.

KBps (Kilo Bytes per second) A unit of data transfer that equates to 1,000 bytes/second.

KBS (Knowledge-Based System) An alternative name for an expert system that includes a knowledge base of rules or heuristics, each comprising fact(s) and conclusion(s), i.e. IF disk drive light off THEN check ribbon cable. Such conclusions, and deductions may be weighted appropriately. The rule-base is chained by an inference engine that chains:

- backwards, comparing an inputted question with conclusions in the rule-base, and may compare subsequently located facts with conclusions of other rules
- forwards, comparing facts.

A KBS can offer informed decision making skills, the effectiveness of which is a function of the accuracy and comprehensiveness of its rule- or knowledge-base. A knowledge engineer is responsible for generating rule-base. Numerous KBS applications exist, including medicine, business, stock market, maintenance, etc. Web-based KBS solutions exist. KBS can offer informed decision

making skills, the effectiveness of which is a function of accuracy and comprehensiveness of rule- or knowledge-base. Knowledge engineers are responsible for generating rule-base – proven to be complex and arduous process. Numerous applications include medicine, business, stock market, maintenance, etc.

Kermit An file transfer protocol that is asynchronous.

Kernel A part of an operating system environment. The Windows kernel is responsible for a number of tasks including memory management and dynamic linking.

Kernel Driver A driver which interacts with an internal or external device.

Kernel32.DLL A DLL included in Windows 3.1 and Windows 95/98.
(See *DLL*.)

Key A means of making encrypted data unique.

key An arbitrary value that locates a datum in a data structure.

Key field A key field is included in a database in order to prevent the duplication of contained field values, and to expedite information retrieval. Key fields are also used to link tables or files in relational databases. Where it is necessary to repeat values in a key field, additional fields are keyed. These are termed multi-field keys.

KHz (Kilo Hertz) A unit of frequency that equates to 1,000 cycles per second.

Kilobyte (or Kbytes, or K) A unit of memory which has 1,024 bytes. Occasionally disk drive manufacturers equate KBytes to 1,000 bytes in accordance with the metric interpretation of Kilo. It is derived from a 10-bit address bus, or 10-bit pointer register, thus giving access to 2^{10} (1,024) memory locations.

Kilostream A digital service provided by BT that requires the customer to have a Network Terminating Unit (NTU). It provides data rates of 2.4 Kbps, 4.8 Kbps, 9.6 Kbps, 48 Kbps, and 64 Kbps.

Kiosk Application A multimedia application intended to interface with the general public. The multimedia system may or may not be housed in a physical kiosk. Such applications might provide maps, tourist information, point-of-information, point-of-sale etc.

Knowledge base 1. An information database that is accessible via the Microsoft Web site. 2. A set of rules that determines the functionality of an expert system. The rules may be simple If. . . THEN rules.

(See KBS.)

Knowledge engineer A person responsible for programming an expert system.

(See KBS.)

Knowledge Management A process that:

- identifies an organisation's intellectual assets
- creates new knowledge for competitive advantage
- imparts corporate information accessible
- imparts best practices
- harnesses IT such as corporate networks, groupware and intranets.

L

L Band A section of the electromagnetic spectrum that ranges from 1.53 to 1.66 GHz, and is applied in satellite and microwave communications.

LAN (Local Area Network) A number of computers connected physically or wirelessly so users can share directories, applications, services, and resources such as printers and fax/modems. LANs are commonly used to connect all computers in a department, while Wide Area Networks (WANs) may be used to connect multiple sites. LAN data transfer rates over approximate speeds between 10 and 100 Mbps, though speeds up to 1000 Mbps are possible. There are a number of internationally agreed standards by which computers forming a LAN are connected. Network topologies include:

- star, where computers are connected using a centralised hub
- ring, where computers are connected in a chain; this is the chosen method for small networks that are perhaps peer-to-peer configurations which might be based on Windows 98/NT. LAN standards include Ethernet, Token Ring and occasionally Fibber Channel (FC). The latter may be used to implement FC arbitrated loops.

(See 10Base, Active Web, Client/server, Ethernet, Optic Fibre, Inactive Web, Master Slave and Server.)

Laser diode A diode assembly able to lase at a fixed wavelength; with the aid of a lens it can become a read head.

(See LED.)

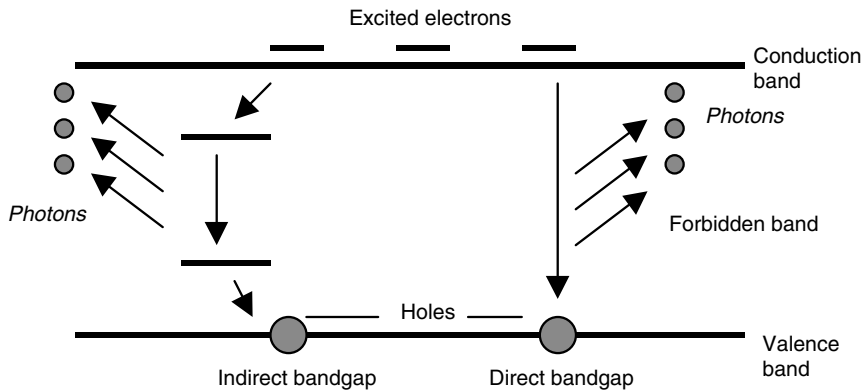
LCD Liquid Crystal Display A form of display measuring a few millimetres in depth. Available in monochrome and colour, LCDs are used in a wide variety of appliances including pocket televisions, notebook computers, PDAs, cellular phones, calculators, and portable CD-ROM readers/electronic books. Modern notebooks tend to use TFT and DSTN display technology. The former provides improved image definition.

(See LED and Notebook.)

Lease A time period assigned to an object, data element or service that dictates longevity. Services that register on a network may be assigned a lease, while objects in a JavaSpaces service may also be assigned leases placing time limits on their availability.

LED (Light Emitting Diode) A semiconductor/optronic device, which emits visible light when excited electrically. It may provide a basis for:

- display technology
- laser light sources for fibre optic lightwave communications
- read heads for CD-ROM and DVD drives.



Radiative recombination

They are used in all types of consumer electronics and computers, as power indicators and alphanumeric displays. Advantages over conventional filament bulbs include, near-infinite life span, incredible durability, reliability, physically robust, easy to manufacture in different colours, low power consumption and inexpensive. LEDs emit optical radiation, and the 800 nm (wavelength) emission is seen as red. Dividing the speed of light c (3×10^8 metres/second) by the wavelength (λ) of an (800 nm) LED's emission, results in its frequency f :

$$f = c/\lambda$$

$$f = (3 * 10^8)/(8.00 * 10^{-7})$$

$$f = 3.75 * 10^{14} \text{ Hz}$$

The emission from an LED is commonly defined in terms of the external stimulation of electrons. Electrons exist in bands that surround a nucleus. The outer or valence band may share its electrons with other atoms that collectively

form molecules. The valence band's electrons are stimulated to higher energy state called the conduction band. This condition occurs when electrons are:

- passed through a pn junction diode
- stimulated by a high voltage
- stimulated by light.

The difference that exists between the valence and the conduction bands is described as the forbidden gap. The type of semiconductor determines the behaviour of the bandgap, which may be:

- *Indirect*, such as silicon, where electrons may occupy intermediate levels as they pass from the conduction band to the valence band.
- *Direct*, where electrons move directly through the forbidden gap, and provide the best results.

Photon emission takes place as electrons are displaced from the conduction band, and united with holes in the valence band. The resulting emission of light from a LED might be referred to as *pn junction electroluminescence* or *recombination radiation*. The latter refers to the combination of electrons with holes.

The resulting wavelength λ (in micrometers) is calculated thus:

$$\lambda = hc/E$$

where,

- h is Planck's constant (6.63×10^{-34} joule-seconds)
- c is the speed of light (3×10^{14} micrometers per second)
- E is energy difference between the valence and conduction bands.

Legacy A system, application or operating system (OS) that is of a past generation, and is usually based on mainframe technology. It may nonetheless be integrated into a modern IT implementation, and coexist with modern client/server architectures.

(*See Client/server.*)

Level 1. A defined RAID architecture. (*See RAID.*) 2. High- and low-levels describe macro and micro features, respectively. In terms of programming languages, low-level languages relate most closely to machine code, such as assembly languages, for instance. High level languages are those that are a considerable distance from the machine language (in terms of compilation processes), and include C++ and Visual Basic. 3. A US defined series of security grades. (*See Security.*)

LIFO (Last In First Out) A type of queue. The order in which items are regurgitated opposes that in which they are deposited; the last item placed in

the LIFO queue is the first to be retrieved. It may be used to store the return addresses, when a subroutine is called. In this guise, it is called a stack.

(See *FIFO and Queue*.)

LIM memory (Lotus Intel Microsoft) An alternative name for EMS (Expanded Memory Specification), this is a method of addressing memory in a PC architecture. Introduced by Lotus, Intel and Microsoft (LIM) in 1984, it was used in Windows 1.x to cache DOS applications. The specification has evolved and numerous different versions are available. In the early days, many PCs were fitted with EMS compliant memory cards. However, growing extended memory (XMS) on motherboards and their EMS compliance drove EMS memory cards into obsolescence. Expanded memory is accessed by reading 16 K pages from EMS into the memory area between 640 K and 1 Mb Ram. A device driver such as EMM386 responds to EMS requests.

Line speed A data transmission rate over media that may be physical or wireless. The unit measurement is typically in Kbps or Mbps.

Linear medium A medium that does not permit user-interaction, in order to control its sequence. Conventional broadcast television is a linear medium. A non-linear medium, such as the Web, provides the user with the ability to control its sequence.

(See *Multimedia and Web*.)

Lingo An OOP-based multimedia authoring language that was developed by MacroMedia, and is a most intuitive language even to non-programmers. It may be used in conjunction with Macromedia Director and Macromedia Authorware Professional. Lingo's functionality, syntax and structure are comparable to those of OpenScript which is a proprietary language included with certain versions of Asymetrix ToolBook. It has become the industry's chosen language for authoring multimedia titles. Using Lingo, Director movies may be interwoven with interactivity, by coding handlers that respond to events. Messages that result from such events can be defined in the program code.

Lingo events Director is driven by four key event categories that are associated with:

- Frame
- Keyboard
- Mouse
- Movie.

Lingo program form

```
on eventOfSomeSort
go to frame 15
end
```

This simple script operates thus: if the specified event occurs, the play head is moved to frame 15.

Lingo messages Events invoke the messages:

```

mouseDown
mouseUp
-- are sent when the mouse button is either
pressed or released
keyDown
keyUp
-- are sent when is either pressed or released
enterFrame
exitFrame
-- are sent when the playback head passes over
frames
startMovie
stopMovie
-- are sent when the movie either starts or
stops
idle
-- is sent during dormant states
timeOut
-- is sent after a specified period following a
previous action

```

Additional messages may be defined.

Lingo If...then form

```

on keyDown
  if the key = ESCAPE then
    alert "Cue previous video clip"
    beep
  else
    alert "Escape?"
  end if
end keyDown

```

Further Reading

Roberts, Jason. *Director Demystified*, Berkeley, CA, Peachpit Press, 1995
 Thompson, John and Sam Gottlieb, *Macromedia Director Lingo Workshop*,
 Indianapolis, IN, Hayden, 1995
 Callery, Michael, Learning Lingo, *Programming with Macromedia Director*,
 Addison Wesley, 1996
 (See *Multimedia authoring tool, Object, OpenScript, www.asymetrix.com and
 www.macromedia.com.*)

Link 1. A process by which the object (.OBJ) files are linked with libraries that include functions, procedures and classes. (See *Compiler and DLL.*) 2. A means of connecting related information in a hypertext model for information storage and retrieval. Hence user-interaction may be given context. They

provide the user with a means of touring non-linear paths through information. Such links of association are taken to limits that are imposed by the design's levels of granularity. Nodes, representing text or images, are linked to provide a potentially infinite number of meaningful paths. For example, a single node representing a linear structure, such as an article, might be linked to numerous other articles and images. Links can naturally exist at a number of levels, either to link complete documents (macro features), or to reference words or phrases (microfeatures) within documents, or complete documents or Web sites that are identified by their URLs 3. A means by which tables/files may be connected in a relational database management system (RBMS). In the case of a multi-table form within a relational database, such links can refer to how master tables and detail tables are associated as follows:

- One-to-one: each master record is linked to only one detail record at any given time.
- One-to-many: each master record is linked to a group of detail records.
- Many-to-one: a number of master records may be linked to a single detail record.
- Many-to-many: each master record is one of a group that may be matched to one of a group of detail records.

Such RDBMSes make possible multiple table changes and updates using a single form as a data entry interface. (*See Data warehouse, Database and Relational database.*) 4. A communications path between devices that may be processors, as is the case in MPP designs. (*See MPP.*)

Linux An operating system based on Unix, which includes Unix commands and concepts. The Linux repository is the CVS (Concurrent Versioning System) that permits multiple users to work on the same files in a collaborative team environment. Files may be checked out and returned to the repository where their contents can be merged with other versions of the same file. For Windows systems access, to the CVS is provided by WinCVS, or alternatively a Telnet and ftp session may be established between the Windows system and the system hosting the CVS. Consider a scenario where you want to write files from a Windows system to the CVS:

Establish a Telnet session with the network system (such as lin3) holding the CVS. This requires Telnet software on the Windows machine, where the command used would logically following the pattern:

```
Telnet lin3
```

Respond the prompts:

```
username:  
password:
```


Open a DOS window and change to the directory holding the file(s) you wish to write to the CVS. To do this use the standard `cd` and `cd/` commands. Establish an ftp session with the network system (such as `lin3`) holding the CVS. Again this requires software on the Windows system. Typically, you would type in a DOS window:

```
ftp lin7
```

In the DOS window, change to the directory on `lin3` where the files are to be copied. By default Linux is now primed for an Ascii transfer, but if the files are to be read using an intranet, and are perhaps PDFs, they will be corrupt, and the intranet will not work for local and for remote workers. A binary transfer is therefore necessary, and this is achieved simply by typing 'binary'. Copy the file(s) by typing:

```
put
```

Or

```
mput outerwall. *
```

Type:

```
cv$ commit
```

Finally in the Telnet window type:

```
cv$ update
```

Linux firewall A firewall created using the Linux operating system and Linux modules.

(See *Firewall and Linux*.)

Liquid asset An asset shown on a balance sheet that may be realised in terms of currency in a short period of time.

List box A windows component that may be assumed to provide a means of selecting files. Where the number of files exceeds a certain figure, a vertical scroll bar is provided in order to assist in the process of their selection.

List server A facility and e-mail address that forwards e-mail messages to a list of registered users.

Literary Machines A book written by Theodore Nelson that put forward his hypertext concept, its methodologies, its data storage models, and its applications. Theodore Nelson is also remembered for his Xanadu project which to some is the conceptual birth of the Web. To others the conceptual birth of the Web and of the Internet is accredited to Vannevar Bush through what

he described as Memex. Both Xanadu and Memex were perceived as unified information storage architectures that could be accessed through specific technologies. Through his writings that include 'As We May Think', Vannevar Bush predicted the miniaturisation of information storage media.

(See *Bush, Vannevar, and Xanadu.*)

Liv Zempel A data compression algorithm.

(See *Compression.*)

Load balancing 1. A method of distributing the workload across processes and system resources, in an effort to optimise performance. It is usually applied dynamically in OO distributed systems. (*See Distributed processing.*)
2. A method of distributing the workload in an MPP architecture, so processors are as close to the heightened states of operation as is possible. It is carried out dynamically, and may be referred to as dynamic load balancing. (*See MPP*)

Local bus A method of connecting video cards, hard disk controllers and other devices more directly to the processor's data bus, thus overcoming the data transfer bottleneck of ISA. Theoretically, local bus technology should permit the accommodation of expansion cards running generally at clock speeds equal to that of the processor's external data bus. Local bus standards have emerged including VL-bus and Intel's PCI (Peripheral Component Interconnect). PCI generally performs better than VL-bus.

Local class A class that is local to a given block of Java code.

Local glue A collection of entities that unite client components, so they may operate collaboratively. OLE, OpenDoc, ActiveX, JavaBeans components require local glues so their running operations may be coordinated. These common OO component architectures use different local glues, where:

- OLE uses ODL (Object Definition Language)
- ActiveX uses COM
- OpenDoc uses CORBA IDL (Interface Definition Language)
- JavaBeans uses a subset of the Java programming language.

(See *ActiveX, Glue, JavaBeans, OLE, and OpenDoc.*)

localisation The implementation of a software product or service so it can be used in a specific region.

Logical client/server model A process of connecting to, and disconnecting from a computer, network, remote server, Internet service provider, or Internet service. A login name is required, as might be a password.

(See *Firewall and Security.*)

Login and Log off A model that sees the interaction of components and programs where messages are typically used to request services and data. Software components may act as:

- servers, providing client components with data
- clients that request data from servers
- server and clients.

Typically, it is a distributed OO software architecture platformed on a physical client/sever system.

(See Client/server.)

Lomem Lowest user memory address in system.

Look-and-feel A term which broadly describes the user interface, or presentation element of an application.

(See Application.)

Lookup service A directory that stores links or objects relating to available or registered network services.

Loop 1. A repetition of code in a program. The loop is normally conditional, and rarely unconditional. 2. A series of video frames that is repeated.

Loose coupling *(See Coupling.)*

Loss 1. A level of attenuation that a signal is subjected to while passing through media which may be physical or wireless. Optic fibber signal losses are caused by impurities in the silica core, and by fibber couplings. 2. A measure of the number of lost telephone calls or connections due to congestion.

Lossless compression A compression technique which does not rely on the omission of pixel information from a video or image file. Authentic lossless compression should result in video or image quality that is equal to that provided by the uncompressed files. However, it may be assumed that attainable compression ratios are lower than those of lossy compression algorithms.

(See DCT, JPEG and MPEG.)

Lotus Domino A server component used in an Lotus' integrated messaging, collaboration and Web application software.

Lotus Notes A Groupware implementation, and remembered as the first commercially successful variant. An evolving solution, it provides network

services such as e-mail and document publishing, and provides easy migration of resulting Notes applications to the Web.

(See Groupware.)

Low-level language A programming language that provides access to the low-level elements of a computer such as memory locations and processor registers. Assembly language is considered to be a low-level language. Assembly languages are indigenous to the processor type. The language consists of mnemonics that replace, and translate into, hexadecimal processor instructions.

M

Macintosh *(See Apple Macintosh.)*

Macro A short program or series of instructions. Macros are useful for automating processes, or for performing tasks that would otherwise take a great deal of time to implement. Typically macros are written when the user interface is restrictive for a given task, or for particular usage habits. They are also written when there is no predefined macro that will perform a desired task. Sometimes certain predefined macros may be improved upon or edited to perform different tasks. Previously sophisticated word processors such as Microsoft Word and Word Pro had indigenous macro languages, as some do today Standard macro languages include Visual Basic for applications.

(See VBScript and Visual Basic.)

Macro level Links which exist at the macro level relate comparatively large documents or ‘chunks’. They are said to exist at a high level, forming part of the chunk-based model of hypertext and hypermedia.

Macromedia SoundEdit A wave file recorder and editor.

Mailing list An electronic forum using e-mail to exchange information.

Main thread A process’ principle thread that may accompany others.

Mainframe A powerful computer that typically offers centralised processing, serving a number of connected dumb terminals. In terms of its positive characteristics, a modern mainframe may:

- process data at speeds beyond those attainable on desktop systems, and those based on conventional 32 bit and 64 bit processors which might be CISC or RISC.
- provide long-term archiving of data
- be a massively parallel processing (MPP) architecture, where processes are run concurrently, offering efficient scaleable processing

- offer industrial strength operation through robust operating systems and applications
- provide easy diagnosis of faults as they are isolated to the network or to the mainframe itself – though the mainframe with all its electronics and mass storage remains a complex fault diagnosis domain
- provide effective migration paths to client/server architectures
- prove a more durable IT solution in terms of longevity, because mainframe technology advances more slowly than microcomputer technology.

Key disadvantages of mainframe computers revolve around:

- high initial cost
- high cost of ownership brought about comparatively high maintenance and servicing bills
- fault tolerance is at a low threshold, because a mainframe fault may render an entire IT solution inoperable. However, the fault-tolerance of the connected mass storage (which may be shared) might be high
- the dumb terminals are typically green-screen, but there is scope for renovation (*See Application Renovation*)
- mainframe languages tend to be old-fashioned, like COBOL, though this is a changing situation.

Makefile In the context of Apple Cocoa and GNUStep, a makefile holds class and implementation files, and other files, so as to build applications.

Mapi (Messaging Application Program Interface) A standard that permits e-mail messages to be sent from any application. Originally developed by Microsoft, it is a DLL containing C functions, and allows developers to exploit Windows messaging. Calls to the DLL may allow applications to be given e-mail functions.

Marketing A process that enables the enterprise or vendor to locate and to reveal potential buyers of a product or service.

(*See Mass market.*)

Marquee A message scrolled across Web pages that may be a promotion, advertisement, announcement, etc.

(*See ActiveX.*)

Mass market A large market sometimes referred to as the critical mass, which usually includes the lower strata of society or the working class. Mass market products are mass produced often in tens of thousands, hundreds of thousands, and even millions in the case of everyday items such as food and clothing.

Mass storage device A device used to store data. May be assumed to be either magnetic, optical or magneto-optical.

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

Master/Slave Processing An architecture where a master computer is connected to slave (intelligent) computers that are connected to dumb terminals. Processing is distributed from the master computer, which may be assumed to be a mainframe, to the slave systems.

(See Client/server.)

Mbone (Multi-cast backbone) A virtual infrastructure for delivering multi-cast packets over the Internet. It is composed of tunnels, and provides limited bandwidth, but enough for audio/video data. A restriction mechanism integrated in MBONE routers or mrouters drops packets over tunnels where a predefined threshold rate is exceeded. Mrouters forward multi-cast packets to specified destinations. The Mbone topology maps are available at www.cs.berkeley.edu:

(See IP Multi-cast, and www.cs.berkeley.edu.)

MCIS (Microsoft Commercial Internet System) An evolving suite of servers used to architect Web solutions. The servers are Windows NT compliant, and include:

- Address Book
- Chat
- Content Replicator
- Internet Locator
- MCIS Mail
- MCIS News
- Membership
- Merchant Server
- Personalisation.

(See Address Book, Chat, Content Replicator, MCIS Mail, MCIS News, Membership, Merchant Server.)

MCIS Mail A Windows NT-based server that may be used to implement mailboxes across multiple Web sites. DPA (Distributed Password Authentication) and SSL (Secure Sockets Layer) are supported. Email protocol support includes:

- POP3 (Post Office Protocol)
- SMTP (Simple Mail Transfer Protocol)
- MIME (Multipurpose Internet Mail Extensions).

(See DPA, MIME, POP3, SMTP and SSL.)

MCIS News A Windows NT-based server that is part of the MCIS, and supports electronic conferencing and newsgroups. It supports the NNTP (Network News Transport Protocol) together with its extensions.

(See *MCIS*.)

M-commerce An e-business concept and transaction mechanism that is platformed and hosted using a wireless application service.

(See *2G, 2.5G and 3G*.)

Media Player A Windows program able to play a variety of different media files. With the appropriate driver selected and installed using the Control Panel it can be used to play various different media types including:

- CD-DA.
- Midi files.
- Wave (.WAV) files.
- Video files.

When launched it shows controls common with typical audio/visual appliances, including Play, Pause, Stop and Eject. Finer control over playing various media files and tracks is provided by a horizontal scroll bar.

(See *Video and Wave audio*.)

Megabyte (MBytes, MB) A Megabyte (MByte or MB) equates to 1,024 KBytes. Sometimes it is wrongly referred to as 1,000 KBytes as is the case when some manufacturers specify hard disk data storage capacities. Derived from 20 address lines resulting in 2^{20} (1,048,576) memory addresses.

Member class A member of an enclosing class, and is defined using the static modifier.

Membership A Windows NT-based server that is part of the MCIS, and allows visitors to become members of your site.

(See *MCIS*.)

Memex An information and storage system concept that was put forward in the 1940s by the visionary Vannevar Bush, Science Advisor to President Roosevelt and administrator of the wartime Manhattan Project. He believed that all published information should be made available through access points, and clearly set out the advantages of association through links. Calling the system Memex, and describing it as a sort of private file and library, he thought that some kind of workstation would be used with user-interaction accommodated through mechanical levers. If there were errors in his vision, it was a total underestimation of the sheer quantity of information that would be published in future, and an overestimation of the technology of the day,

i.e. microfilm, facsimile and telegraph. It was Bush's misfortune to live in the era of valves. The solid state transistor had yet to be invented, and it was some thirty years before the first reasonably sophisticated microprocessor was made commercially available. As such, Memex remained in the minds of a select few. (*See Hypertext, Multimedia, Web and Xanadu.*)

Memory protection A system where one process is prevented from accessing the reserved memory of another process.

Memory-mapped files A physical file that is mapped to memory.

Merchant An entity that accepts payment for goods or services using physical or electronic payment transaction technologies.

Merchant Account A contract between an e-business and a Processing Bank or Independent Sales Organization (ISP) for the clearing and settlement of credit card transactions.

Merchant Account Provider (MAP) A company that provides Merchant Accounts, and EMS is an examples

Merchant Server A Windows NT-based server that is part of the MCIS, and permits the construction of virtual shopping sites. (*See e-commerce and MCIS.*) The server consists of a:

- Controller that is used to define language, currency, date and other preconfigurable parameters.
- Router that is an ISAPI (Internet Service Application Programming Interface) DLL. This routes requests from the client to relevant parts of the Store server, and routes responses to those requests back to the client browser.
- Store Server that is the system's backbone, and functions to implement tasks such as order requests, and to interact with the backend database.

Merchant Server may be used to implement sites that allow customers to:

- peruse product databases
- purchase items using a shopping cart metaphor
- receive e-mail confirmation of orders placed.

Merchant Server permits the vendor to:

- query customer details, and purchase habits
- conduct promotions
- conduct marketing campaigns
- create membership accounts using IDs and passwords
- offer membership discounts
- integrate ActiveX, OLE and COM components into the server

- use ODBC compliant databases
- secure credit card transactions using the SET (Secure Electronics Transfer) protocol together with Verifone's vPOS application.

(See *Server*.)

Merchant services A bank department that processes information for Merchants.

(See *Merchant*.)

Message 1. An object responds to messages that stimulate objects to respond in some way. Using Objective-C a message is sent to an object (or receiver) using the expression:

```
[receiver message_name];
```

where receiver is the object, and message_name is the message or method name that is to be invoked – and may be referred to as a method selector.

To invoke the display method of the mySquare object:

```
[mySquare display];
```

Labels describing arguments precede colons:

```
[myRect setWidth:20.0 height:22.0];
```

Messages with a variable number of arguments:

```
[receiver makeList:list,argOne,argTwo,argThree];
```

(See *Object and Objective-C*.) 2. A request sent from one object or component to another, commonly used in OO systems. The message will be of a standard or proprietary format, with address information, and appropriate data. The messages might require an acknowledge message, before the originating component may continue processing. OO client/server architectures use messages and underlying protocols as their collective glues. (See *Glue*.)

Message authentication A process or usually sub-process that verifies that a message is received from the appropriate or legal sender.

Message wrapper A top-level data structure that conveys information to message recipients.

Meta data A term used to describe data that indicates the information types and subjects. The data may be stored in an information storage and retrieval system. In the context of the Web, metadata such as indexes and URLs are gathered and stored by search engine implementations. This provides clients with the ability to search and retrieve documents from the Web.

(See *Search engine*.)

Method An operation or procedure that objects may execute in response to a message. Methods may be defined in a set of APIs and they may define objects' behaviours in terms of how they respond to an expected event such as a mouse click, and to other stimuli. Other events might be the reception of messages from other objects, and the underlying methods might interpret them, and initiate an appropriate response. The response might be an acknowledge message, or a return value such as the contents of a variable.

(See Message and Objective-C.)

MHz (Mega Hertz) A measurement that equates to one million cycles or pulses per second. It is commonly used to describe the clock speed of computers, thus providing indication of speed of operation. A 50 MHz machine will therefore yield 50 million clock cycles per second, and a single clock cycle will have a duration of 1/50,000,000 secs.

MicroJava A processor from Sun Microsystems that is optimised for the Java programming language. It is used in network devices, telecommunications hardware and consumer games.

(See Java and Sun Microelectronics.)

Micropayment A small payment and transaction of perhaps between 1 F and 50 F.

Microsoft A large software producer and vendor that was founded jointly by Bill Gates and Paul Allen. Microsoft is a leading computer software company targeting mainly the PC platform. Its best known products are Windows, Microsoft Office, the MS-DOS operating system etc. It also produces multimedia titles, and has recently extended its operations to the Internet through the Microsoft Network (MSN), and numerous related ventures.

Microsoft ActiveX SDK An SDK dedicated to the creation of ActiveX controls, compatible with Visual C++ 4.2 (or higher).

(See ActiveX.)

Microsoft Commercial Internet System *(See MCIS.)*

Microsoft Design-Time Control SDK An SDK that is used to create Design-Time ActiveX Controls, that as their name suggests, is active only during design. Resulting controls may be used with FrontPage, InterDev, Visual C++, Visual Basic, etc.

(See FrontPage, Visual InterDev and SDK.)

Microsoft DirectX SDK A toolset that is used to develop multimedia elements, and includes:

- Direct3D for three-dimensional graphics
- DirectDraw for 2-D graphics

- DirectInput for connectivity to input devices such as joysticks
- DirectSound for exploiting sound card/software capabilities
- DirectPlay for connecting to remote applications.

Microsoft Forms 2.0 ActiveX Control A suite of ActiveX Controls included in Visual Basic Control Edition.

(See Visual Basic Control Edition.)

Microsoft IIS (Microsoft Internet Information Server) *(See MCIS.)*

Microsoft. NET *(See. NET)*

Microsoft Index Server 1. A search engine that may be used to find information on a Web site. It is included with Microsoft IIS, as is the Crystal Reports reporting engine. *(See Crystal Reports and IIS.)* 2. A Web server used with Microsoft Windows NT operating system, and bundled with Microsoft Windows NT Server. *(See Web server.)*

Microsoft Internet Client SDK A comprehensive set of tools, components and utilities for ICPs, Internet developers and Web authors.

Microsoft Internet News A technology that allows Web Browser users to subscribe to newsgroups, submit messages, and read messages. Microsoft Internet News is invoked from Internet Explorer by selecting Read News on the Go menu. *(See Newsgroup.)*

Microsoft MDK (Multimedia Developers Kit) A collection of tools that may be used to develop sophisticated multimedia titles.

Microsoft NetShow A streaming technology server that may be integrated into a Web site/application. Its inclusion results in the ability to serve client Browsers with streaming audio, video and multimedia. Web site and Web application developers may integrate it into IIS-based Web application solutions.

(See ASF, IIS, Multimedia and Streaming.)

Microsoft NetShow Theater Server A streaming MPEG video media server that extends Windows NT Server NetShow Services, to deliver higher quality video, including:

- MPEG1 and MPEG2 video streams from 500 Kbps to 8 Mbps
- scalability up to thousands of video streams
- a distributed, fault-tolerant PC architecture for mission-critical applications.

(See Streaming media and MPEG.)

Microsoft Office An integrated software package that features the:

- Word processor
- Excel spreadsheet
- Access database
- Outlook contact management program
- PowerPoint presentation program.
- Publisher desktop publishing program (in later editions only)

(See Application, Microsoft, and Windows.)

Microsoft Proxy Server A server implementation that may be used to deliver Internet access across an enterprise. The Internet Service Manager is used to manage the Proxy Server, as well as Chat and Mail servers. The Microsoft Proxy Server:

- is compatible with Intel and Risc platforms
- uses caching algorithms to optimise access to LAN data
- includes an Auto-dial features that connects the user with the ISP, if the user's requested data does not reside in the cache
- assign users with access rights to specified Web sites.

(See Server.)

Microsoft SDK for Java A superset of the JDK, it includes Microsoft class libraries, JIT compiler, and the Microsoft Virtual Machine for Java.

(See Java.)

Microsoft SQL Server A relational database management system (RDBMS) that provides multi- and concurrent-user access to enterprise data. The Microsoft SQL Server's utilities include the:

- SQL Enterprise Manager, which provides management features
- SQL Service Manager, which provides start and stop functions
- Interactive SQL for Windows, which permits sessions with multiple SQL servers
- SQL Security Manager, which provides access to security features
- SQL Setup, which may be used to upgrade MS SQL Server, as well as to change default settings
- SQL Client Configuration Utility, which is used to manage SQL Server client software configurations
- SQL Performance Monitor, which offers performance readings
- SQL Server Web Assistant, which permits the generation of Web pages that use SQL Server data
- SQL Trace, which is used to track SQL Server user habits.

(See Server.)

Microsoft Transaction Server A transaction manager. A Microsoft solution for integrating transaction processing in Web applications. Its component architecture includes the:

- Transaction Server Explorer, which is used for administration and management purposes
- Transaction Server Executive, which is a DLL providing functions used by the application's server components.
- ActiveX Server Components, which is used to deploy ActiveX server components
- Server Process, which hosts the application's components
- ODBC Resource Dispenser, which manages database connectivity
- Shared Property Manager, which gives access to a Web application's properties
- Microsoft Distributed Transaction Coordinator, which coordinates transactions, and is integrated in Microsoft SQL Server 6.5

Other transaction managers include CICs and Encina.

(See Server and ACID.)

Microsoft Video for Windows (VfW) A video playback, capture and editing program suite. It includes the VidCap video capture program, VidEdit video editing program, BitEdit 8 bit graphics editor, and PalEdit 8 bit colour palette editor. Compression algorithms such as MPEG, Microsoft RLE (Run Length Encoding) and Microsoft Video 1 help reduce video file sizes by varying amounts. The size and quality of resultant video files can be controlled using compressors through the adjustment of compression settings. Resultant video may be added to applications through OLE (Object Linking and Embedding). It supports the AVI (Audio Video Interleaved) format and features a number of compressors including Microsoft 1, Microsoft RLE and Intel Indeo.

(See Video.)

Microsoft Visual Basic *(See Visual Basic.)*

Microsoft Web Wizard SDK A tool that can be used to create Wizards that may be used to build Web sites using tools like FrontPage and Visual InterDev. Tools created using Design-Time Control SDK may be used with the Web Wizard.

Microsoft Windows An industry standard operating system and graphical user interface (GUI) for the PC. It uses the windows metaphor as a means to contain documents and applications. Up until late 1995, when Windows 95 appeared, its foundation was considered to be Program Manager, a main window that contained program group windows. The group windows

contain selectable icons of related applications. Windows 95 offers a replacement for Program Manager by way of Task bar. By default it underscores all applications, providing buttons to select open applications, and it anchors the all-important start button which invokes the start menu. This bears options that lead to programs as well as to submenus that replace the group windows of Program Manager. Once invoked the menu system can be navigated by dragging the mouse rather than by clicking menu items, and programs are opened through a single mouse click. Application menu systems echo its operation.

(*See Visual Basic.*)

Microsoft Windows CE (Compact Edition.) A version of the Windows OS designed for palmtops, organisers and other small-scale system solutions including those targeting the consumer market. It also supports UPnP.

Microwave radio Short wavelength radio waves that have a frequency above 1,000 MHz or 1 GHz.

Middleware 1. A software implementation or glue that exists between the client and the server. It makes the network protocols and other server workings transparent to the client. Middleware implementations include those based on the OMG's CORBA-based Notification Service that supports push and pull style communications of an asynchronous nature. There is no real-time synchronisation between client (consumer) and server (supplier) applications, rather the client may invoke operations even when a supplier application or complete server is occupied. Both consumers and suppliers invoke operations in the API that includes modules or files written in the CORBA Interface Definition Language that is loosely based on C++. Within the files are defined interfaces, operations (or methods), exceptions, and certain error codes. The key conduit in such implementations is the event channel, and all (*See Glue and Notification Service.*) 2. Database middleware connects client applications with back-end applications, and consists of:

- an application programming interface (API)
- network and database translators.

(*See Glue.*)

MIDI (Musical Instrument Digital Interface) An industry standard file format and specification for producing and playing electronic music using computers and compatible devices such as Midi keyboards and Midi guitar interfaces. It covers hardware, cables, connectors, and data protocols (MIDI messages) and file formats. The single most significant advantage of Midi is the compactness of resultant so-called Midi song files. These consume a fraction of the data capacity required by digitised waveform audio such as .WAV files. A one-hour stereo Midi file may consume around half a MByte.

Even using compression techniques, an equivalent. WAV file would consume literally hundreds of MBytes.

MIME (Multipurpose Internet Mail Extensions) A standard specification which permits e-mail messages to include multimedia elements. It supports:

- Ascii alternatives such as foreign language character sets
- images
- multiple objects
- audio
- video
- postscript.

Included in served files is a MIME code that has a type and subtype, denoting the media included. Types of media such as HTML and GIF may obviously be displayed by any Browser. Others require helper programs, and include MPEG video. MIME was developed by Nathaniel Bernstein of Bellcore, and by Ned Freed of Innosoft.

(See E-mail.)

Mirror site An Internet site that duplicates the functionality of another site. Mirror sites help provide an improved service for users by lowering usage demands on individual sites.

Mirroring A function of hard disk controller that writes data to more than one disk drive simultaneously.

M-JPEG (Motion-Joint Photographics Experts Group) A type of video that uses individual frames compressed according to the JPEG algorithm. It gives full frame updates as opposed to the predominantly partial frame updates of MPEG-1 video. M-JPEG video, therefore, provides random access points and lends itself to non-linear editing. In this respect it is more flexible on playback because applications can simply show any frozen frame of an M-JPEG sequence or play any selected frames of a sequence either backwards or forwards. Another advantage of M-JPEG is that it may be compressed into other formats, including MPEG-1/2. A principal disadvantage of M-JPEG, however, is its comparatively low overall compression ratio.

(See MPEG-1 and MPEG-2.)

MMX Technology A set of extensions (or additional instructions) that gives a processor improved multimedia performance. The Intel Pentium and Pentium II processors have MMX Technology that consists of 57 instructions. The addition of MMX results in dramatic performance gains in video and 3-D graphics. MPEG refused to adopt the whole of Intel's now obsolete DVI (Digital Video Interactive) technology as a video standard, allegedly causing Intel to abandon its initial plans for an Intel processor with built-in DVI functionality.

Intel once announced that it would integrate the functionality of its i750 DVI chipset into a general-purpose processor design. However, the year of 1995 saw Intel unveil its MMX Technology, which is not an acronym, but a trademark. MMX delivers performance gains to multimedia-, graphics- and video-related applications ranging from 3-D animation programs to videoconferencing. The array of multimedia-related standards, such as those of the MPEG continuum and those that have yet to emerge, fit within the open framework that is MMX Technology. This gives ISVs the freedom to adopt current, emerging and even proprietary compression standards. MMX Technology delivers improved matrix manipulation through some 57 new instructions and gives higher levels of concurrency through Single Instruction Multiple Data (SIMD). Fred Pollack, an Intel Fellow (1997), once stated, 'Preliminary tests have shown performance benefits between 50 and 400 percent, depending upon the application.'

(See DCT, MPEG and Pentium.)

Mobile data application An application that is deployed over a mobile network and is accessible using mobile handsets such as WAP, 2.5G and 3G phones and palms.

(See 2G, 2.5G and 3G.)

Mobile network A network that provides wireless communications and access to wireless applications and services. Key mobile networks include GSM (Global System for Mobile Communications), PCN (Personal Communications Network) or DCS-1800, and 3G UMTSs (Universal Mobile Telephone Service). These have displaced the earlier networks like AMPS, and currently account for the vast majority of wireless data and voice traffic. Then, there are mobile satellite networks like Teledesic, Globalstar and Odyssey.

(See 2G, 2.5G and 3G.)

Modal A term used to describe interaction where the user moves between different modes of program operation. The multimedia authoring tool Asymetrix ToolBook is modal, in that the user switches between Read and Design modes.

(See OpenScript and ToolBook.)

Modem (Modulator/demodulator) A hardware device used for modulating and demodulating data normally received and transmitted over voice-grade communications systems. It may be an:

- internal modem that consists of an expansion card that plugs into the expansion bus.
- external modem connects with the serial port of a computer. It typically measures about 15 cm*10 cm*2.5 cm.
- external PCMCIA (Personal Computer Memory Card International Association) modem that is little bigger than a credit card.

A 56.6 Kbps standard analogue modem exceeds the proven bandwidth limit calculated using Shannon's theorem. The higher speed is achieved using PCM, and a digital link between the telephone company and the ISP. 56.6 Kbps modems are asymmetrical, offering wider downstream bandwidths, thus downloading times are shorter than those of uploading. The ITU has attempted to amalgamate the two industry standards:

- X2
- K56flex

The resulting V.90 standard was specified provisionally and finally released in 1998.

(See 56.6 kbps and Shannon's theorem.)

Moderator A person that checks all contributions to newsgroups before posting them.

MOLAP An OLAP implementation that supports Multidimensional Database Management Systems (MDBMS), which may be assumed to use proprietary data storage techniques.

(See Data warehouse, DBMS, OLAP and RDBMS.)

Money laundering An illegal activity that sees money enter an economy without it being declared to Customs, Inland Revenue, IRS or other national tax collecting body. This money is sometimes referred to as the black economy where earnings may be obtained through larceny or through other illegal activities.

(See AML.)

Monitor A display device used with computers, multimedia and digital video playback systems. Desktop systems may be assumed to include CRT (Cathode Ray Tube) displays, but increasingly flat-screen TFT displays are being used. Notebooks and other portable systems may be assumed to integrate LCD (Liquid Crystal Displays), TFT or DSTN display technology. Principal technical factors that dictate a monitor's specification are its:

- screen size
- supported resolutions
- non-interlaced and interlaced screen refresh rates (in the case of CRT-based designs)
- supported number of colours, which is irrelevant with CRT-based designs.

Moore, Gordon A founder of the Intel Corporation.

Morphing An animation technique where one image is evolved into another. Its full name is polymorphic tweening. Numerous commercial morphing programs exist. Using such programs, the first step in the creation

of a morphing animation might involve loading two bitmaps. The animation program can then be used to produce an animation which merges one of the bitmaps into the other. Modern morphing programs for Windows are able to create animations in the .AVI format so providing full compatibility with all fully specified presentation programs and multimedia authoring tools. Morphing animation effects provide a means of enhancing the appeal of many multimedia presentations and applications.

Mosaic A Browser developed at the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign. Distributed under a licensing agreement with Spyglass, Inc. Contains security software licensed from RSA Data Security Inc. Portions of this software are based in part on the work of the Independent JPEG Group. Contains SOCKS client software licensed from Hummingbird Communications Ltd.

Motherboard A principal electronic assembly within a computer. It holds the processor, RAM (Random Access Memory), external memory cache, expansion bus, and any co-processors that might be included. It may also include additional subsystems such as a hard disk controller, video controller and even sound facility. Many designs have old-fashioned ISA (Industry Standard Architecture) expansion slots which are used to connect expansion cards such as hard disk controllers and graphic cards. ISA was introduced by IBM in the 1980s to accompany the Intel 80286 processor which was used in the IBM PC AT. The bus is 16 lines or bits wide and runs at a relatively slow clock speed of below 10 MHz. The ISA bus was not redeveloped by IBM to run faster, instead it introduced the now obsolete MCA (Micro Channel Architecture) bus, a 32-bit variant included in the IBM PS/2 range of systems launched in mid 1987. The PS/2 launch is a milestone in the history of video in the PC environment because it marked the beginning of the VGA (Video Graphics Array) standard through which the PC finally had been given reasonably advanced colour graphics through an analogue port. The MCA bus requires compatible expansion cards whether they be graphics cards, video capture cards, CD-ROM controllers, or hard disk controllers. Such is the inseparability of the terms MCA and PS/2, compatible expansion cards are advertised as PS/2 cards. In the late 1980s, around the same time that MCA was launched, nine major PC manufacturers – referred to as the ‘gang of nine’ – joined forces to develop the EISA (Extended Industry Standard Architecture) bus. A 32 bit bus, several high end PCs use the EISA bus, for which highly specified expansion cards exist. The real key to opening up the expansion bus and tapping into the clock speeds of the processor’s external data bus, however, came through the arrival of so-called local bus slots and ancillaries. Local bus standards emerged in the early 1990s through the VESA (Video and Electronics Standards Association), and so-called VLB (Vesa Local Bus) expansion slots are now common. Usually they accompany ISA slots but may also accompany PCI slots. A VLB graphics card will

offer better performance than a comparable ISA variant, and so widen the PC video bandwidth attainable. An alternative to VLB slots has emerged through Intel's PCI (Peripheral Component Interconnect) bus which offers slightly better performance than VLB. Generally, either local bus standard will suffice in making a system faster and better equipped for video playback, capture and editing. Certain motherboards feature ISA, VLB and PCI slots. To help speed up the processor a so-called memory cache is provided. This can either be internal, forming part of the actual processor, or external where it is included on the motherboard. External cache memory is of a static design and does not require the cyclic refreshment that normal dynamic RAM does. In future it is possible that external memory caches might be replaced by using interleaved system memory composed of static and dynamic RAM.

MOTO (Mail Order/Telephone Order) A transaction that emanates from a card-not-present scenario, and may take place using voice communications or most often using an e-commerce Web site.

Mouse A hand-held input device. By dragging it on a flat surface it provides a means of moving a screen pointer/cursor in both *x* and *y* directions. It is typically connected to the serial port, but may also be wireless. It typically includes two or three push buttons that are used to make selections either by pressing a button once (or single clicking) or by pressing a button twice in succession (or double-clicking). The mouse is also used for dragging (or moving) objects from one point to another, or for resizing windows by dragging their borders. Dragging is carried out by holding down the left mouse button above an object or window border, and then moving the mouse appropriately. Modern notebook systems use mechanism-free touchpads instead of the traditional mouse.

MP3 A compressed stream of digital audio created according to level 3 of the MPEG-1 audio/video specification that dates back to 1990. It is a popular format for distributing audio using the World Wide Web, and numerous MP3 Web sites exist from which such audio may be downloaded free of charge. An MP3 player application such as WinAmp or even a consumer appliance may be used to play resulting files, and they may be recorded or created using an appropriate MP3 recorder. MP3 file quality is determined by the:

- Source recording quality
- Source format (which may be analogue cassette, CD, DAT etc.)
- Source playback device
- Sample rate (which may be 11.025 KHz, 22 KHz or 44.1 KHz.)
- Sample size (which may be 4 bit, 8 bit or 16 bit.)

(See *MPEG*.)

MP3 audio (MPEG level 3 audio) *(See MP3.)*

MPEG-1 (Moving Picture Experts Group Algorithm) An internationally agreed digital video compression standard. It is used widely for local playback, and for streaming multimedia over the Internet, and other IP and multimedia networks. *(See MPEG-2.)* The early days of digital video were plagued by the problem of just how digital video data should be compressed, thus illuminating the need for international standards for the digital storage and retrieval of video data. Sponsored by the then ISO (International Standards Organisation) and CCITT (Commiss  e Consultatif International T  lgraphique et T  lphonique), the Motion Picture Experts Group (MPEG) was given the task of developing a standard coding technique for moving pictures and associated audio. The group was separated into six specialist sub-groups including Video Group, Audio Group, Systems Group, VLSI Group, Subjective Tests Group and DSM (Digital Storage Media) Group. The first phase of MPEG work (MPEG-1) covered DSMs with up to 1.5 Mbits/sec transfer rates, for storage and retrieval, advanced Videotex and Teletext, and telecommunications. The second phase (MPEG2) of work addressed DSMs with up to 10 Mbits/sec transfer rates for digital television broadcasting and telecommunications networks. This phase would cling to the existing CCIR 601 digital video resolution, with audio transfer rates up to 128 Kbits/sec. MPEG1 was finally agreed, developed and announced as long ago as December 1991. MPEG participants included leaders in: computer manufacture (Apple Computer, DEC, IBM, Sun and Commodore); consumer electronics; audio visual equipment manufacture; professional equipment manufacture; telecom equipment manufacture; broadcasting; telecommunications; and VLSI manufacture. University and research establishments also played an important role. It provided a basis for the development of Video CD which was specified publicly by Philips in late 1993. This is an interchangeable format that may be played using both PCs fitted with an appropriate MPEG video cards and compatible CD-ROM drives, as well as Philips CD-I players fitted with Digital Video cartridges. Its development is constant to accommodate the increasing data transfer rates of both DSMs and other video distribution transports. MPEG-1 compression is optimised for DSMs with data transfer rates of up to 1.5 Mbits/sec. MPEG-2 accommodates DSMs and video distribution transports capable of supporting higher data transfer rates of up to 10 Mbits/sec. MPEG-4 video compression is designed to transmit video over standard telephone lines. An MPEG video stream generally consists of three frame types:

- intra
- predicted
- bi-directional.

Central to MPEG encoding is the use of reference or intra (I) frames, which are complete frames and exist intermittently in an MPEG video sequence. The video information sandwiched between intra frames consists of that which does

not exist in the intra frames. Information that is found to exist in the intra frames is discarded or 'lost'. Intra frames can act as key frames when editing or playing MPEG video as they consist of a complete frame. Generally compressed MPEG video is difficult owing to the paucity of authentic access points. However, editable MPEG files do exist, one of which is backed by Microsoft. Additionally, an MPEG video stream composed entirely of I frames lends itself to non-linear editing. The quality of MPEG video depends on a number of factors ranging from the source video recording quality to the use of important MPEG parameters that affect the overall compression ratio achieved. Contrary to popular belief, the logical operations that provide a basis for obtaining high quality MPEG video are by no means the preserve of expensive video production bureaux. Equipped with a reasonably specified PC and a basic understanding of MPEG video, there is nothing to stop you producing good quality White Book-compatible video on your desktop. Probably the most obvious elements that influence MPEG video quality include the analogue or digital source recording, the video source recording format, and the video source device specification. It may be assumed that the higher resolution S-VHS format will provide slightly better results than VHS, but there will not be a dramatic improvement in resolution because the MPEG SIF is standardised at 352-by-288 pixels for PAL. If you are also digitising the sound track of the source video recording, then you will probably obtain the best results with camcorders and VCRs that offer hi-fi quality stereo sound. When capturing a video file so it may eventually be compressed, it is important to choose an appropriate capture frame rate, capture frame size and image depth. The capture frame rate should be set for 25 frames/second for PAL and 30 frames/second for NTSC. Frame rates that differ from these will cause the MPEG video sequence to run at the wrong speed, and it will not be White Book compliant. The capture frame size should correspond with the MPEG-1 SIF which is 352-by-288 pixels for PAL and 352-by-240 pixels for NTSC. Authentic MPEG requires a truecolour image depth of 24 bits per pixel giving a total of over 16.7 millions colours which are generated by combining 256 shades of red, green and blue. The quality of captured audio that is used as an input audio stream obviously depends upon the sample size, recording frequency and whether mono or stereo is chosen. You can assume that your wave audio recorder or video capture program will provide sampling rates of 11 KHz, 22 KHz and 44.1 KHz, and samples sizes of 8 bit and 16 bit. While higher sampling rates and larger sample sizes yield improved audio quality, the resultant audio stream can consume an unacceptably large portion of the available MPEG-1 bandwidth. With regard to careful adjustment of the MPEG compression parameters there is not much you can do if the MPEG encoding software provides no control over them. If it does, then it may be assumed that a greater number of I frames can improve the quality slightly, though this will introduce an overhead in terms of lowering the compression ratio.

(See *MPEG-2*.)

MPEG-2 (Moving Pictures Experts Group) An improved version of MPEG-1 video compression, supported by DVD technology. It was developed for media and networks able to deliver 10 Mbits/second data transfer rates. MPEG-1 was developed for narrow-bandwidth media, such as the original single-speed CD drive variants that offered average data transfer rates of approximately 150 Kbytes/sec or 1.2 Mbts/sec. MPEG-2 video may contain considerably more audio and video information than MPEG-1. The most noticeable improvement is the higher playback screen resolutions that are possible, making possible D1 or CCIR 601 quality. DCT is key to MPEG-2, as it is to MPEG-1 and JPEG (or even M-JPEG). As is the case with MPEG-1, MPEG-2 requires decoding solutions, which may be hardware-based, such as set-top boxes (STBs), or equivalent hardware implementations integrated in computers. Applications of MPEG-2 video include Video-on-demand, multimedia, videoconferencing, etc. It may also be stored and delivered using DVD variants.

Further reading

Information Technology – Generic Coding of Moving Pictures and Associated Audio. ISO/IEC 13818.

(See *D1 and DCT.*)

MPEG frames An MPEG video sequence consists of partial frames in the form of Predicted (P) frames and Bi-directional (B) frames, and full frames or Intra (I) frames. I frames are compressed in a similar way to JPEG (Joint Photographic Experts Group) images and do not rely on image data from other frames. They exist intermittently, perhaps between 9 and 30 frames, and provide non-linear entry points. Increasing the frequency of I frames provides a greater number of valid entry points, but the compression ratio of the overall file diminishes proportionately. Realistically, the compression ratios achieved using MPEG may be assumed to be around 50:1. Higher compression ratios lead to an unacceptable loss of quality, and it is wise to forget that 200:1 ratio which MPEG is supposedly capable of producing. Normally this is achieved through a pretreatment process which dramatically reduces the number of frame pixels. I frames and the following P and B frames are termed Groups of Pictures (GOPs), and the occurrence of each frame might be predefined through the careful adjustment of MPEG parameters prior to encoding. However, this fine level of control over compression parameters may not be provided by low cost MPEG encoding programs.

MPP (Massively Parallel Processing) A computer that has multiple processors that may operate independently and concurrently, as well as interact with one another through interprocess communications. The strict definition of MPP is a system that offers scalability where resulting processor gains

increase in multiples that equate to the processing power of single unit processor. For example, the collective processing power of an MPP system with n processors, should increase by x MIPS per added processor(s). The processors may have their own memory and I/O capabilities, and constitute complete computers, or use shared memory. The processors also exhibit channels of interconnection between other processors. These connections constitute the network, and its bandwidth naturally influences the collective processor power of the system. The network is not to be confused with external, industry standard networks such as IP and Ethernet. An MPP network is internal, with the rationale of optimising system performance by permitting the processors to communicate as quickly as possible. Typical network topologies include ring, two-dimensional mesh, three-dimensional mesh, and hypercube. The resulting MPP interconnection network may be specified in terms of its:

- link bandwidth, or the rate at which data may be sent via a direct link, and is a function of clock speed, and data bus width.
- switching latency that might be defined as the period between a processor data request and the reception of that request. This is a function of clock speed, the network topology, and the physical location of the serving processor in the network; the farther away it is, then the switching latency is extended.

The processing power of an MPP may be measured in:

- millions of floating point operations per second (MFLOPs)
- billions of FLOPs (Giga FLOPs or GFLOPs)
- trillions of FLOPs (Tera FLOPs or TFLOPs) – in future
- millions of instructions per second (MIPs)
- SPECmarks.

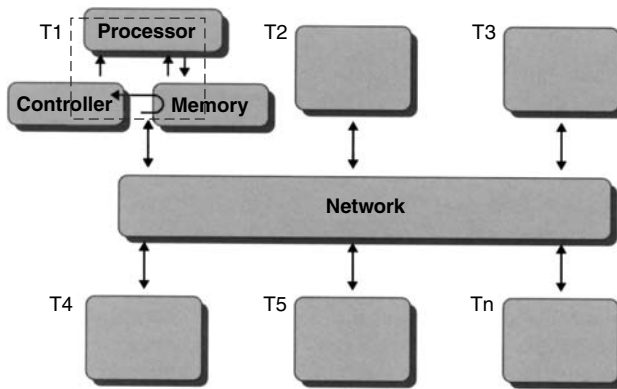
The optimum processing yield depends on distributing processes evenly across the processor array, matrix or network. Program algorithms may perform this function of *dynamic load balancing* that is carried out in real time. A common denominator in current networks, is that not all processors are connected directly. MPP architectures are divided between:

- Multiple Instruction Multiple Data (MIMD)
- Single Instruction Multiple Data (SIMD).

MIMD architectures feature memory which may be:

- distributed
- or shared.

The SIMD architecture has a single controller driving multiple slave processors, each with independent storage. The distributed memory DM MIMD architecture has a multiplicity of such processors, and controllers, too. An MPP architecture variant may be explained in terms of its electronic storage, controller(s) and



MPP DM-MIMD architecture

processor(s). Leading MPP manufacturers include Cray, Thinking Machines, Intel and nCube.

Concurrent programming languages include Occam which has its origins in Inmos (UK) where it was developed as part of the Transputer parallel processor. Java is the first mainstream programming language that supports the parallel programming model. Languages that are optimised for parallel processing systems offer authentic concurrency. One of the earliest transputer-based supercomputers was developed by Meiko though the Computing Surface. This was used in the development of DVI, and modern transputer-based implementations are used as Video-on-demand servers. Among the advantages of such parallel processing systems is scalability, where, for example, growing numbers of subscribers to a Vod service may be accommodated through additional processors, and even complete servers.

(See NUMA, SMP and Transputer.)

MReply An e-mail autoresponder, with added features including the ability to send multiple messages to recipients on a mailing list.

MRO (Maintenance, repair and operations.) The supply of products and services used in the upkeep of plant, buildings and other assets. It is estimated that MRO requires 7% of an enterprise's expenditure and equates to:

- 60–90% of purchased items
- 65% of accounts payable and invoice matching
- 80% of purchase orders
- 90% of shipping and receiving functions.

MSDN (Microsoft Developer Network) A Web site targeting developers using Microsoft tools and technologies. Hyperlinks to the site are also included on hybrid CD-ROM discs included with the Microsoft Visual Studio.

(See www.msdn.com.)

MSN (Microsoft Network) A superset of the Web, providing additional services. Its four main category headings are:

- Communicate
- Essentials
- OnStage
- Find.

MTBF (Mean time between failures) An average period time that indicates the frequency at which a device, component, subsystem or complete system will fail.

(See MTTR and Reliability.)

MTTR (Mean time to Restore) An average period required to return a failed system to its fully operational state.

(See MTBF and Reliability.)

Multi field key *(See Key field.)*

Multi-cast A packet that is addressed to multiple addresses/recipients.

Multi-homing A server with more than one address. For example, one address may be used to connect with hosts within a firewall, and another may be used to connect with hosts outside a firewall.

(See Firewall.)

Multimedia A broad term which may be applied to a system or process which embodies and combines various different media. Modern (digital) multimedia may comprise computer animations, text, still images, digital audio, synthesised sound, digital video and interactivity. Combining still and moving images, sound, audio, text and interactivity, multimedia has initially culminated in a re-evaluation media. Unlike linear, non-interactive media such as broadcast television, it provides users with a choice of numerous meaningful paths. The underlying technology has spawned offshoots, of which the most notable will be video-telecommunications and videoconferencing. Distribution media disc-based multimedia include Compact Disc – Read Only Memory (CD-ROM) and. Earlier, and less known, distribution media include Compact Disc Interactive (CDI), and CD-ROM XA (Extended Architecture) discs. The 12 cm-diameter CD-ROM and CD-I discs typically support up to about 660 Mbytes data storage capacity. A single-sided, single-layer DVD-ROM disc supports 4.7 Gbytes, and supports MPEG-2 video playback. Increasingly, however, multimedia networks are being used, and the most significant of these is the ubiquitous Internet.

(See Hypertext and Web.)

Multimedia authoring tool A software tool intended for the development of multimedia. Many require no programming skills.

(See *Authorware and ToolBook*.)

Multimedia development team A team given the task of designing and developing a multimedia application. It may consist of experts in all disciplines required to generate the multimedia title, including:

- producer/director, to enforce an appropriate degree of creative control and oversee amalgamation of media types
- project manager, to ensure budget and schedule are observed and adhered to
- high-level language programmers, to design retrieval system, or to write other routines
- multimedia author, to implement interactive design
- content provider/advisor who possesses expertise in the material/information to be communicated
- associate producer
- project planner
- interface designer
- animation director
- writer
- art director
- lead programmer
- quality Assurance (QA) manager
- sound designer
- audio visual (A-V) designer
- 3-D modeler
- video editor
- graphic designers/computer graphics artists, to produce original artwork
- sound engineers for recording etc.
- studio technician(s)
- various production staff
- Web site/Internet developer(s).

How many of the aforementioned experts should be included, depends upon the complexity of the material and upon what percentage, if any, of the production process is contracted out.

Multimedia presentation A multi-media based presentation that might combine audio, midi, video, text, animations and graphics. It might be presented on a desktop or even notebook computer using their attached displays, or it might be presented using an LCD projector. The most popular multimedia presentation program is Microsoft PowerPoint, included with Microsoft Office. Multimedia authoring tools such as ToolBook, IconAuthor and Authorware may also be used, but these are not dedicated to the production of presentations.

Authoring an interactive multimedia presentation When creating a multimedia presentation the aim of the author is to communicate information as effectively as possible. The media types required to do this depend upon the intended audience. It is true to say that a presentation to customers in a bank may be more effective if interesting animations, video and sound tracks are included. A multimedia presentation to financiers and investors, on the other hand, may require a greater proportion of text and charts giving factual information. However, it could be argued that multimedia with video, animations and effects is a persuasive medium, irrespective of the audience. You must have heard or read that over used statement that people remember 10% of what they read, 20% of what they hear, 30% of what they see and 70% of what they see and hear. There is disagreement generally about the factual accuracy of this much repeated statement, although that people do, in fact, remember a great deal more that they see and hear is agreed widely. Your job as a multimedia author is to create a presentation that will be memorable for the right reasons, and leave the audience with a clear understanding of the information you are conveying. But you have to be subtle; you cannot hammer home important points by repeating salient points over and over. Remember you are not briefing a platoon or detachment of soldiers for an important mission. Do not author a presentation that is an obvious attempt to brainwash people. Equally do not fall for that elementary error of turning up the volume too high. Ear piercing wave audio or Midi music is unlikely to have the desired effect. And be sure not to arrange loud speakers so as to be right next to certain people in the audience. Keep all loud speakers at least five metres away from members of the audience. This raises the matter of seating arrangements. Ensure that you leave the name of each member of your audience in an appropriate seating position. For example, important members should be seated more centrally, and closer forward, so they have a direct view of the screen and yourself, and where they may benefit from a good stereophonic and perhaps surround sound effect. Less important members should be seated at the periphery of the room or auditorium. Returning to the content of the actual presentation, it is important to create an appropriate blend of media types. Achieving the right balance should not be too difficult if you simply bear in mind that too much of any one may cloud the messages and information you are trying to put across. The opposite to over working certain media types can also have a negative effect. A dull presentation without animation, video, or interesting music might bore people and leave them desperate to leave, making the whole presentation an instantly forgettable experience.

Text in presentations Almost all Windows presentation programs use TrueType fonts. There are a wide variety of these available and you can normally buy inexpensive collections of them. Choosing appropriate fonts to use in your presentation does not require the expertise of print designer, but simple common sense – in most instances. Basically the fonts you choose should be legible and suit the nature of the presentation. Straightforward legibility is obtained by choosing the correct font and point size. Fonts that resemble ornate writing styles with fancy serifs should be avoided; although you may find that you can get away with using them for the first letter of a word, or as a drop capital. Generally fonts with a symmetrical geometric appearance are more legible than others. Particularly good examples include families of Arial, Helvetica, Futura or Futurist. With regard to type styles used, you might find it useful to bolden or italicise certain portions of text purely to highlight salient

points. Although take care with italics as this can reduce legibility. In terms of the suitability of the fonts used, common sense should tell you which ones to use. For example, a traditional Times Roman is a font with credibility and should be used perhaps for more formal presentations possibly to an audience of investors, or board members. Generally you can mix different fonts on the same screen, but do bear in mind that there are limits – if you are conventional that is. If you are unconventional, you can mix as many fonts as you please, though we are not recommending that you do this. Text foreground and background colours are also important and should be chosen in terms of the suitability. A closer investigation into colour will indicate the reactions that different colours evoke in people. However, once again common sense may play an important role with your choice of colours.

Graphics The numerous different methods of obtaining digital images include:

- scanning photographs and illustrations
- using a digital camera
- using a stills video camera
- using a video frame grabber
- using photographs processed onto Photo CD
- using royalty free collections of clip art and clip photos
- drawing them using a graphics program
- capturing a frame from a captured video sequence
- capturing charts from databases, spreadsheets and graphing programs
- photographic library.

The graphics you include may function simply to improve the look of your presentation, or to perform a function like a chart to illustrate sales figures or whatever. With regard to using photographic images these should be relevant and not included simply because you found a good one in a royalty free collection that vaguely relates to the subject of your presentation. The cheapest method of obtaining original photographs is to use Photo CD, although how good an image you achieve rather depends upon how good a photographer you are, as well as on camera quality. A compact camera will not going to give the same results as a professional medium format camera like a Hasselblad. If you require a good quality photograph and your budget does not run to hiring a professional photographer consider hiring an automated medium format camera – this will give excellent results and will be almost as easy to use as an automatic 35 mm camera.

Graphics in presentations Graphics files come in numerous different formats including PCX, Compuserve GIF, Windows BMP and so. Some of these are more efficient than others, offering a more compact means of storing pictures. Perhaps the best known image file format for storing compressed still images is JPEG (Joint Photographics and Experts Group). Which image file formats you use may depend upon the graphic import filters in you presentation program. For example if it won't import JPEG files then you will have to work in another file format. Although numerous software programs are available that convert image file formats, including the shareware program PaintShop Pro, and the conventionally marketed program HiJaak Pro. Ideally you should choose an image file format that requires comparatively small file sizes, and short loading times. The image depth you choose can be a

function of your presentation platform which must have the appropriate graphics card. Many authors find an image depth of 8-bit per pixel and resultant 256-colour graphic images perfectly acceptable. Which image depth used can also depend on the graphics themselves; if they are cartoon-like images, then there may be little point in opting for an image depth greater than 8 bits. Photographic images on the other hand are different, and to obtain realistic images you may need 16-bit 65 K colour images, or even 24-bit 16.7 million colour images. Needless to say file sizes grow in proportion to the image depth chosen; a 16-bit file of an image will be twice the size of the same image stored with an 8-bit depth. When including a number of different images in a presentation, you may have to create a common optimum palette using the presentation program itself or another graphics program. This is to avoid any problems you might encounter with palette switching.

Sound choice Sound in the form of dialogue, music and effects can mean the difference between a good and bad presentation. Music is not to be underestimated; its mood changing characteristics can be persuasive with even the hardest business people. The sound you include may take the form of Midi songs, wave audio, or CD audio. The advantages and disadvantages of these have been discussed previously, but we shall run through the basics once again. Wave audio is ideal for recording dialogue. Its technical quality is important, and 8-bit wave audio recorded at a low sampling rate will be inferior to 16-bit CD-quality audio recorded at 44.1 KHz. Although the quality of script and spoken voice are not to be overlooked either. Midi is useful for music only. The single most significant advantage of Midi is the compactness of resultant so-called Midi song files. These consume a fraction of the data capacity required by digitised waveform audio such as WAV files. However, the WAV file representation is authentic, it is not composed from a rigidly defined set of sounds as you would find in Midi files. For example, a Midi representation of a recital of Beethoven's Ninth Symphony would be basic and understandably synthetic, though sound cards that use actual samples of musical instruments are a great improvement those that use synthesiser chips only. A wave file on the other hand could be used to record the actual performance of, say, the London Philharmonic playing Beethoven's Ninth. Using 16-bit samples at a rate of 44.1 KHz a wave file can produce a CD quality recording. However, and it's a significant 'however', Midi files can be edited using various Midi applications. Also, you can speed up or slow down Midi files to sync them with animations. For many multimedia authors, the process of composing a Midi sequence is something best left to Midi professionals. Midi song producers will compose original sound tracks to suit your multimedia title or presentation. Though this approach will lead to professional quality Midi songs, the cost can be high. And it is hardly something you would do if authoring an in-house multimedia title. A cheaper alternative is provided by collections of clip music Midi files that are in the public domain and can be used without payment of royalties to their owners. The many companies that produce collections of such clip music include large companies like Voyetra and Twelve Tone Systems. There are many other companies that produce clip-music collections. Check with computer magazines such as Windows Sources (McGraw-Hill) and with CD-ROM dealers for information about clip music. CD audio may be used if you find an interesting royalty free clip music track. Using many presentation programs you can play CD tracks or even a section of a track using MCI commands. There are numerous other

media devices that can be controlled using MCI commands. Such MCI compatible devices may well provide an alternative to using CD.

Animations and effects Produced correctly animations and effects can make a presentation a little more interesting. The animations can be aesthetic or functional perhaps adding motion to a graph or chart. Popular programs that allow you to generate animation include Autodesk Animator and 3D Studio. Resultant .FLI or .FLC can be imported into most presentation programs and if you have Video for Windows you can convert them into the .AVI format. Actually producing an animation can be time-consuming, depending upon the type of animation you want. Bear in mind that in most cities you will find animation production companies, though you will need an appropriate budget to cover the cost of such production.

Video Easily the most persuasive of all the multimedia types, video can transform a presentation into an infinitely more engaging communication medium. Although PMPSV might be inadequate for some presentations. You may prefer to use FMFSV such as MPEG-1 and MPEG-2 video.

(*See MPEG.*)

Video in presentations Often video is stored on hard disk usually in the .AVI format. .AVI files can be created using Video for Windows together with an appropriate video capture board. All full-featured modern PC multimedia presentation programs can integrate .AVI files. Storing video in this manner can make presenting your multimedia production easier because there is need for nothing more than an MPC2 for playback. (*See MPEG.*) Video quality is a function of the:

- Compression techniques, where MPEG-2 can be assumed to deliver the best results
- quality of analogue/digital video source
- quality of analogue/digital video source device
- video capture board used
- graphics card used in the presentation platform
- video capture technique used: step-frame capture can result in better video quality than real-time video capture
- hard disk speed
- depth of video data
- processor speed
- size of external cache

The second method is to use something like an MCI compatible videodisc player and a video overlay card.

The script The script you write should convey all the messages you want to put across. A good approach is to begin by writing down the text you wish to display in each frame of your presentation. Remember if your audience is to read the text it must be displayed using an appropriate font size. Although it probably goes without saying that you should reinforce the text messages by repeating them verbally. Again this can be done by you or the presenter, or using recorded wave audio. The script you write is the gateway to completing your complete presentation. It will provide you with ideas as to where and when various different media types need to be

included. More important, it provides the general sequence of events and gives you the basis for a storyboard. Say, for example, we wanted to create a presentation advertising a special price holiday package to Australia that you might want to target members of the public. It is a holiday package aimed at young professionals in the 18–30 age group. Because of this it needs to be up market while including features that may turn on young people. These features might include pop music of various sorts, lots of synthesiser sounds, a punchy dialogue, and interesting video and animations. The script might look something like this, where the bold text is the actual text that will appear in each frame of the presentation and the remaining text is dialogue recorded in the form of 16-bit wave audio which, if appropriate, can be distributed among your audience as hand-out notes.

(See Multimedia.)

Multimedia producer An individual given the task of captaining the production of multimedia applications/titles. Typically he/she will:

- liaise with investors, if he/she is not the sole investor in the project
- often have control over the hiring of personnel, ranging from directors to programmers and multimedia production staff that might include camera operators and even sound engineers
- be responsible for optimising the application of a given budget
- be responsible for originating marketable project ideas
- understand the technical issues that control the quality of a multimedia application
- direct personnel effectively, perhaps toward the use of contracted services and sources of multimedia or Web content
- receive praise or criticism for the complete project.

Multimedia production A process of gathering media files for inclusion in a multimedia application. Multimedia production embodies the implementation of all tasks necessary to attain (in appropriate format) audio and visual materials required. The following components are typical of the production process. The end result should be a collection of usable digital files that may be included in an application. It may involve the following processes:

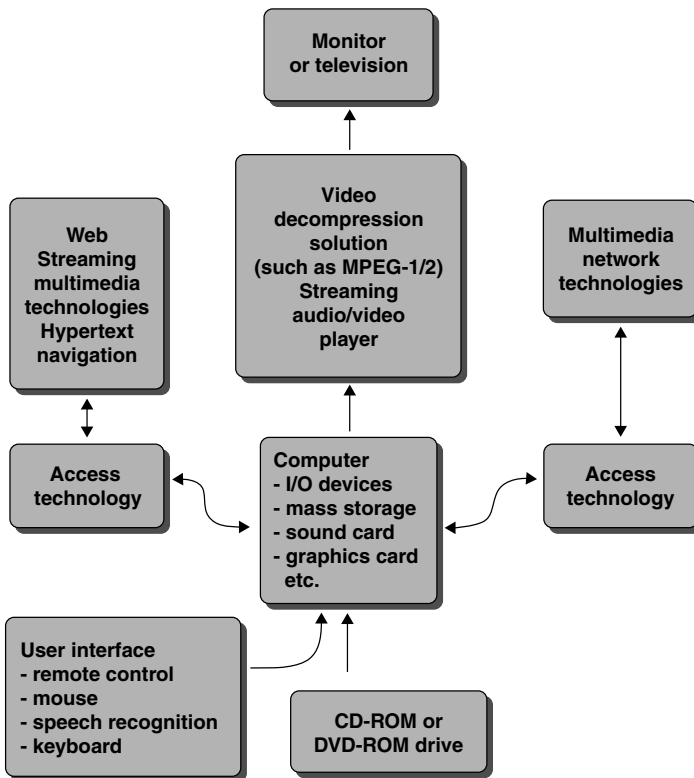
- Capturing video using an appropriate video capture program and capture card.
- Editing digital video using a video editing program such as Adobe Premier or Microsoft VidEdit supplied with Microsoft Video for Windows.
- Editing 8 bit video/graphics colour using a palette editor.
- Compressing video according to preselected parameters that are appropriate to the bandwidth of the target platform.
- Recording digital wave audio using a sound card/sound feature together with wave audio recording software.
- Editing wave audio files.
- Compressing wave audio files.

- Obtaining still images by scanning, using a still video camera, or using Photo CD.
- Compressing graphics files and/or converting them into the appropriate file formats.
- Digitising text using a scanner.
- Marking up text files using a language such as HTML (HyperText Markup Language).
- Creating Web pages.
- Creating Java applets.

(See *ActiveX, Multimedia, Multimedia authoring, OOP, Java, JScript, Visual Basic, VBScript.*)

Multimedia streaming A real-time delivery and playback of multimedia that may be local or remote. Typically, it takes place over the Web or Internet, and requires a server and client. Web applications include real-time monitoring or surveillance of remote locations, WebTV and video playback.

(See *ASF, Multimedia, Streaming and Video.*)



Multimedia system/appliance

Multimedia system/appliance A device capable of playing multimedia titles. Examples include MPC-3, DVD-ROM-based PCs and Apple Macintosh computers. A multimedia appliance includes:

- a modem and Web browser.
- an interface to access technology such as 2.5G or 3G mobile network.
- an operating system such as Windows CE, PalmOS, Windows 95/NT, Modular Windows, OS/2, or Mac OS.
- a CD drive variant such as CD-ROM or DVD-ROM drive
- a sound synthesiser able to play and record wave audio with a sampling rate of 44.1 KHz.
- a stereo amplifier with accompanying speakers, or self-powered speakers, or simply a pair of headphones.
- a video decoder.

(See MPC-3.)

Multiple Inheritance A concept where subclasses inherit methods and data from more than one superclass. It defines a class of object, which inherits attributes and behaviour from multiple superclasses.

(See C++, *Inheritance and OOP*.)

Multiplexing 1. A process by which an MPEG video stream is mixed with an MPEG audio stream to form an MPEG system stream. (*See MPEG and Video capture*.) 2. A process by which multiple signals may be communicated along a single transmission path that may be serial or parallel. The Integrated Services Digital Network (ISDN) standard uses multiplexing involves creating a data stream consisting of 8 bit PCM blocks. The blocks are created every 125 micro seconds. By interleaving the blocks with those from other encoders, the result is time division multiplexing (TDM). In North America, ISDN typically interleaves data from 24 64 Kbits/sec sources or channels. This results in connections that provide 1.536 Mbits/sec. Although in actual fact the connection has a bandwidth of 1.544 Mbits/sec, because each channel's frame has a marker bit 'F', adding 8 Kbytes/sec. Europe sees ISDN that typically interleave 30 64 Kbits/sec channels, giving 2.048 Mbits/sec. This and the 1.544 Mbits/sec connection are known as primary rate multiplexes. Further interleaving of primary rate multiplexes sees:

- 6, 45, 274 Mbits/sec in North America
- 8, 34, 139, and 560 Mbits/sec in Europe.


PCM was conceived in 1937 by Alec Reeves, but was not applied widely for many years.

Multisync monitor A monitor that may synchronise itself with various incoming signals. There are many technical implementations of the 'multisync monitor', the simplest of which will automatically synchronise with perhaps

two or three vertical frequencies. The term multisync was coined by NEC that it registered. Professional versions are able to automatically synchronise with a range of horizontal and vertical frequencies. This is called the scanning range, and the greater it is, the greater the number of acceptable signal sources. Yet higher specification monitors economise on scan range, thus concentrating on the narrow band of professional graphic controllers beginning with VGA. Such monitors may be considered non-proprietary.

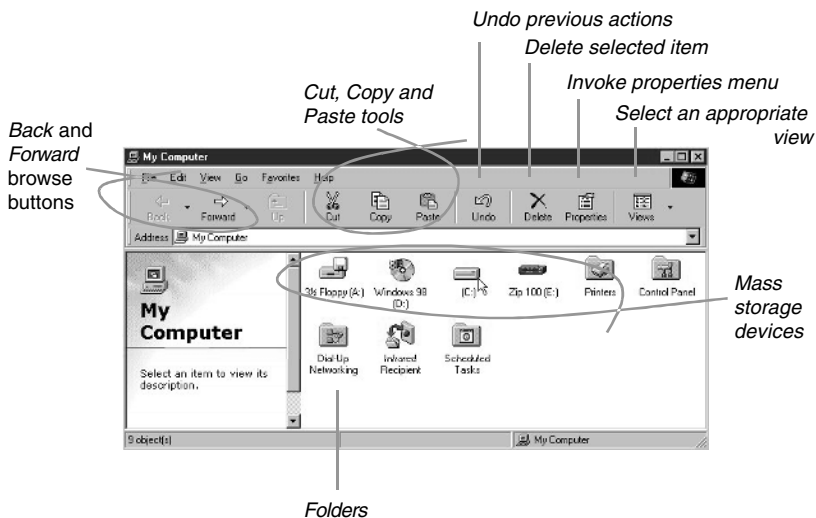
Multi-tasking A concurrent execution of multiple processes.

Multi-threading A process by which multiple processes within the same application are executed concurrently, or what is perceived to be concurrently.

My Computer An icon/feature on the Windows Desktop that provides access to practically the whole feature array of Windows 98/2000. It may be considered as the highest level window, in a hierarchical context. Double-clicking the My Computer icon  results in the My Computer window

that may be used to:

- open important folders such as the Control Panel
- generally access features
- browse, and work with files on mass storage devices that are fixed or removable.



(See Windows.)

N

Nanosecond A billionth of a metre.

NAPSTER A on-line audio file resource.

NC (Network Computer) A computer designed for connection to the Internet or to an IP network. The subsequent rationalisation of hardware results in low system costs, and reduced costs of ownership. Base case NCs are not fully specified standalone, multimedia devices. They do, however, offer streaming multimedia functionality that plug-ins and ActiveX controls may provide to the client.

NCSA Mosaic A Browser that was developed at the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign, and is distributed under a licensing agreement with Spyglass, Inc. It contains security software licensed from RSA Data Security Inc. Portions of this software are based in part on the work of the Independent JPEG Group. It also contains SOCKS client software licensed from Hummingbird Communications Ltd.

NDIS (Network Driver Interface Specification) A standard specification for network interface cards (NICs). It provides functions collectively referred to as a wrapper that may be used by TCP/IP protocol drivers. It was developed by Microsoft and 3-COM. Its implementations for Windows may be assumed to be proprietary.

(See NIC.)

Nelson, Theodore The inventor of the term hypertext, and a dedicated hypertext evangelist. He also began project Xanadu that echoed the functionality of the Web.

(See Hypertext and Xanadu.)

Nested 1. Nested transaction: a technique that sees the integration of sub-transactions within transactions. The subtransactions are said to be nested. (*See Transaction and Server.*) 2. Nest loop: a loop in a computer program that is encapsulated within another. (*See Java.*)

Nested top-level class A static member of an enclosing top-level class.

Net An alternative shorthand name for the Internet or The Net.
(*See Internet and Web.*)

Netiquette A form of etiquette that addresses the Internet. It is a set of rules that may called ‘acceptable use policies’ (AUP).

Netizen 1. A person that uses the Internet as an interface with society.
2. An active user engaged in Internet growth.

NetMeeting A Microsoft technology that permits a multiplicity of communication and information exchange types over the Internet and over compatible IP networks such as intranets. The communications types supported include:

- Internet telephony
- Whiteboards
- Application sharing
- File transfer
- Chat
- Multiple participant conferences.

(*See IRC, Whiteboard and Videoconferencing.*)

NetMeeting SDK (Software Development Kit) An software suite that can be used to integrate conferencing features into applications.
(*See API.*)

NetPC A PC specification designed for network systems.
(*See NC.*)

Netscape A company founded by Marc Andreesson, who developed its initial flagship product, the Netscape Navigator Web browser. The company continues to produce Internet software for users and for developers, including the Netscape Communicator.
(*See Netscape Communicator and Netscape Navigator.*)

Netscape Navigator A Web browser produced by Netscape. Its functionality is improved through the addition of plug-ins. Plug-ins for streaming audio

and video are available. Like many other browsers, Navigator may be used to send email messages, but it is not an email application. A bookmarks window assists users to list and revisit Web sites that are of interest. Images that are shown in the client area may be saved to disk by right-clicking on them.

(*See Browser and Web.*)

Netware A network operating system (NOS).

Network 1. A physical or wireless entity that unites computer systems. (*See Client/server, Internet, LAN and Web.*) 2. A physical entity which interconnects processors in an MPP. (*See MPP.*) 3. A interconnecting scheme for neural networks. (*See Neural network.*) 4. A collection of hosts, servers and user systems that are interconnected. (*See LAN.*)

Network computing A broad term denoting the use of systems that are connected to physical networks.

(*See Internet, LAN and NC.*)

Network interface card An device used to connect a system to a network. It may be one (or even more) of a number of standard and proprietary variants, including:

- Ethernet
- Token Ring
- ISDN interface
- Fibre channel interface (arbitrated loop)
- Modem (such as an analogue or cable variant).

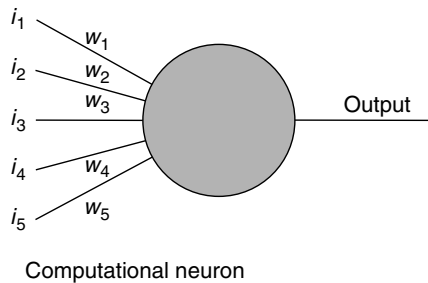
(*See Ethernet and Fibre channel.*)

The Network Is The Computer. A much-publicised vision of Sun Microsystems Inc. that was formed in 1982.

Neural net A network of neurons, which function as processing units. Part of the field of *artificial intelligence* (AI), their implementation is an attempt to reconstruct the operation of the human brain, which has some ten thousand million neurons. The neuron connections have weights, which determine network behaviour. Given an example, the weights may be learned. Neural network variants include the:

- perceptron.
- multilayer perceptron.

The perceptron neuron was proposed in 1962 by Frank Rosenblatt, a significant figure in the development of synthetic neural networks. A computational neuron has input connections, each of which may have a different weight.



The neuron is preprogrammed with a threshold value, which if equaled or exceeded by the total weight of inputs, will respond accordingly. Typically the response is to output a specific value. They differ from multiple input logic gates (such as AND, NAND, OR or NOR) in that the inputs may not be one of two logical values. The inputs i are assigned the weights w , and a positive output is yielded should a predefined threshold t be exceeded:

```

if  $i_1w_1 + i_2w_2 + i_3w_3 \dots + i_nw_n > t$ ,
  then output =1
  else
  output =0

```

Further reading

Cawsey, Alison. *The Essence of Artificial Intelligence*, Prentice Hall, 1998
(See *KBS*.)

Newsgroup A discussion forum concept where participants post messages on what is essentially a bulletin board.

NFS (Network File System) An NFS server allows users to share files on other hosts.

NIC (Network Interface Card)

NN (See *Neural Net*.)

NNTP (Network News Transfer Protocol) A protocol for transferring Usenet news between servers, clients and a central server.
(See *Usenet*.)

Non-interlaced A mode of CRT-based monitor/display operation in which the screen image is generated by scanning all lines in a single scan field. The rate at which all lines are scanned is termed the refresh rate or the vertical scan rate. The frequency that lines are scanned is termed the horizontal frequency.

Non-linear medium A medium whose sequence may be controlled by the user or viewer; interactive television and the Web are non-linear media.

Non-preemptive multitasking A type of multitasking in which the operating system does not interrupt applications. It is less seamless than preemptive multitasking in that a reasonable degree of concurrency is not achieved. Windows 3.1 (and earlier) and Windows for Workgroups 3.1x offer non-preemptive multi-tasking.

Notebook A portable computer with a footprint about the size of an A4 page. A sub-notebook is slightly smaller.

Notification Services An extension to the OMG Event Service that defines interfaces and operations for transmitting events between client and server applications.

(See *CORBA Notification Service*.)

Novell A corporation which markets and sells Internetworking products. Its flagship product is Netware.

(See *Novell Netware*.)

Novell Netware A network operating system that is optimised for serving information to a large number of users. It caches data read from servers in RAM.

NS message (Notification Services) (See *CORBA-based Notification Service (NS)*)

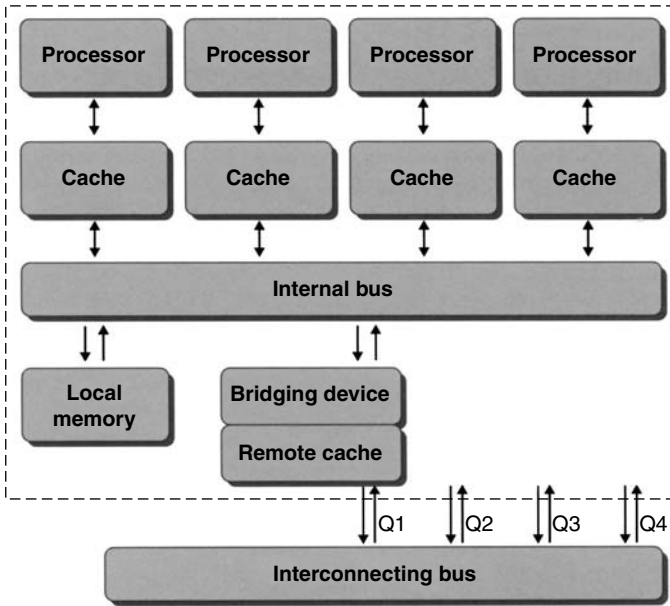
NT (New Technology) A 32 bit version of Windows that features an extra layer to prevent general protection faults and unrecoverable application errors.

***n*-tier client/server architecture** A client/server architecture that sees multiple divisions of application logic and data. The divisions are distributed across four or more systems, which represents the number of tiers (*n*).

(See *Application and Client/server*.)

NUMA (Non-Uniform Memory Architecture) A variation of the SMP system architecture that attempts to solve the bottleneck of using a single shared bus to interconnect processors. Instead a number of internal buses are introduced, thus promoting processor scalability. NUMA systems have modules called quads, which include processors, memory and I/O devices that share an internal bus. Quads interconnect via a main bus. The NUMA architecture permits processors to access:

- local and external caches
- local and external memory.



NUMA 'Quad-based architecture'

Its non-uniform characteristic hinges on the varying access time, between local and remote memory access. Though NUMA is architecturally superior to SMP, it is not classifiable as an MPP system.

(See MPP and SMP.)

NYSE (New York Stock Exchange) The US stock exchange.

O

Oak An original name for the Java programming language that was developed largely under the Green project that commenced in December 1990 at Sun Microsystems.

(See Java.)

OBI Open Buying on the Internet. A protocol aimed at the standardisation of e-commerce on the Internet.

Object An object is an entity in a running OO program, which provides a link between data and methods that read and operate on that data. An object is stimulated by messages that are sent to it, and its responses to messages are defined by its repertoire of methods.

(See Object, Objective-C, Java, C++, C#, Message and .NET.)

Object-based *(See OOP, C++ and Java.)*

Object factory Not to be confused with ‘factory object’, an object factory is sometimes used to describe software publishers that offer objects such as ActiveX controls, Java applets, JavaBeans, Plug-ins, or OLE objects. *(See ActiveX, OLE, Java and Plug-in.)*

Object implementation A coded solution that dictates an object’s behaviour and response to events. The code represents the object’s methods.

(See OOP.)

Object interface An object’s outer layer that intercepts messages, and directs them appropriately. The layer is sometimes referred to as a shell. It is the first entity which an inbound message meets. The message may then be processed internally by the object’s methods.

(See Object and OO.)

Objective-C An authentic object-oriented programming language that is based on ANSI C, and adds constructs for classes, messages and inheritance. The language supports polymorphism and dynamic binding where the runtime system determines what code is executed based on an object type. Objective-C is intuitive for C programmers and for OOP programmers using Java. It executes faster than Java because it is compiled like C, and the Objective-C OO extensions are compiled to C calls to the Objective-C runtime library (libobjc). Objective-C programs have the main function:

```
#include <stdio.h>
int main (void)
{
    printf ("Hello my friend\n");
    return 0;
}
```

The example is also a C program as it holds none of the Objective-C constructs.

Objective-C messages An object responds to messages that stimulate objects to respond in some way. Using Objective-C, a message is sent to an object (or receiver) using the expression:

```
[receiver message_name];
```

- receiver is the object
- message_name is the message or method name that is to be invoked – and may be referred to as a method selector.

To invoke the display method of the mySquare object:

```
[mySquare display];
```

Labels describing arguments precede colons:

```
[myRect setWidth:20.0 height:22.0];
```

Messages with a variable number of arguments:

```
[receiver makeList:list,argOne,argTwo,argThree];
```

Object-oriented (*See OOP, C++ and Java.*)

Object-Oriented Database Management System (*See OODBMC.*)

Object-oriented language (*See OOP, C++ and Java.*)

Object-oriented programming (*See OOP, C++ and Java.*)

Object-oriented programming language *(See OOP, C++ and Java.)*

Object-oriented UI *(See OOUI.)*

Object schema A structure that defines the interactions and relationship of objects in an OO system.

(See OO.)

Object scraping A method of mapping data from a server to objects. The objects are used to perform transactions or other types of processing. It may be applied in an application renovation solution.

(See Application renovation and Screen scraping.)

OCR A program that converts scanned text into text files.

OCX A control or object that was a forerunner to ActiveX. OCX controls can be integrated into compatible applications, yielding functionality gains that may take the form of complete applications such as grammar checkers. OCX controls can be written using Visual C++.

(See C++ and ActiveX.)

ODBC (Open Database Connectivity) An internationally agreed standard, covering database connectivity. Most modern databases offer ODBC compliance.

(See DBMS.)

ODBC 3.0 SDK A set of tools, libraries and headers that can be used to integrate ODBC 3.0 connectivity access in Web sites.

(See Data warehouse and ODBC.)

OLAP (On-Line Analytical Processing) A data analysis technique used predominantly in the client/server computing environment. It is a decision-making support technique that can be applied to interrogate data from disparate sources. Resulting data may also be analysed. OLAP implementations may be assumed to embody multidimensional data analysis techniques, and integrate:

- an OLAP GUI for user communication
- OLAP analytical processing logic
- OLAP data processing logic.

OLAP empowers users to generate query data in order to answer complex questions based on what-if scenarios, or on current and historical data. It is an advancement of the primitive querying techniques harnessed in RDBMS designs. These include Borland (now Inprise) QBE, and even query languages such as the industry standard SQL.

(See Data warehouse, MOLAP and ROLAP.)

OLE (Object Linking and Embedding) An object architecture. It is a method by which one application may be linked with, or embedded into another. An OLE server application is the underlying source of an OLE client application. Objects may be video, wave audio, speech synthesis, Midi files, graphics or text. The objects may be shown in the client OLE document or application as an icon, and may be launched by double clicking that icon. OLE can be used to embed Windows Media Player into client applications so as to add voice or video annotations to documents. Using OLE1 compliant applications the process of embedding an object is more intensive than that associated with OLE2 applications. Object embedding is made easier using OLE2 compliant applications, because objects can simply be dragged from one application to another. An increasing number of Window applications are OLE2 compliant.

(See *ActiveX*.)

OLE client (Object Linking and Embedding client) An application which has an embedded object or application from an OLE server application.

(See *Object and Visual Basic*.)

OLE DB SDK A Microsoft database access specification that bases itself on OLE and COM object architectures. It complies with SQL and non-SQL databases.

(See *Database, ODBC and ODBC 3.0 SDK*.)

OLE server (Object Linking and Embedding server) An application which provides an object for an OLE client application, providing a means of running that object from within the client application.

(See *Object and Visual Basic*.)

OMG (Object Management Group) (See *www.omg.com*.)

OMG Notification Service (NS) An extension to the OMG Event Service that defines interfaces and operations for transmitting events between client and server applications. In OMG terminology such connected entities are termed consumers and suppliers, and in some NS implementations the terms are interchangeable with consumers/receivers and publishers. The OMG NS is a defacto industry standard messaging architecture, and a mainstay for many client/server implementations which adhere to the push and pull models as a means of driving information-on-demand. It enhances the OMG Event Service by allowing:

- clients to specify received events by filtering proxies in a channel
- event transmission in the form of structured data types, adding to the Anys and Typed-events of the OMG Event Service

- defined operations (or methods) to provide out parameters to suppliers, thus informing them of event types required by consumers on a channel, and providing information about usage habits (See CORBA NS operations.)
- event types offered by suppliers to an event channel to be discovered by consumers of that channel so that consumers may subscribe to new event types as they become available
- quality of service (QoS) properties to be set for individual channels, proxies, or structured events (Relevant CORBA operations include `set_qos` and `get_qos`.)
- optional event type repositories that facilitate filter constraints by end-users, and make available information about the structured events flowing through the channel.

The NS is based on a series of CORBA IDL (Interface Definition Language) modules that define operations and interfaces that may be used by consumers and suppliers that connect over a client/server environment, and include:

- `CosNotification` (See *CosNotification*)
- `CosNotifyFilter`
- `CosNotifyComm`
- `CosNotifyChannelAdmin`.

(See *OMG* and www.omg.com.)

On-line advertising Advertising that takes place on the World Wide Web, and takes the form of advertising banners which may be placed on many major sites for a fee.

On-line banking services A banking service that is platformed on the World Wide Web or other network.

On-line brokerage services A brokerage service that is platformed on the World Wide Web or other network.

Online state A state in which a computer or peripheral can perform its intended purpose. For example, a printer may print when it is online, and it is possible to communicate with a remote computer when it is online.

OO (Object-Oriented) A prefix used in object-oriented systems, software and development tools.

(See *Object*, *OOP*, *ActiveX*, *Java*, *JavaBeans*, and *C++*.)

OO User Interface A user interface that uses the object model as its underlying interface components. They are typically graphical user interfaces (GUIs or 'goosey'). The Apple Macintosh is remembered as one of the first systems to feature a commercially successful OO UI, followed by NextStep,

which was founded by Apple Computer's co-founder, Steve Jobs. This was followed by the Microsoft Windows and IBM OS/2 OSs that featured OO user interfaces.

(See *ActiveX, C++, Java, Object, OO, Windows and UI Builder.*)

OODBMS (Object-Oriented Database Management System.) A database used to store, and to retrieve complete objects including their code and data. Stored objects may be categorised and stored in compound structures or objects. OODBMSs are characterised by their ability to:

- store complex objects
- be renovated or updated without radical renovation of data table structures associated with RDBMS implementations
- be extensible, providing a means of defining new data types
- support OO methodologies and concepts, including encapsulation, where objects' inner workings are hidden, and inheritance, where objects may be granted the methods and data of other objects. Multiple inheritance may also be supported where subclasses inherit methods and data from more than one superclasses.

(See *OO, OOP DBMS and Data warehouse.*)

OODL (Object-Oriented Dynamic Language) A programming language that is both object-oriented and dynamic.

(See *Dynamic and OOP.*)

OOL (Object-Oriented Language) A programming language that adheres to the object-oriented programming model.

(See *C++, Java, and OOP.*)

OOP (Object-oriented programming) A modular programming approach that depends upon reusable objects. OOP programming tools include Inprise Delphi, Optima++ and PowerSoft PowerBuilder. OOP languages include C++, Java and Visual Basic. In the real world we unconsciously place objects in classes. We know, for example, that cars, holiday chalets and computers are from different classes, but each time we see a car we do not ask ourselves: which class does a car belong to? Or why is it different from a holiday chalet? We know that it is a member of the class vehicle because we have learned how it behaves, and that behaviour, with all its methods, is in our mind. We do not have to learn or consider an objects' behaviour each time we come in contact with it. For example, you know that you cannot drive the holiday chalet because of its behaviour, and the class to which it belongs. You know these things without having to, repeatedly, decide that a holiday chalet

cannot be driven because it has no wheels, no axle, no engine and so on. Object-oriented programs are much the same. Classes of objects are carefully defined. Hierarchies form another important part of classes where, once again, like in the real world, classes are subdivided into further classes. This helps distinguish between, say, a sports car and a jeep. The jeep would be a member of the class `OffRoadVehicles` which is a member of the class, `Cars`, which in turn is a member of the class, `Vehicles`. This additional information tells us that a sports car cannot be driven up a steep muddy slope, etc. Everything in the real world is a member of a class, of which there are an infinite number. Some Windows databases come with a number of in-built methods to choose from. These cover standard activities such as opening tables and forms, and even opening the Help window. This type of database building is achieved through a so-called 'pick and build' interface. The OOP model embraces:

- data hiding
- encapsulation
- reuse
- polymorphism.

OOP languages include:

- Java
- C++
- Smalltalk
- Visual Basic.

(See Objective-C, C++, Data hiding, Encapsulation, Java, Polymorphism and Smalltalk)

OOUI (Object-oriented user interface.) *(See OO user interface.)*

Open Buying on the Internet A protocol aimed at the standardisation of e-commerce on the Internet.

OpenDoc A standard object or component architecture initially aimed at the creation of compound documents. It is not as widespread as OLE or Microsoft ActiveX component technology.

(See ActiveX, Compound document, OLE, and JavaBeans.)

Open loop A relationship that sees cardholders and Merchants maintained by different banks.

OpenScript A programming language included in many versions of Asymetrix ToolBook. It fits into the same programming language category as Lingo, but is dedicated to the ToolBook environment, and is not used as widely. ToolBook operates in two basic modes: Author level and Reader level. The Author level mode provides access to ToolBook's drawing and

programming tools. It lets you create books, create and modify page objects, and program in OpenScript. The Reader level mode provides all necessary features to run ToolBook applications, but does not provide access to the development tools. It lets users:

- navigate through pages, and add pages
- type, edit and format text in fields
- print
- run OpenScript programs.

To deny users from changing ToolBook applications you can use the runtime version of ToolBook. While authoring an application you can switch between Author level and Reader level instantly in order to test applications under development. You toggle between Reader and Author levels either by selecting Reader or Author from the Edit menu, or by pressing F3.

scripts A typical OpenScript is shown below. It plays a Midi file and shows a page of a video file in a stage. Take for example the script for page 1 which is shown below:

```
to handle enterPage
mmOpen clip "intro"
mmShow clip "intro" in stage "intro"
mmPlay clip "music"
end
```

Like all the scripts associated with page objects this event handler is activated by simply opening, or moving to, the page number. The second line simply opens the video clip stored as “intro” in the Clip Manager. With the “intro” clip open the third line shows the first page, or a current page, of the “intro” video file. Finally, the fourth line plays a Midi file clip stored as “music” in the Clip Manager. All the page scripts operate in the same way, except they have extra statements to close Midi file clips. The button script below simply closes a Midi file clip that is played by the page script, and plays the video file in the stage. This requires just two lines of code using the `mmClose` and `mmPlay` commands:

```
to handle buttonClick
mmClose clip "music"
mmPlay clip "intro" in stage "intro"
end
```

The script below illustrates a Pause button. It requires an additional `IF...THEN` structure to determine whether or not the video clip is playing. This has to be included because an attempt to pause a clip that is not playing causes an application to crash.

```
to handle buttonClick
if mmStatus of clip "intro" = "playing" then
mmPause clip "intro"
end if
end
```

The status of any clip may be obtained using the `mmStatus` command.

(See *Lingo, ToolBook and Authorware Professional.*)

Open Source Software whose source is freely available for modification and redistribution.

(See www.opensource.org. and www.gnustep.org.)

Open-to-buy An item of information on a credit card that is the difference between the line-of-credit and the balance owed by the card holder.

Open Transport A communications architecture for implementing network protocols and other communication features on computers running the Mac OS.

Operating system (OS) A generic term used to describe the software elements that manage system resources and so provide an interface between the user and the system, as well as between software and the system. The shell, user-interface or front-end is sensitive to a number of user-commands. Popular operating systems include Windows 98/NT, OS/2 Warp, MS-DOS, DR-DOS, OS/2 and Unix.

(See *Windows.*)

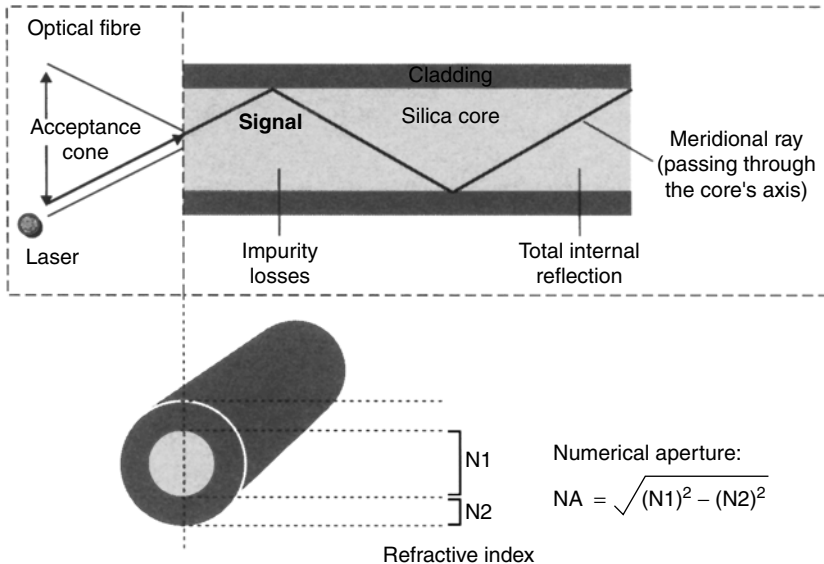
Operation A term which is interchangeable with method, as used in languages such as C++ and Java.

(See *CORBA-based Notification Service, C++ and Java.*)

OPIE (One-Time Passwords in Everything) (See *OTP.*)

Optic fibre A silica-based fibre that can propagate a light signal while inducing minimal losses. Light propagation is driven by total internal reflection. This is made possible using a core fibre and surrounding cladding of different refractive indexes. The light source must emit light into the cable at the critical angle in order to achieve total internal reflection. Applications include:

- lightwave communications
- flex sensing in gloves and bodysuits, which are used in VR.



Optical fibre – monomode/single mode

Numerous different types of optic fibre exist, including graded and step-index. A step index is one in which the core silica is of one refractive index and its coating silica is of another index. A graded fibre consists of a core fibre that is coated with a number of grades of silica of differing refractive index. The advantages of optic fibre include:

- light and easy to install.
- immunity to electrical and reasonable levels of electromagnetic interference.
- exceptionally wide bandwidth when compared to electrical conductors.
- cost effective.

The operation relies upon total internal reflection, given by reflecting injected rays in the cladding. The core and the cladding, therefore, have a different refractive index. The angle at which rays are injected into a fibre is critical, in order to achieve total internal reflection, and to propagate the ray appropriately. The numerical aperture (NA) of a fibre is a measure of the size of its acceptance cone, or the range of angles at which rays must be injected. Propagated rays may be:

- meridional, which repeatedly intersect the core's axis
- skew, which spiral through the core without ever intersecting the axis. Their launch angle tends to be greater than that of meridional rays.

The light source must be an LED or laser device, which lases at an appropriate wavelength. A multimode step-index fibre may have a core diameter

of between 125 and 500 micrometers, and an NA of the order of 0.15 to 0.4. They are able to propagate a substantial amount of emitted light from an LED. Injected light is dispersed into many thousands of paths called modes.

Oracle A database development environment, produced by a company of the same name.

Oracle Media Objects An object-based multimedia authoring tool.

Orange Book A set of security standards developed by the United States Department of Defense, and formally named the Trusted Computer Standards Evaluation Criteria.

(*See Security.*)

OS/2 (Operating System/2) A PC operating system. Launched in mid-1987 to coincide with the release of the IBM PS/2 family of computers, it is a multitasking operating system able to run applications simultaneously, and is downwardly compatible with DOS. OS/2 is used in conjunction with Presentation Manager, a GUI. Relaunched in 1992 by IBM under the name OS/2 2.0, it is now a relatively successful 32-bit operating system. It is also able to run Microsoft Windows applications in either real or standard modes. The release of OS/2 2.1 in mid 1993 saw the inclusion of multimedia extensions that compare with those of Windows.

OSGi (Open Standard Gateway Interface) A standard for residential networks.

OSI (Open System Interconnection) A seven-layer industry standard reference model that is applied extensively to client/server architectures, and was introduced in 1984 by the ISO (International Standards Organisation). It provides a standard infrastructure for the applications, glues and communications required of modern client/server implementations. The seven layers include:

- *Application*, which encompasses client- and server-side programs, such as e-mail clients and browsers at the front-end.
- *Presentation*, which is the formatting layer, delivering such operations as protocol conversion and compression. A typical application sees clients' SQL requests converted to a format that complies with the SQL server.
- *Session*, which permits a conversation between programs, objects or processes.
- *Transport*, which provides error detection and correction operations for communicated data, and adds a transport-layer ID.

- *Network*, which operates to break down transmitted data into packets (with sequence numbers), and to reassemble them into a readable message on reception. It may be assumed to route packets to an appropriate node.
- *Data-link*, which receives packets from the network layer, and adds control information to their headers and trailing regions. The resulting frames are passed to the physical layer when appropriate access is detected.
- *Physical*, which converts frames into binary data so that it may be transmitted, and returns this data to frames upon reception at its intended destination.

(See *Application, Client-server and Glue.*)

OSPF (Open Shortest Path First) A protocol used in routers.

OTP (One-Time Password) A password protection security policy to prevent illegal access. In many instances it does not prevent hackers from monitoring the network and gaining access to information. OTP variants include:

- Wietse Venema's LogDaemon
- BellCore's S/KEY Version 1.0
- BellCore's Commercial S/KEY Version 2.0
- United States Research Laboratory's (NRL) One Time Passwords in Everything (OPIE).

(See *Encryption.*)

P

P2P (peer to peer) A peer to peer network permits all connected computers to act as a server or as a client.

Package A set of Java classes that address specific functions where, for instance, `java.io` addresses input and output functions, and `java.net` addresses Internet and network operations.

Packet (*See Packet Switched Network.*)

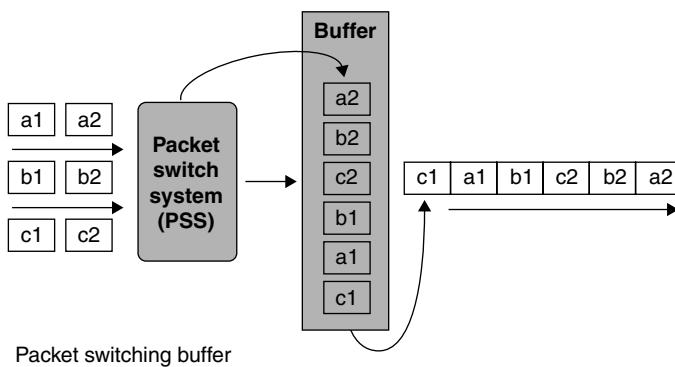
Packet filtering A method used to promote network security, where packets are filtered according to predefined criteria. Packet filtering is possible using screening routers and security gateways.

(*See Screening router and Security gateway.*)

Packet switched network A data transmission and reception technique where data streams are divided into packets coded with origination and destination information. The packets may be interleaved with different data transmissions. For instance, the packets that may be providing a two-way audio communication link in IP telephony, might be interleaved with other streams such as videoconferencing data. Packets may follow dissimilar routes over a network, and are directed over what are perceived as the quickest and least congested routes. If available routes or logical channels are congested, then packets are buffered before transmission. The buffer is a FIFO (first in first out) storage, where the first packet placed in the buffer is the first to be retrieved and transmitted when the appropriate virtual channel is available. The X.25 protocol standard dictates that a packet may contain between three and 4100 octets or bytes. (*See X.25.*) Up to 4,095 logical channels might be accommodated on a single physical link (1997). The logical channel followed by a packet is determined by its header information. There is also error correction, where the receiver might request that a particular packet is re-transmitted. The original packet switching standard for public data networks is CCITT X.25 (*See X.25.*)

This is a multi-tiered recommendation embodying everything from physical connectors to data formatting and code conversion. Packet switching is rather like the logistics involved in shipping a motor car part by part. The disassembled parts are sent, and assembled at the factory of destination. Equally if a part is damaged, the factory will request that it is sent again. The packets may have one of two identities:

- Multi-cast packets (or items of transmitted information) can be delivered to more than one destination.
- Unicast packets that have one destination only.



Packet switched networks (that use IP) are currently displacing switched networks in the telecommunications industry, and drive the growing use of IP telephony. The comparative advantages of IP telephony include reduced costs, and reduced cost of ownership, for telcos and corporations running IP compatible networks such as intranets. The reduced costs are largely brought by the fact that IP and Internet traffic is unregulated. Corporations and government departments may experience savings in the cost of voice traffic that might reach as much as 80 percent. Flexibility is also an advantage because IP telephony makes better use of bandwidth. For example, Australian telecommunications giant, Telstra, introduced the virtual second line in the late 1990s. This allows subscribers to its ISP (Telstra Big Pond) to receive incoming calls while connected to the Internet.

(See *Internet telephony*.)

PaintShop Pro A popular graphics capture, and editing program. It has numerous special effects.

Palette An item of colour information accompanying 8 bit digital video sequences, and images.

Palette Editor A program used to edit the palette of 8 bit graphics or video. Palette editors such as Microsoft PalEdit are used to alter the colour characteristics of 8 bit video sequences. They are also useful for building palettes that work with a number of different 8 bit video files. The importance of this relates to switching between two or more different 8 bit sequences on screen that contain different palettes that can result in a flicker. The degree to which the flicker occurs depends upon the difference that separates the palettes, as well as upon the general video and graphics speed of the playback system. Building a common palette is easiest if you run multiple instances of the palette editor, provided the program has this capability, or where it is able to open multiple palettes.

Palette switching An instant when a colour palette is switched from one to another. Palette switching occurs most often when 8 bit video is cut from one sequence to another which has a different colour palette, or when one 8 bit still image is cut to another which has a different palette. Palette switching can result in a brief screen flicker. The screen flicker may be eliminated using a common palette for all bitmaps (images) and video clips. A common palette can easily be achieved using a palette optimiser, or using an editing program such as PalEdit.

Palmtop A small scale portable PC that runs a streamlined operating system such as Windows CE.

PAN (Payment Account Number) A number on the front of payment cards.

PARC (Palo Alto Research Centre) A research establishment founded in 1970 by Xerox. It is the birth place of many multi-media associated technologies and concepts including laser printing, local area networks, the graphical user interface (GUI), and object orientated programming (OOP). The GUI system integrated into the Apple Macintosh launched in 1984 was a direct result of Apple's Steve Jobs visiting PARC. During his visit he saw a GUI platformed on PARC's Alto system.

(See Windows.)

Parser A function of a compiler, interpreter, or translator that attaches semantics to tokens which are generated by the lexical analyzer.

(See Java.)

Pascal A high-level, general purpose programming language used in Inprise Delphi. The original implementation was developed in the mid 1960s by Prof. Niklaus Wirth of Eidgenossische Technische Hochschule, Zurich. A structured language, it was one of the main advancements in computer programming

languages to follow Algol 60. The most popular and successful implementation of Pascal was Turbo Pascal from Borland (now called Inprise).

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

Passport (Microsoft) .NET Passport uses the Kerberos distributed security protocol that is a proven industry standard and is also used by Microsoft® Windows® 2000 and XP. Kerberos authenticates client requests and distributes tickets or temporary encryption keys:

1. The user clicks on the .NET Passport sign-in scarab, and enters a sign-in name and password.
2. A request is made to .NET Passport for a 'ticket-granting-ticket' (TGT).
3. If appropriate .NET Passport grants the TGT that may be cached.
4. The client presents the TGT to .NET Passport or 'ticket granting server' (TGS), and request is made for a session ticket.
5. .NET Passport uses TGTs to verify clients and to validate tickets, and then returns a session ticket and session key to the requested .NET My Services service.
6. The client or Web site sends the session ticket to the .NET My Services service.

Password A series of alphanumeric characters uses to protect a system against unauthorised access. Using TCP/IP, the password file, */etc/passwd*, is used to prevent unauthorised access. Servers like Apache, NCSA and Netscape integrate facilities for authenticating users that do not require programming. The principle files are the *access file* (*.htaaccess*), and the *password file* (*.htpasswd*) that is stored in a secure directory on the server and listed below:

```
#!/usr/bin/perl

$passfile = "/disk/mysite.com/ood/.htpasswd";

require "ctime.pl";
$method=$ENV{"REQUEST_METHOD"};
$type=$ENV{"CONTENT_TYPE"};

%input_values=&break_input;
$username=&normalize_query($input_values{"username"});
$password=&normalize_query($input_values{"password"});

open(PWFILE,"+< $passfile") || &croak("Can't open
    $passfile: $!");
$salt=reverse time;
seek(PWFILE,0,2);
print PWFILE $username,":",crypt($password,$salt),"\n";
close (PWFILE);
&croak ("All done");
exit;
```

```

sub break_input {
local ($i);
read(STDIN,$input,$ENV{'CONTENT_LENGTH'});
@form_names = split('&', $input);
foreach $i(@form_names) {
($html_name,$html_value) = split('=', $i);
$input_values{$html_name} = $html_value;
}
return %input_values;
}

sub croak {
local($msg)=@_;
&print_header("System Error");
print $msg;
&print_footer;
}

sub print_header {
local($title) = @;
print "Content-type: text/html\n\n";
print "<HTML>\n<HEAD>\n<TITLE>$title</TITLE>\n";
print "</HEAD>\n<BODY>\n<H1>$title</H1>\n";
}

sub print_footer {
print "</BODY>\n</HTML>\n";
}

sub normalize_query {
local($value) = @;
$value =~ tr/+// ;
$value =~ s/%([a-fA-F0-9][a-fA-F0-9])/
    pack("C",hex($1))/eg;
return $value;
}

```

The access file (.htaccess) holds the following:

AuthUserFile/disk02/htpasswd that points to the file containing user names and passwords.

AuthGroupFile/dev/null that points to groups of names – though this is unusual in a Web context.

AuthName Name goes here that specifies the realm.

AuthType Basic that specifies the user authentication system.

<Limit GET> that specifies the server method that may also be POST or PUT.

Require valid-user that ensures only valid users access the implementation.

Using HTML the passwd.cgi program is integrated as follows:

```
<BODY>
<H1>Input Password</H1>
<FORM ACTION=http://,botto.com/cgi-bin/passwd.cgi"
  METHOD=post>
User name: <INPUT TYPE="text" NAME="username"><P>
Password; <INPUT TYPE="text" NAME="password"><P>
<INPUT TYPE="Submit">
</FORM>
</BODY>
```

(See *Security*.)

Path A series of characters used for authorisation purposes, which provide access to appropriate services, applications and hardware.

Path/trail 1. A path through a series of links in hypertext, hypermedia or multimedia material. 2. A statement which points through the hierarchy of directories to a file or folder, and may take the form:

```
C:\jini1_1\source\examples\,
```

and are often included in autoexec.bat files so the user need not type the path of a file or program in order to run it.

PATH_INFO A CGI variable that holds the URL's suffix or that data which follows the script's name.

Pattern language A vocabulary of entities which defines the problems and the forces that drive them, as well as the actions that may be taken to obtain acceptable solutions. The language can exist in many domains and sciences and can even be the basis of a new science or technology or simply provide the decision-making frameworks and rules and changes to a business community or organisation. Christopher Alexander, the founding father of pattern languages, invented three key concepts:

1. '*Quality Without a Name*': an essence held by living things giving qualities such as freedom, wholeness, completeness, comfort, harmony, habitability and durability.
2. '*The Gate*': an entity which provides access to the quality.
3. '*Timeless Way*': a flow of patterns through the gate that ultimately evolves and shapes a design or entity. (See *Design Pattern*).

Payload A user data capacity of a packet, block, cell or frame that forms part of a protocol.

Payment gateway A gateway that translates SET messages to and from standard bank financial data formats.

Pay-to-view An e-commerce site that is created to sell content rather than tangible goods, and may vary from a virtual publication to a TV broadcasting

facility or on-line juke-box. Implementing such sites requires password access to selected areas, and forms for gathering credit card or bankcard details.

PC Card (See *PCMCIA*.)

PCI A local bus implementation that permits the addition of expansion cards to a system. Such cards typically include graphics controllers, internal modems and sound cards. Local bus technology provides high performance communications between such devices and the system processor and memory. It does this by providing a data path width and operating clock speed that is more closely matched to the internal and external data bus of the processor. While PCI has become the industry's chosen local bus standard, Vesa Local Bus (VLB) is also used. Non-local bus variants include:

- IBM's 8-bit XT bus
- IBM's 16-bit ISA (Industry Standard Architecture) or AT (Advanced Technology) bus
- IBM's MCA (Microchannel Architecture)
- EISA (Enhanced Industry Standard Architecture).

PCM (Pulse Code Modulation) A method of encoding data in digital form, for transmission over a network, or for storage on DSM. Used in the Integrated Services Digital Network (ISDN) standard, multiplexing involves creating a data stream consisting of 8 bit PCM blocks. The blocks are created every 125 micro seconds. By interleaving the blocks with those from other encoders, the result is time division multiplexing (TDM). In North America ISDN typically interleaves data from 24 64 Kbits/sec sources or channels. This results in connections that provide 1.536 Mbits/sec. Although in actual fact the connection has a bandwidth of 1.544 Mbits/sec, because each channel's frame has a marker bit 'F', adding 8 Kbytes/sec. Europe sees ISDN that typically interleaves 30 64 Kbits/sec channels, giving 2.048 Mbits/sec. This and the 1.544 Mbits/sec connection are known as primary rate multiplexes. Further interleaving of primary rate multiplexes sees:

- 6, 45, 274 Mbits/sec in North America
- 8, 34, 139, and 560 Mbits/sec in Europe.

PCM was conceived in 1937 by Alec Reeves, but was not applied widely for many years.

Sampling Using ISDN, an 3.4 KHz analogue signal is sampled at 8 KHz. The sampling rate is less than twice the bandwidth of the analogue signal, in accordance with Nyquist's sampling theorem, and prevents aliasing. A sampling frequency in a multiple of 4 KHz was used because the existing networks used 4 KHz carriers, and would cause audible interference in the form of whistles.

Coding The amplitude of each sample is measured, and encoded using 12 bit values that give $\pm 2,048$ possible values.

Compression The 12 bit samples are reduced to eight bits using logarithmic compression, which may be:

- ‘mu-law’ in North America
- A-law in Europe.

Compression standards permit the system to be embedded anywhere in an analogue network.

(See *ATM, ISDN and T1.*)

Further reading

CCITT Recommendation G.711. Pulse Code Modulation (PCM) of voice frequencies.

PCMCIA (Personal Computer Memory Card International Association)

A slot that connects with almost credit card-size peripheral devices, which may be modems, NICs, interfaces to CD-ROM drives, hard disks etc. The original PCMCIA was designed for memory cartridges only, but in September 1991 the PCMCIA Type II (PCMCIA 2.0) specification was launched facilitating hard disks and modem/facsimile devices.

PCX A bitmap file format developed by ZSoft, and features RLE compression.

PDA (Personal Digital Assistant) A portable device that may serve a number functions including that of an e-mail client, Web browser and organiser.

Peer-to-peer network A network that permits each network user to access the directories and the peripheral devices associated with any connected computer. When computers are linked together so that they can share the resources of one or more computers, a network is formed. You can build a peer-to-peer network using Windows 95/98, simply by adding Ethernet cards to connected systems. Another type of local area networks (LAN) is the server-based variant that permits users to access and share information stored on a powerful computer commonly termed a server.

PEM (Privacy Enhanced Mail) An encryption standard for e-mail that was created by the IETF.

Pentium A fifth generation Intel processor, and successor to the 486DX family of processors. Currently the Pentium with MMX Technology is the de facto Intel fifth generation processor. MMX Technology is the registered trade name for Intel’s additional instructions that lend themselves to multimedia. They drive performance gains through such applications as speech recognition, video, and 3-D graphics. The clock speed of the Intel Pentium processor has increased steadily, and currently there are 200 MHz, 233 MHz, and 266 MHz

versions. The more modern Intel Pentium II processor offers yet higher performance.

(See *MMX and Pentium II*.)

Pentium II An Intel processor that integrates MMX Technology as standard.

(See *MMX and Pentium*.)

Pentium Pro A sixth generation Intel PC processor that integrates SMP design features. It is used for servers, and for workstation class PCs.

(See *Pentium and SMP*.)

Perl (Practical Extraction and Report Language) A programming language for processing text. It was developed by Larry Wall who once joked that Perl stood for 'Pathologically Eclectic Rubbish Lister'. He describes Perl as: '... an interpreted language optimized for scanning arbitrary text files, extracting information from those text files, and printing reports based on that information. It's also a good language for many system management tasks. The language is intended to be practical (easy to use, efficient, complete) rather than beautiful (tiny, elegant, minimal). It combines (in the author's opinion, anyway) some of the best features of C, sed, awk, and sh, so people familiar with those languages should have little difficulty with it. (Language historians will also note some vestiges of csh, Pascal, and even BASIC-PLUS.) Expression syntax corresponds quite closely to C expression syntax ...'

Perl variables Scalar variables are assigned single data values that may be integer, floating point or string:

```
$transform=25;
$response="You did not enter the correct patient
symptoms.";
```

Numeric variables are incremented using the syntax:

```
$transform=$transform+1;
```

or,

```
$transform++;
```

Numeric variables are decremented using the syntax:

```
$transform--;
```

Subroutines are named using the syntax:

```
&subroutine;
```

Perl arrays An array of scalars is defined using the syntax:

```
@trans(2,4,5);
@forward(7,8,9);
```

The number '4' in the defined three-element array is addressed thus:

```
$state=@trans(1);
```

Arrays may be combined using the syntax:

```
@combine=(@trans, @forward);
```

The definition of array variables is accompanied by the generation of scalar variables (of the same name) that have the @# prefix. These store the array size, or more precisely the sequence number of their final element. The array size need not be defined, and it is legal to insert elements into an array at whatever point, thus:

```
@transform = (10,25,35,55);  
$transform[25] = 7;
```

An associative array of scalars may be assigned to a variable (with the "%" prefix) thus:

```
%transform = ("x",100,"y",20,"z",20);
```

This equates transform to the element strings "x", "y", and "z", whose values are 100, 20 and 20.

Subroutines Subroutines begin with the word `sub` and its code or block is contained within opening and closing braces, this:

```
sub transform_every {  
    $state=@trans(1);  
}
```

(See CGI.)

Personal Web Server (See PWS.)

PGP (Pretty Good Privacy) An asymmetric cryptosystem that is in the public domain, and was invented by Phil Zimmerman. It is used along with RSA by SET (Secure Electronic Transactions) for security and authentication services.

(See *SET, Ciphertest, Plaintext, Encryption algorithm, SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetric, Transposition and Dictionary attack.*)

PHP A server side scripting language. PHP was originally written by Rasmus Lerdorf in late 1994, and soon became PHP/FI 2.0, and eventually PHP 3.0. PHP code was developed so as it could be embedded in HTML. Much of PHP's syntax originates from C, and some of it comes from Perl, C++ and Java.

Physical address An address represented as a hexadecimal number, which can be used to address a device such as a memory chip or even a UART. For instance, by signalling the devices CS (Chip Select), it is then possible to

write an address to a memory chip, so as to read stored data. The addresses themselves may be of various lengths including 8 bit, 16 bit, 32 bit, 64 bit, 128 bit, etc.

PicoJava A Chipset from Sun Microelectronics that is optimised for the Java programming language. It is used in cellular phones, and computer peripherals.

(See Java and Sun Microelectronics.)

PIN (Personal Identification Number) A number assigned to an ATM cardholder.

Ping A name for ICMP (Internet Control Message Protocol) Reply/Echo. It is also used to describe programs that use ICMP. ICMP is used to test the reliability and connection speed to a remote host. The reply to such a test is called a pong.

Pipe A network communication channel that provides a means of transferring packets between local or wide destinations. Pipes have addressable names and may be used to send and receive data (that is typically assembled into packets) to and from a central computer over a WAN.

Plaintext An input into an encryption algorithm or cipher, which becomes ciphertext. When ciphertext is processed by a decryption algorithm it is returned to plaintext.

(See Encryption algorithm, SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetrical, Transposition and Dictionary attack.)

Plug-in A module that adds functionality to an application. In the case of a browser, a plug-in might take the form of a video playback feature. Numerous plug-ins are available for the Netscape Navigator browser. An alternative technology to Microsoft's ActiveX Controls, plug-ins tend to be a feature of browsers. ActiveX Controls are applied more broadly and cut through boundaries that separate many different software sectors, including client-side and server-side component architectures. The plug-in architecture adds processing capabilities to the client Browser, and displaces logic from the server side.

(See Active Desktop, Active Document, Active Server, ActiveX, and Netscape Navigator)

PnP (Plug-and-Play) A hardware specification that ensures easier installation using Windows 95/NT. PnP hardware devices can be detected and installed by Windows 95/NT.

POI (Point Of Information) A means of exhibiting products electronically through the Internet or other medium such as CD-ROM or DVD-ROM. Traditionally, consumer education has consisted of publishing

product brochures, advertising, allowing the potential customer to peruse in a shop or showroom, and product demonstrations. These generally accepted ways in which the consumer chooses an appropriate product may be aided or replaced using multimedia in a point-of-information (POI) guise. POI terminals present the customer with the ability to browse through product ranges, or experience just those items that fit a user-defined profile. POI can be a powerful marketing and advertising tool providing the means to display products. The benefits are clear: it gives an opportunity to promote products in a medium that cannot be rivalled by (current) television advertising. It also allows small and medium-sized companies to promote products on terms that only large companies and corporations could previously afford. Furthermore, if products can be demonstrated adequately through multimedia, the need to exhibit them physically becomes unnecessary and so floor space may be saved. Research also indicates that users of POI terminals spend more money than those shoppers using conventional means. Finally, the possibility of fewer sales staff is raised. With the growing number of multimedia systems in the home and with the falling price of disc replication, POI may be distributed free like junk mail. In the computer industry, there is also the possibility of distributing short advertisements/demonstrations containing video sequences on floppy disk. Museums of various kinds throughout the world have installed POI terminals. These give visitors the opportunity to follow user-defined guided tours. Such an approach also allows visitors to experience interesting items which might otherwise be catalogued and hidden away from public view. Many other areas such as careers advice, geographic information systems, surrogate travel (brochures) are also possible through POI.

Polymorphism 1. A concept where two or more objects may respond differently to the same message; for example, client objects may respond differently from a message from a server object. (*See Objective-C.*) 2. An object-oriented concept where an entity has many forms. For example, a function call may be used to apply an object in different ways. The object might be a button, whose various forms include different methods that determine its response to mouse clicks. Polymorphism allows messages to stimulate context-sensitive processing. For instance, the message might be interpreted by one of a number of methods in a single object.

(*See C++, Java and OOP.*)

POP3 (Post Office Protocol) A protocol for sending and receiving e-mail. Compliant e-mail applications are called POP3 agents.

Port 1. A channel through which a computer communicates/drives a peripheral device. Standard PCs include Centronics parallel ports, and serial ports (that are often referred to as COM ports). Typically parallel ports are used to connect with such peripheral as printers, mass storage devices and scanners.

Serial ports are often used to connect with external modems. Other ports include FireWire and USB (Universal Serial Bus). 2. A method of translating a program from one platform to another, or from one language into another. 3. A port number used by a server.

port 1. A number that selects a receiver for incoming packets. 2. A number that selects the sender of outgoing packets.

POS (Point Of Sale) 1. An automated credit card or bankcard transaction. 2. A method of selling products or services from e-commerce Web sites, or even multimedia booths.

POSIX (Portable Operating System Interface) An operating system interface agreed by the ISO/IEC, IEEE, and The Open Group.

POST method (*See CGI.*)

PostScript A standard formatting language used to store and print documents. Many commercial printers and reprographics bureaux are able to accept files in the PostScript format, from which they are able to print, or produce films. The language itself is the property of Adobe. PostScript printers are more expensive than others mainly because Adobe require licence fees.

PowerBook A range of notebooks manufactured by Apple Computer. Such notebooks can operate as DOS, Windows and Windows NT using emulation software.

PowerPC A processor architecture designed for Microsoft and Apple OS compatibility. The technology is integrated in Apple desktop and notebook systems.

PowerPoint A presentation program that is marketed and sold by Microsoft. It may also be used as a drawing package, and is included in the Microsoft Office integrated package.

PowerPoint Animation Player A Microsoft animation player that may be added to Web pages.
(*See ActiveX Control.*)

PPP (Point to Point Protocol) A standard protocol used with standard access technologies such as POTS and ISDN. Such connections to ISPs see it used with the IP protocol.
(*See SLIP.*)

Precedence In C++, arithmetic operators have a precedence value. These indicate the order in which such operators are implemented that is significant with expressions such as:

```
dev = xx + yy * zz + yy;
```

Control over such arithmetic operations is obtained by using parentheses, i.e.:

```
dev = (xx + yy) * zz;
```

Parentheses may be nested.

(See C++.)

preemption A term used to describe the moment a running task is interrupted.

Preemptive multi-tasking A type of multi-tasking in which the operating system interrupts applications running concurrently. It is more seamless than non-preemptive multi-tasking in that a higher degree of concurrency is achieved. Windows 95 and OS/2 Warp embody preemptive multi-tasking.

preemptive multi-tasking A prefix that defines an operating system able to interrupt a running task so as to run another task.

Pretty Good Privacy (See *PGP*)

Private key encryption An encryption model that requires the sender and the receiver of encrypted matter to use a single password key. The size of the key (in bits such as 56 bit etc) is a function of the encryption techniques harnessed.

(See *Encryption*.)

process A term used to describe a running program that may have a virtual address space, threads, and file descriptors.

Process Flow A diagram which shows the processes included in a system architecture. It shows how the processes, and their leaf processes, interrelate and interact with entities that might be data or program modules.

Processing fees A fee charges by Acquirers and Merchants for using interchange networks or for using Merchant Account services.

Processing power A measure of a system's processing performance, and may be measured in:

- millions of floating point operations per second (MFLOP)
- giga FLOPs or billions of FLOPs (GFLOPs)
- terra FLOPs or trillions of FLOPs (TFLOPs)
- the rate at which instructions are executed in millions of instructions per second (MIPs)
- SPECmarks
- whetstones
- dhrystones.

Processor A device that embodies the functionality of a CPU (Central Processing Unit). The familiar Intel PC processor continuum broadly equates to: 4004, 8088, 80286, 80386DX, 80836SX, 80486DX, 80486SX, 80486DX2, Pentium, Pentium Pro. The generic PC processor continuum is a little more complex with companies such as AMD (Advanced Micro Devices) and Cyrix producing reverse-engineered, and often enhanced, Intel compatible processors.

Product catalogs A catalog that may be print or electronic and describes a product or service range, and is essentially a POI (Point of Information).

Programmer A broad term used to describe a person engaged in developing computer programs. Programmers tend to specialise. For example, applications programmers might specialise in the development of financial systems, RDBMSs (Relational Databases Management Systems) or client/server applications. RDBMS programmers might use programs/development tools such as Paradox for Windows, dBase, FoxPro, Microsoft SQL Server, DataEase for Windows and Compsoft Equinox. High level language (HLL) might specialise in C++ or Java, or Visual Basic. Low-level language (LLL) programmers, or machine code programmers, or software engineers, work at the machine code level. They generally program using assembly languages which are indigenous to different processors.

(See C++, Java, and Object.)

Programming tool An item of software used to develop software.

Project planning A process of planning a project so its component parts are completed on time. The compilation of a design, development and production schedule is essential for the efficient use of studio time, or for providing a completion date. As with costing, estimation may play a role, the accuracy of which will increase with greater experience. A reasonable starting point for accurate scheduling is a design network, within which the frequency of targets or milestones depends upon fineness of granularity. A low-level approach will yield a more accurate basis upon which to build a precise schedule, where each stage may be allocated a precise period of time. The real function of a design network, however, is to illuminate a critical path, highlighting those stages whose target dates, if exceeded, set back the entire project. Equally, less important stages manifest themselves. For example, it might be found that certain production processes running in parallel with application development can overshoot target dates without setting back the completion date.

Properties A set of attributes associated with an entity that may be a simple font or window, or a complex container which has an embedded application.

Property list A data list that has element types, including arrays, dictionaries, and strings.

Proposal A business proposal holds information describing a service or product which is to be sold. It may include sections headed: impact statement, cost, payment schedule, delivery date, guarantees, etc.

Proprietary A prefix denoting non-standard hardware or software.

Protocol A format used to transmit and to receive data. Examples of industry standard protocols include IP, Ethernet, SMTP, HTTP, etc. Each protocol is optimised for the information it is intended to carry, and for the network over which it is to be used. A protocol often consists of:

- an information field for data
- the destination address
- error detection and correction codes
- originating address.

All of this information is held together in a single unit that might be a packet, cell or frame. In IP networks, such as the Internet and intranets, they are called packets, but it is just a new name; really they are all the same thing. The packets are assembled at the point of transmission, and sent over various different paths to their destination. Once received they are checked for errors, and then appropriately assembled. Network protocols are analogous of the Royal Mail: the packets are comparable to envelopes, and they have destination and originating addresses etc.

(See TCP/IP.)

Proxy object An object that may be passed to a client so as to provide access to remote object via an interface. Jini devices consumer Jini services in this matter, where a proxy object is passed to a JVM.

Proxy Server A intermediate server on the communications path between server applications and data entities, and the client systems and software.

Pseudo-conversational communication A communication regime between two software components or objects that exists only for the duration of interaction.

PSTN (Public Switched Telephone Network) A voice-grade, public telephone network.

(See Packet Switched network.)

Pthreads A POSIX threads package.

Public domain CGI script A script that is freely available from a Web site and requires no payment.

(See www.eff.org.)

Public key *(See [Cryptography](#).)*

Public key encryption An encryption technique that requires both private and public keys. A public key is used to encrypt sent data.

(See [Encryption](#).)

Publishing Medium A medium that may be used to publish information. The Internet, CD-ROM and DVD-ROM are publishing media.

Pure transaction A transaction that occurs under control and where all shared access to resources is coordinated.

(See [Transaction](#).)

Push technology A technology with which a user is served requested Web-sourced information. It is sometimes referred to as the push model.

PWS (Personal Web Server) A downsized implementation of IIS, bundled with Microsoft FrontPage. It can be used to:

- test Web applications
- build intranets.

Python An OO programming language which is not widespread.

Q

QBE (Query By Example) A proprietary database querying method introduced by Borland through the Paradox RDBMS. It involves completing forms, and using arithmetic operators, to interrogate tables. It offers users the basic functionality of SQL, but is not a language.

(See SQL.)

Quad A processor module incorporated in a Non-Uniform Memory Architecture (NUMA).

(See NUMA.)

Quality of Service (QoS) 1. A set of attributes that determine the reliability and performance of a given service that may be a real-time event channel in an OMG NS middleware implementation, or a complete network service. Factors that typically influence QoS are numerous and include software attributes that may be given values such as the maximum number of channels supported, or the time out values, or leases that objects hold. Collective system elements that include network coupling, read/write latency, protocols, protocol translation, NICs, networks, servers and clients also determine QoS values. 2. A QoS allocated to the user of a mobile network, which determines bandwidth and prioritisation. A GPRS QoS, for example, will allocate the user a specific data rate. *(See Reliability.)*

Query A question that may be implemented in code such as SQL, or by completing a query table that is presented to a database which returns an appropriate result.

QUERY_STRING A CGI variable that holds the “query” part of an HTTP GET request that is the URL’s suffix portion following ?.

Queue A contiguous series of memory locations utilised as a temporary storage area. It is a FIFO (first in, first out) system in that the order in which items are dispensed is the same as the order in which they were deposited.

QuickTime A video compression standard. It appeared in advance of the Microsoft Video for Windows (AVI) video standard. QuickTime files can be converted into Video for Windows (VfW) format using a utility supplied with VfW.

(See AVI.)

QuoteChar() In the JDK 1.0 this can be used to specify a character that delimits strings.

R

RAD tool (Rapid Application Development tool) A development tool that expedites application development. Its identity hinges on a number of identifying features that may include:

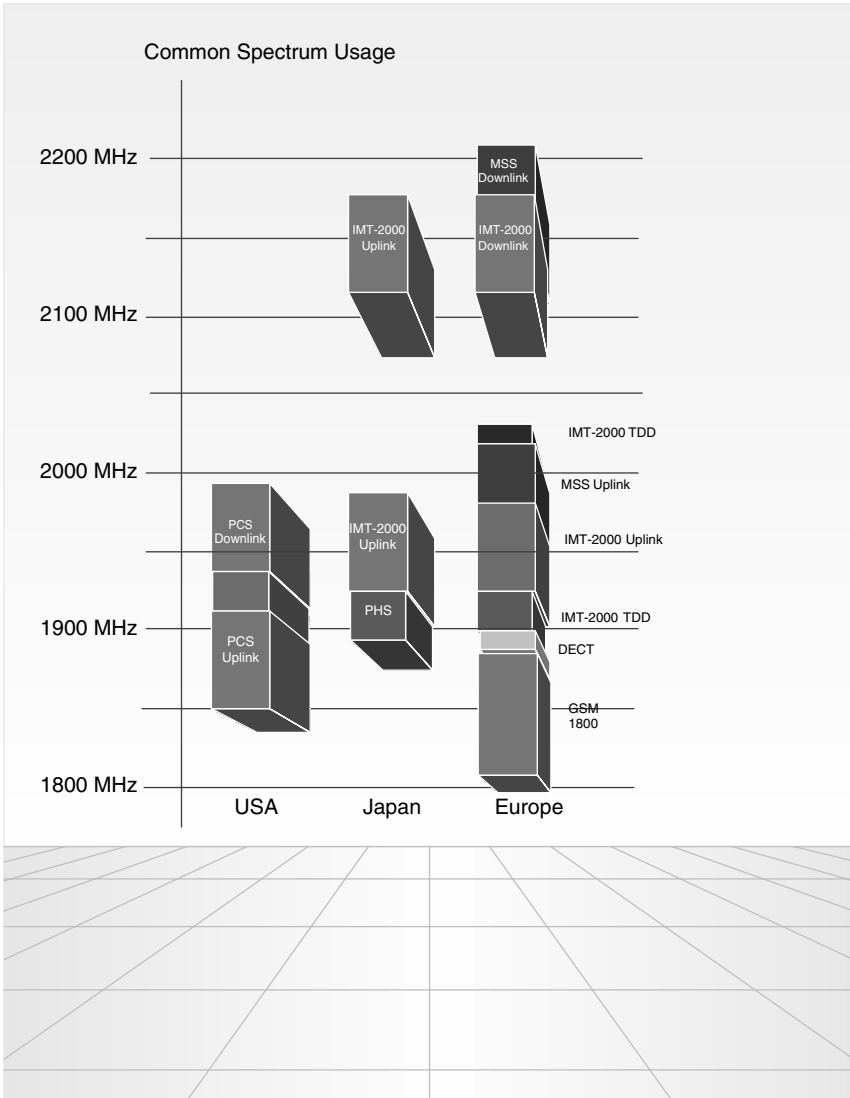
- authentic Object Oriented Programming (OOP)
- visual programming methodologies
- industry standard component architectures such as ActiveX or JavaBeans
- useful program libraries
- features that are appropriate to the collaborative team development environment. These may include security features that can be used to provide team members with access rights to objects so they may be developed.

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

Radio button A group of buttons where only one may be selected at a time. For example, using HTML you may add radio buttons using the following form that merely displays four radio buttons labelled £30, £40, £50 and £60.:

```
<FORM> NAME = "Customer" ACTION = "http://botto.com/  
cgibin/form/cgi METHOD =get>  
<INPUT TYPE = "radio" NAME = "rad" VALUE = "1">  
£30  
<INPUT TYPE = "radio" NAME = "rad" VALUE = "2">  
£40  
<INPUT TYPE = "radio" NAME = "rad" VALUE = "3">  
£50  
<INPUT TYPE = "radio" NAME = "rad" VALUE = "4">  
£60  
</FORM>
```

Radio frequency A frequency used in wireless communications and by the air interfaces between mobile networks and the user.



RAID (Redundant Array of Independent Disks) A mass storage device that has many individual disks. Identifying features of RAID may include:

- high levels of fault tolerance
- scalability through the addition of hard disks
- hot-swappable disks, meaning they may be removed and replaced without the need to power down the RAID
- redundant power supplies for improved fault tolerance

- shared mass storage, serving disparate computers/networks
- heterogeneous characteristics, where they may be integrated into environments comprising multiple OSs
- high speed interfaces such as Fibre Channel and Ultra SCSI.

The RAID specification originated from UC Berkeley in 1987, and was named Redundant Array of ‘Inexpensive’ Disks. The aims of the Berkeley group were threefold:

- improve fault tolerance of mass storage
- reduce mass storage costs
- improve mass storage performance.

Realising the inescapable fact that no single mass storage system could be optimised in all three of the aforementioned areas, the group defined what were to become a number of industry standard solutions. Achieving its objectives to varying degrees, the Berkeley group defines a series of RAID levels employing several tried and tested data storage techniques. One of these was mirroring where data is written to, and read from, pairs of disks concurrently in order to deliver fault tolerance. Modern RAID systems may be specified in terms of:

- maximum data storage capacity that is typically in the GByte range for a single RAID unit, and is in the TByte range for multiple connected units
- average access time measured in milli seconds (ms)
- average and burst data transfer rates
- cache size
- interface type
- multiplicity of host types that may be connected
- OS compatibility.

RAID performance has obvious effects, and high performance echoes performance gains that are felt locally and remotely. The five levels of RAID defined by the Berkeley group include:

- Level 0, which that stripes data across multiple disks, but provides no error correction or redundancy.
- Level 1, which that uses duplexing or mirroring, where data is written concurrently to pairs of independent disks, promoting a high degree of fault tolerance.
- Level 2, which that stores and reads data by dividing it into bits, and storing them on different drives – otherwise known as striping. It also stores ECC codes on dedicated disks.
- Level 3, which that divides data into blocks, storing them on different independent disks. One additional disk contains parity data.
- Level 4, which stripes data blocks across multiple disks. One additional disk contains parity data.

- Level 5, which stripes data blocks across multiple disks, while parity data is stored on multiple disks.

Other RAID configurations include Level 6 and Level 7, neither of which were devised by the Berkeley group. Level 7 offers improved fault tolerance, and is patented by Storage Computer Corporation.

(See Hard disk.)

RAM (Random-access memory) A form of rewritable, electronic memory that may be dynamic (requiring electrical refreshing) or static. Access times for data are assumed to be equal using RAM.

RAS (Remote Access Services) A RAS feature/program permits you to dial-in to remote networks and to ISPs. Windows NT features RAS compliance.

RDBMS (Relational Database Management System) *(See DBMS.)*

RealAudio A streaming audio technology for deploying real-time audio over the Web.

(See Streaming.)

RealNetworks A software publisher engaged in the manufacture of media players that include RealPlayer, RealPlayer G2 and RealPlayer Plus.

(See RealPlayer.)

RealPlayer A media player that is able to deliver streaming audio and video, as well as play local media files. It provides options to connect to streaming media sites including those associated with radio and broadcasting.

(See Streaming media.)

Real time 1. A program or system that responds to user interaction, instantly. 2. A program or system which captures and/or compresses data at the rate it actually occurs. For example, a live satellite broadcast link is in real time.

Real-time compression A technique where an uncompressed video stream is compressed while it is played at full speed.

Real-time video capture A video capture technique where a source video recording is digitised and stored as it is played at full speed.

(See Video Capture.)

Record A row in a database table, or a collection of fields that contain field values.

Recursion A property of a programming language that enables procedures to be called by their own code. Such compliant languages are termed recursive.

(*See C++.*)

Red Book Audio An industry term used to describe the official Compact Disc-Digital Audio (CD-DA) specification that defines the common or garden audio CD.

Redirected URL A page, or URL, which converts one URL into another.

(*See URL.*)

Referring site A site that offers links to other sites.

Referrer log A log that tracks the user's visited pages.

Refresh rate A measurement of the rate at which all lines on a CRT-based monitor are scanned. It is quoted in Hz.

(*See Monitor.*)

Relational database An information storage and retrieval application. Using a relational database, information is stored in records that are divided into fields of different types including text, numeric, date, graphic, and even BLOB (Binary Large Object). The records are stored in tables or files. Records from one file may be linked to records stored in a separate file or table. Codd's standard text about relational databases published in the 1960s specified different types of relational links. Types of link include one-to-one, one-to-many, and many-to-many. There are many commercial examples of the relational database that base their design on the original writings of Codd. Relational databases are formally referred to as RDBMSs (Relational Database Management Systems) whereas flat-file databases are termed simply DBMSs (Database Management Systems). Commercial examples of software products that permit the development of RDBMSs include Borland Paradox for Windows, dBase, Microsoft Access, Ingress, and Comsoft Equinox.

All fully specified RDBMS development tools include an indigenous programming language. For instance, Paradox for Windows has ObjectPAL (Paradox Application Language) which is a visual programming language. Important relational database features include:

- ODBC1 or 2 (Open Database Connectivity) compliance

- Maximum table or file size

- Speed of operation

BLOB (Binary Large Object) support permits the storage of field values that include executables and digital video files.

(*See Data warehouse, DBMS and OODBMS.*)

Reliability A measure of the period of down-time that a system will endure. It may be expressed as a percentage value, indicating the portion of time that the system will be fully or even partially operational. Such a measure of availability (A) may be applied to devices, components, subsystems, systems, networks, etc. Availability may be calculated using the:

- MTTF (Mean time to restore), which is the average time period required to return a failed system to its fully operational state.
- MTBF (Mean time between failures), which is the average time period that indicates the frequency at which a device, component, subsystem or complete system will fail.

$$\text{Availability (A)} = \text{MTBF} / (\text{MTBF} + \text{MTTR})$$

Collective Availability (Ac) of a complete system is equated to the product of the availability for each individual component. For example:

$$\text{Availability (Ac)} = \text{Clients (Au)} * \text{Server (As)} \\ * \text{Network (An)} * \dots * \text{Router (Ar)}$$

Remote An application or data entity that is not local, and is not on the user's machine in a permanent form.

(See 3-tier.)

Remote Method Invocation (RMI) over Internet Inter-Orb Protocol

(See *RMI over IIOP*.)

REMOTE_ADDRESS A CGI variable that holds the client's or proxy's IP address from where the request is being made.

REMOTE_HOST A CGI variable that holds the hostname of the client or proxy making the request, or its IP address only when NO_DNS_HOSTNAMES is defined in the config.h file.

Removable medium A medium that may be removed from the computer. Examples include floppy disk, CD-ROM disc, DVD disc and Iomega Zip disks.

(See *CD-ROM and DVD*.)

Requester path A uni-directional path from the client to the server that supports GET requests, and may deliver to the server such information as the client's:

- domain
- e-mail
- user agent denoting the Browser type
- variables such as a list of file types with which the Browser is compatible.

The requester path naturally coexists with the uni-directional path from the server to the client which may deliver:

- Web pages
- streaming media
- etc.

(See *CGI and CGI environment variables*.)

Resolution A measurement of the concentration of dots or pixels in a digital image. In display technology, resolution is specified in terms of screen dimensions expressed in pixels, and the dot-pitch expressed as the distance between displayable pixels. Typical display resolutions of commercially available monitor include 640-by-480 pixels, 800-by-600 pixels, 1,024-by-768 pixels, 1,280-by-1,024 pixels, and 1,600-by-1,200 pixels. In terms of printer technology, resolution is expressed in terms of the number of dots per inch (dpi). Generally, low-cost laser printers produce output composed of 300dpi. More expensive variants offer 600dpi and 1,200dpi resolutions.

(See *Monitor*.)

Restore A method by which a maximised or minimised application or document window is returned to its previous size and position.

Retained window A window that has a buffer for screen pixel values of sections that are not shown on the screen.

Revenue stream A source from where an enterprise derives some, or all, of its turnover.

Reverse engineer A process that begins by studying the inputs and outputs of a system or devices, and progresses to design and implementation, which echoes the same input and output characteristics.

Reverse engineer ER diagram A process of beginning with a database, and then arriving at an ER diagram representation.

Rhapsody An operating system built around OpenStep technology which was developed by NeXT Software.

Risk exposure (RE) A product of risk probability (RP) and risk cost (RC):

$$RE = RP * RC$$

- RP is the probability of attempted attacks on a system leading to a security breach
- RC is the estimated cost of a particular (or average) security breach.

(See *Firewall and Security*.)

RLC (Run Length Coding) A lossless compression process. It may be used in conjunction with DCT and forms part of the JPEG algorithm.

RMI over IIOP An implementation of RMI that can be used to develop CORBA compliant distributed applications, but using the Java programming language. It was developed jointly by Sun and by IBM. It does not require an IDL of its own, and allows the transmission of serialisable Java objects between communicating applications, and uses IIOP as a communications protocol that may glue applications running on the Java platform to C++ and to SmallTalk and to any CORBA compliant program.

(See *IDL, IIOP, Java and RMI.*)

RMI Security A security perimeter for RMI reliant applications. Downloading entities and classes dynamically reveals the obvious need for security that typically approximate all those things that security gateways are designed to address, such as the filtering of unwanted ActiveX controls, Cookies, Applets and Plug-ins. In order to prevent the downloading of potentially hostile code the standard `SecurityManager` is installed, and prevents the download of entities of all their program elements – including classes and stubs – not found in those folders defined by the local classpath. It is effective in many applications though some may require additional flexibility, or the ability to configure the security policies as you would using a security gateway. RMI has another security manager called `java.rmi.RMISecurityManager` that may be used to implant a security policy that gives certain permissions depending on the code's origins. The security manager also operates on local code and may render certain functions inoperable as they try to connect with remote URLs, so a policy file must remedy this block. More information about RMI security is available on the Web, and particularly at jini.org and at the Sun general site.

ROLAP (Relational On-line Analytical Processing) A data analysis environment using RDBMS data structures and query language implementations and techniques.

(See *OLAP and Data warehouse.*)

Root class A class in object oriented programming that is at the root of the class hierarchy and which may be shown using a class diagram. This means it does not inherit from superclasses, but has only subclasses.

(See *Class, OO, Object and Objective-C.*)

Route 1. *Noun*: A path taken by a packet or message which leads from a sending device to a receiving device. The path might involve the interaction with software components which may form part of an OO distributed system.

2. *Verb*: An action taken in order to send or forward a packet or message to a receiving device, or even software component.

(See *Screening router*.)

Router A device which receives and routes messages between network systems, or between complete networks. The messages may be packets, cells or frames, depending on the protocol used.

(See *Protocol, Frame relay, Packet switched network Screening router*.)

Routing An action which sees a packet, cell or frame, allocated a path.

(See *Protocol, Frame relay, Packet switched network Router, and Screening router*.)

RS232 A standard from the Electronic Industries Association (EIA) for the serial transmission of data over relatively short distances, but greater than those internal to most computer systems. Standard representation of digital data, using TTL for example, is limited in terms of transmission distance. To overcome this, signal strength is broadly increased. RS232 represents an industry standard for achieving this, increase transmission distance, and give interchangeability of computer peripherals.

RSA (See *Cryptography*.)

RSA A public-key or asymmetric cryptosystem or algorithm developed by MIT professors Ronald L. Rivest, Adi Shamir, and Leonard M. Adleman in 1977. It is used by numerous e-commerce site developers and e-commerce product vendors. Its aim is to make difficult the derivation of the private key from the public key using a one-way function. For example, if the public key is a known function of x , $f(x)$ it may be made theoretically difficult to determine the unknown x that is the private key. The same cannot be said of the reverse, where x is known and $f(x)$ is unknown, particularly in the case of factorising. This was illustrated in 1977 when RSA-129, a 129-digit integer, was published by Martin Gardner in *Scientific American*. He laid down the gauntlet, challenging readers to factorise it, for which they would receive a small cash prize. Not until March 1994 was it factorised by Atkins *et al*, using the resources of some 1600 computers and the quadratic sieve factoring method that has been superseded by the more economical general number field sieve.

(See *Cryptography and Brute Force, RSA Factoring and RSA*.)

RSA One-way function The so-called one-way function is appropriately effective when attempting to factorise the product of two large primes. Using RSA, this is implemented as follows:

1. Two prime numbers are selected: p and q
2. Calculate their product n , or the public modulus
3. Another chosen number $e < n$
4. e is relatively prime with $(p - 1)(q - 1)$
5. e and $(p - 1)(q - 1)$, therefore, have only 1 as their common factor
6. Calculate $d = e^{-1} \bmod [(p - 1)(q - 1)]$
7. e is the public exponent
8. d is the private exponent
9. The public key is the pair, (n, e)
10. The private key is the pair, (n, d)

The chosen prime numbers p and q may be kept with the private key, or destroyed. Using PGP, p and q are retained in encrypted form and help expedite operations through the Chinese Remainder Theorem. The reverse process is difficult, thus obtaining the private key (n, d) from the public key (n, e) is deemed secure. Factorising n would result in p and q , leading to the private key (n, d) . The encryption process involves:

dividing the target message into blocks smaller than n

modular exponentiation: $c = m^e \bmod n$

Decryption or the inverse is driven by: $m = c^d \bmod n$

RTP (Real-time Transport Protocol) A protocol that supports real-time audio/video communications.

(See ASF.)

Rule-based A software solution that relies upon rules or heuristics for decision making.

(See AML.)

S

SAA (Systems Application Architecture) A strategy initiated by IBM for enterprise computing, which defines the three layers:

- Common User Access
- Common Programming Interface
- Common Communications Support.

Sample A digital value derived from an analogue source.
(*See ADC and ISDN.*)

Sales Ledger A listing of sales that may include the date of sale, the product description, the product code, the net cost, and the total cost including a breakdown of sales taxes and shipping charges, and other miscellaneous charges that may include that of storage.

Sampling rate (or frequency) A frequency at which an incoming analogue signal is digitised. The sampling rate of an ADC influences the effectiveness of conversion.

SAP R/3 A client server development environment, which is the successor to SAP R/2. The transition was a response to the shift from the two-tier client/server model to the three-tier client/server model. The product is used globally, and came to prominence through its application in German industry, notably the automotive sector.

(*See Client/server, Three-tier client/server and Two-tier client/server.*)

Satellite system A medium or communications technique which uses orbiting satellites fitted with microwave antennas. These provide line-of sight communications with microwave antennas at earth stations. Applications are used extensively in telecommunications, and in television broadcasting. Geo-stationary satellites orbit above the equator, revolving in unison with the earth, hence they are stationary relative to the earth's rotation. The concept was originated by science-fiction writer, Arthur C. Clark.

Scanner A device used to digitise printed material such as photographs. With optical character recognition (OCR) software, a scanner may be used to convert text into machine readable form. Types of scanner include:

- Hand-held scanners typically offer a scanning width of around 10 cm. Operation involves passing the scanner over images to be digitised.
- Flat-bed scanners are the most popular. Paper handling is comparable to that of a photocopier. Flat-bed variants can allow complete A4 or A3 pages to be scanned, and are ideal for digitising manuscripts, together with illustrations. If digitisation of a significant amount of material forms part of development, then a flat-bed scanner is essential. Conversion of text into a computer readable format requires optical character recognition (OCR) software.
- Sheet-fed scanners are easier to use than hand-held scanners. Paper handling approximates that of fax machine where motorised rollers simply pass sheets over the scanning array. A principal disadvantage is that bound publication pages have to be removed before they may be scanned.
- Drum scanners are very highly specified and tend to be used by commercial printers and bureaux. They offer very high resolutions that provide true photographic-quality images.
- Slide scanners enable the production of images using 35 mm slides alone.

Scanners may be greyscale or colour. The simplest greyscale variants will produce 8 bit images so generating images with 256 (2^8) grey scales. More sophisticated colour versions may generate colour images using 24 bits per pixel so producing 16.7 million (2^{24}) colours. Image depths of 30 bits, 32 bits or 36 bits may also be supported. Most scanners come complete with scanning software, picture editing programs and OCR (Optical Character Recognition) software. Such software may be essential in the production stage of multimedia, and also in electronic publishing when transcribing older texts into digital form. Drivers supplied with a scanner do much for compatibility with various software packages. For example, a standard Twain driver will allow the scanner to be used with Twain compliant programs like HiJack Pro. Equally HP Scanjet drivers are allowing the device to understand HP protocols.

Schema A database architecture showing tables, indexes, rules, and links. An ER diagram may be considered a schema.

SCM (See Supply Chain Management.)

Screen refresh rate

(See Refresh rate.)

Screen scraper A client/server software component or function that removes or 'scrapes' display information from requested data and formats

it so it may be displayed by the client system. It can also do the same for outgoing traffic from the terminal or client system.

(See Client/server and client/server.)

Screened subnets A subnet which restricts TCP/IP traffic from entering a secured network. The screening function may be implemented by screening routers.

(See Firewall, Screening router and Security gateway.)

Screening router A router variant able to screen packets that match a predefined criteria, including the:

- source address
- destination address
- protocol type.

(See Firewall, Packet filtering and Security.)

Script A series of instructions that can be interpreted by a program, and are sometimes referred to as macros. Scripts can sometimes be generated through menu selections or by writing code.

(See VBScript and Perl.)

SCRIPT_NAME A CGI variable that holds the name and path of the CGI script being executed.

Script-based authoring tool A multimedia authoring system/environment which requires coded program sequences or scripts. They are generally difficult to use for non-programmers.

Scripting A scripting language such as VBScript or JScript may also be perceived as a glue, as may be HTML.

(See JScript and VBScript.)

Scroll bar A user-interface component that is used to scroll an image of text that is too large to be shown in the display area. Horizontal and vertical scroll bars are available.

SCSI (Small Computer System Interface) A universal and internationally agreed interface standard backed by ANSI (American National Standards Institute), intended to provide interchangeability between peripherals and computer systems from different manufacturers. Apple Computer has long since realised the importance of SCSI fitting Macintosh machines with appropriate controllers. The SCSI continuum approximates:

- SCSI-1
- SCSI-2

- Wide SCSI
- Fast Wide SCSI
- Ultra SCSI.

(See Firewire and Fibre channel.)

SDK (Software Development Kit) A library of functions that can be used to implement specific solutions. Microsoft SDKs are numerous, and include those associated with:

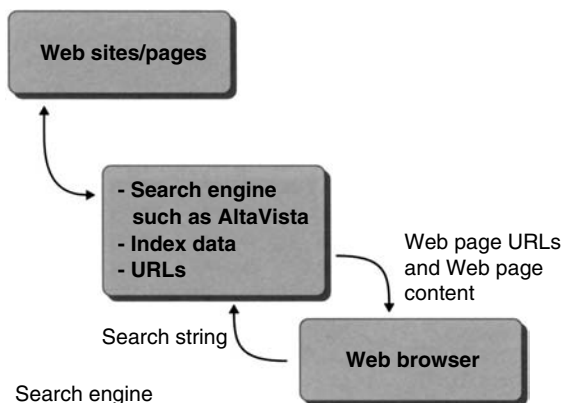
- ActiveX
- Java
- NetMeeting
- Design-Time Control
- Active Template Library
- OLE DB.

SDRAM (Static Dynamic RAM) A type of random access memory (RAM) that offers a comparatively short access time. Such access time is measured in nano seconds (nS), or billionths of a second.

Search engine 1. A site used to retrieve documents from the World Wide Web that operates using gathered and evolving indexes stored locally. The indexes are not common to all search engines, though they share a standard format which dictates that the document's:

- heading is enclosed by HTML <TITLE> tags
- description consists of the 200 characters that follow the <BODY> tag, or the matter enclosed by <META> tags.

The interface permits the entry of search words and phrases that may include logical operators. Popular search engines include AltaVista, Yahoo and HotBot.



A HTML tag may be used to enclose descriptive meta data that can be used by search engines as an alternative to the 200 characters that follow the <BODY> tag.

```
<HEAD>
  <TITLE>Francis Botto home page</TITLE>
  <META name="description" content="IT Research">
</HEAD>
```

Francis Botto

IT Research

The <META> tag may also be used to add keywords of up to 1,000 characters to Web page, and may be retrieved through appropriate search phrases, i.e.:

```
<META name="keywords" content="Multimedia, MPEG, DVD">
```

A HTML tag that encloses the Web page title is used as meta data by popular search engines when retrieving Web documents, displaying it as the document's title. Such data is collected by search engines periodically, but may remain transparent if your ISP uses a robots.txt file to stop web robots from indexing Web pages. It is possible to determine if a server has a robots.txt file by entering the Web page's URL (including its domain name and domain category) and including robots.txt as a suffix:

- <http://www.FrancisBotto.com/robots.txt>

Sending Web page URLs to search engines may cause them to be categorised as available via additional search words and phrases, other than those contained in the Web pages themselves. (*See <TITLE> and HTML.*) 2. A feature that permits a Web site to be searched.

(*See <META>, <TITLE> and HTML.*)

Search string A single word, phrase, sentence (or a number of words, phrases, sentences) for which a document or number of documents are searched. A search engine or retrieval system retrieves documents (or document details) based on the search string. Search engines and retrieval systems support wild cards and logical operators. For instance, if it were necessary to find documents containing the name Van Gogh along with the city Amsterdam, using logical operators you would use the phrase 'Van Gogh' AND Amsterdam.

(*See Search engine.*)

Second generation language A programming language where instructions are represented by concise mnemonics. The language is said to be a

second generation language. Such ‘assembly languages’ are indigenous to processors. Often the terms assembly language and machine code are regarded interchangeable.

Secure Mail An e-mail that is suitably encrypted.

(See *Cryptosystem and RSA*.)

Secure Systems A system that has cryptosystems integrated into its design.

(See *Cryptosystem and RSA*.)

Secure transaction A transaction that is made secure using cryptography.

Security A method of restricting access to applications, data and systems to their intended users.

The term may include automated virus checks on incoming documents, and on executable code such as Java applets and ActiveX controls using security gateways. Firewall technology is key to Web security, as is data encryption and password protection. Security is paramount to organisations deploying corporate data, and for companies running e-commerce Web sites (such as Amazon, for example). Security standards include those developed by the United States Department of Defense, and named the Trusted Computer Standards Evaluation Criteria, which are otherwise known as the Orange Book. This was introduced in 1985, and was originally aimed at mainframe and mini computers for many years. It is also applicable to databases and to networks, through the Trusted Database Interpretation, and the Trusted Network Interpretation. The Orange Book is a multi-tier set of guidelines, including:

- Level D1, which is the lowest level of security, rendering the system untrusted.
- Level C1, which is a discretionary security protection system, requiring a login name and password, and access rights are allocated.
- Level C2, which includes Level D1 and Level C1 security, and integrates additional security features. For instance, this level requires the system’s relevant events be audited.
- Level B1, or Labelled Security Protection, which provides tiered security. Compliance sees object permissions that may not be changed by file owners.
- Level B2, or Structured Protection, requires the labeling of all objects.
- Level B3, or Security Domains level, which requires terminal connections via a trusted path.
- Level A, or Verified Design level, is the highest Orange book security level.

(See *Security gateway, Encryption, Firewall, Packet filtering, Risk exposure, Screening router, SET and Web site security*.)

Security boundary Also known as security perimeters, such boundaries encapsulate systems, software, objects, etc. They may be implemented in software, hardware using firewalls, passwords, encryption, and the assignment of dongles to users. Boundaries exist at a number of different levels including:

- Physical, which covers tangible resources such as systems
- Application, which cover access rights to applications
- Data, which covers access and editing rights to data
- System, which dictates who may log on to a network or system.

(See *Firewall*.)

Security gateway A security layer that fortifies a network against hostile virus attacks, by screening incoming executables and data. The executables might be Java applets, ActiveX controls or plug-ins. Each of these represents a potential threat, not just in terms of viruses, but in terms of what they may do to client-side documents, files and even system files such as those concerned with the initialisation of Windows variants. For instance, an ActiveX control might take control of a client's Word documents, performing operations on them, such as convert them to HTML, and then possibly abstract them, for display or even processing on a remote Web site. For many security managers, this is unacceptable behaviour. Additionally, the unregulated Internet means that virtually anyone can deploy applications that can potentially damage clients. It is desirable, therefore, to attempt to check and possibly screen such inbound traffic. Such a comparative centralisation of the anti-virus security layer, makes redundant the need for standalone variants on clients, though these may still be employed particularly if removable media are being used for file transfer. Such a security gateway may:

- provide multiple OS support, such as Windows, DOS, Netware, though many are confined to Windows NT.
- support ActiveX, Java, cookies, plug-ins, JavaScript, JScript, VBScript and various executables.
- check all Java classes on downloaded applets.
- provide intelligent filtering features.

(See *Firewall and Security*.)

Security protocols A protocol that integrates a cryptosystem.

(See *SHTTP*.)

Security proxy A Web proxy that integrates security features that are used to authenticate connections to servers.

(See *Firewall, Security and Web proxy*.)

Semantic Visual Café A visual programming development tool.

(See *Visual Basic*.)

Semaphore A communications method, involving physical signaling, which was invented by the French in 1792. Even today the semaphore principle is applied in programming, where flags may be used to relay certain states and events. In computer terms, Semaphore may be applied to coordinate processes.

Sequential prose A continuous stream of linear text.

(See *Hypertext and Nelson, Theodore.*)

Serial port An input/output port through which data is transmitted and received sequentially. RS232 is a standard serial port used to transmit serial digital information over modest distances to connect communication devices and other serial peripherals to computers. The PC COM (COMMunications) ports are serial ports.

(See *Firewire and USB.*)

Server 1. A Web server may be considered as the software implementation that serves HTML pages, etc. Commercial examples include:

- Microsoft IIS
- Apache server

(See *Web.*) 2. A transaction server is allocated the task of transaction processing (TP), and often invokes the application logic necessary to perform database interactions and manipulations. The process(es) invoked directly or indirectly by the client are collectively referred to as the transaction. Transaction servers may include UI logic, driving the client UI, relegating the client device to little more than a dumb terminal. Typically, mainframe based transaction systems might adhere to this model. Alternatively, the UI logic, or presentation may be distributed to the client. The server consists of a TP monitor that performs transaction management and resource management. Transaction management ensures the so-called ACID properties of transactions. These include Atomicity, Consistency, Isolation and Durability. ACID property compliance is achieved through the two-phase commit protocol. (See *ACID and Two-phase commit.*) Resource management is intended to optimise the use of resources that include memory, mass storage and processing. It may also be involved with load balancing between resources and between the software processes that may be threads. (See *MPP.*) 3. An entity that serves clients. The services provided might include the implementation of processes and the distribution of data, and may be categorised under:

- Fax, where the server provide fax reception and transmission facilities for connected client systems.
- Database, in the client/server configuration in which SQL requests from the clients perform the necessary data requests.
- Communications, which enable client systems to make remote connections to external networks and servers.

- Print, where the server is dedicated to printing locally or remotely.
- File, where a centralised server, perhaps connected to RAID storage devices, is utilised by clients to provide high-volume data storage, and high performance disk access and data transfer rates.
- Transaction, where the server updates data which may form part of a simple client/server two-dimensional database, or warehouse data that may be multidimensional (in data cubes) or even hyper-cubes.

(See *Data warehouse and entries listed below.*) 4. A Web server is the hardware platform that supports one or Web sites. Traditionally, Web servers have been based on the Unix or Windows NT OSs. 5. An intranet server may be considered in the same terms of a Web server, but with a security perimeter to prevent public access. 6. A peer-to-peer server is a system on a network in which the resources of any connected system may be shared. While any system on a peer-to-peer network might be a server, typically the most highly specified system performs as a server. 7. A file server provides centralised resources for network users. 8. A database server provides centralised data storage. 9. An object or application that serves an application or object with embedded or linked data. The server might be OLE 2.0 compliant, or may conform to another component architecture. (See *ActiveX, Object and OLE.*) 10. A CD-ROM server dynamically distributes requested information from CD-ROM drives to LAN users. If the maximum number of drives per server is exceeded, additional servers are added. The incorporation of additional servers, prior to reaching the network maximum of drives per server, leads to better service for users. There are several commercially available CD-ROM network packages, many of which are software orientated. 11. A video server is a hardware solution that provides the basis for a Video-on-Demand (VoD) service. It may be implemented using MPP. Advantages of such parallel processing systems include scalability, where growing numbers of subscribers to a VoD service may be accommodated through additional processors, and even complete servers. (See *MPP.*) 12. A video, audio or multimedia server serves client systems with streaming media. (See *ASF, Streaming and e-commerce web site development.*) 13. A WAP server provides WAP applications to mobile users. 14. A 3G server provides 3G services to users. 15. A GPRS server provides 2.5G GPRS services to users.

Server application A term used to describe a server-side application that may drive, or provide services for client applications and systems. The latter tier is the front-end, with which the user interacts. Between the back- and front-end applications is middleware or glues which exist at a number of levels. These may bind together and coordinate application logic, data and presentation distributed across the back- and front-ends.

(See *Application, Client/server, Front-end and Glues.*)

Server crash A state where a Web server is rendered inoperable by a hacker who has in some way overloaded the services it provides perhaps by:

- Subjecting the server to excessive e-mail traffic
- Using a program that continually attempts to access content files.

(See *Hacking*, *See Brute Force*, *cryptosystem*, *RSA*, *public key encryption*, *asymmetrical* and *Dictionary attack*.)

Server object An object that runs on a server or at some location at tier 3. (See *3-tier*.)

SERVER_NAME A protocol that contains the name of the host on which server is running.

SERVER_PORT A CGI variable that holds the port on which server is running.

(See *CGI variables*.)

SERVER_PROTOCOL A CGI variable that contains the protocol version.

SERVER_SOFTWARE A protocol that holds the name and perhaps version of the server software.

Service An entity that may be used to provide functions of some kind that may be relevant to users, devices, applications or to other services that are typically on a network. Jini services are an example, and may provide access to communications applications, printers, remote residential networks, etc.

Servlet A Java program that exists on the server-side and publishes services which may be dynamic Web content to clients, and coexists with an HTTP server. Servlets are compiled, support threading, and may be added to Web sites using programs like JRun or a Java module for the Apache server. An e-commerce site may use a servlet that is perhaps based on the `HttpServlet` abstract class which provides support for handling requests from the client-side, and responds to them accordingly. Servlets may be loaded either:

- when specified using a URL
- or when the Web server starts.

The Web server calls the servlet's `init` method to begin, and the servlet calls `service`, `doGet`, or `doPost` method requests to serve requests. When unloaded the servlet may invoke the `destroy` method to release itself from committed resources and to save state changes to a persistent state, and these may be retrieved using the `init` method. When called the `init` method is passed a `ServletConfig` object that holds configuration information about the particular Web server implementation including the `initArgs` parameter

that is held in the servlet properties file, and is obtained by calling the `config.getInitParameter("parameter")` method. Servlets may also interact with, and make use of, EJBs (Enterprise JavaBeans). A HTTP servlet may handle requests and responses using its `service` method, and accepts the:

- `HttpServletRequest` object that holds the client's sent headers and streams.
- `HttpServletResponse` object that holds the servlet's output stream response.

SET (Secure Electronic Transactions) A standard means of securing payment transactions made to on-line merchants. Integrating cryptosystem techniques, it is perceived as a credit card security system, and was initiated by Visa and Microsoft. SET implementations are an amalgam of cryptosystems, protocols, secure protocols and techniques.

(See SET and Cryptography.)

SET application An application that uses the SET internationally agreed technologies and methodologies.

(See SET.)

SET ASN.1 (Abstract Syntax Notation One) A standard that defines the encoding, transmission and encoding of data and objects that are architecture neutral.

SET Baggage A method of appending ciphered data to a SET message.

SET CDMF Commercial Data Masking Facility. A ciphering technique based on DES that is used to transfer messages between the Acquirer Payment Gateway and the Cardholder in SET implementations.

SET Certificate Authority A trusted party that manages the distribution of SET digital certificates, where layers of the Tree of Trust has the representation of a digital certificate.

SET certificate chain A group of digital certificates used to validate a certificate in a chain.

SET certificate practice statement A group of rules that determine the suitability of certificates to particular applications and communities.

SET certificate renewal An event that sees the renewal of a certificate for continued transacting purposes.

SET Consortium An international organisation that was formed when Mastercard and Visa announced SET, whose initial objective was to create an agreeable standard, and to consider STT and SEPP.

(See SET.)

SET digital certificate A means of linking an entity's identity with a public key and carried out by a trusted party.

SET digital signature A digital signature may be applied to an encrypted message. A message digest is ciphered using the sender's private key and then appended to the message, resulting in a digital signature.

SET E-wallet An element of a cardholder that creates the protocol and assists in the acquiring and management of cardholder digital signatures.

(See Digital certificates and SET.)

SET Hash An element that reduces the number of possible values using a hashing function such as the Secure Hashing Algorithm (SHA-1).

SET Idempotency An attribute of a message that sees repetition yield a constant result.

SET message authentication A process or usually sub-process that verifies that a message is received from the appropriate or legal sender.

SET message pair Messages that implement the POS and certificate management in a SET implementation.

SET message wrapper A top-level data structure that conveys information to message recipients.

SET order inquiry A pair of set messages used to check the status of orders.

SET Out-of-Band An activity that is not within the bounds of the SET recommendations, guidelines and standards.

SET PKCS Public Key Cryptography Standards. A set of public key cryptography standards used by SET which include:

- RSA
- Diffie-Hellman key agreements
- Password based encryption
- Extended certificate syntax
- Cryptographic message syntax
- Private-key information syntax
- Certification request syntax.

(See Cryptography.)

SGSN *(See 2.5G.)*

SHA-1 Secure Hashing Algorithm. A mechanism for reducing the number of possible values.

Shannon's theorem A theorem that may be applied to give the maximum data transfer limit over a given medium such as an access technology:

$$I = F \log_2(1 + S/N)$$

F = bandwidth

S/N = signal-to-noise ratio.

(See *56.6 Kbps, Access Technology and Modem.*)

Shareware A distribution channel that sees software initially provided free of charge, and is usually made usable for a fixed trial period, after which a registration fee may or may not be required. On payment of the registration fee, the software is supported by its vendors.

Shell 1. A means of entering commands using Unix and other similar operating systems. Unix shell may be considered as performing a similar task to the command line interpreter associated with DOS. 2. A term used to describe the framework of an expert system. The shell is occupied by a knowledge base that consists of IF...THEN rules that are used to solve entered problems. The knowledge (or rule) base is interpreted by an inference engine.

Shockwave A streaming multimedia technology that uses AfterBurner compression. Its producers, Macromedia, also produce the popular Director and Authorware programs. Essentially, the technology is used to deploy Director movies over the Web, and can also be applied to applications that depend on the Lingo multimedia authoring language. Web Browsers may be enabled using a Shockwave plug-in.

(See *Lingo and Streaming.*)

Shopping basket A metaphor used by e-commerce sites so customers may accumulate products for purchase.

(See *Shopping cart.*)

Shopping cart An element of an e-commerce site that permits items to be collected and purchased at a virtual checkout. Typically items are written to the client as cookies and their information is read by the e-commerce site when the final purchase is committed and the transaction is made. Another method of implementing shopping carts involves the use of forms and hidden fields, and remedies situations where the cookie function on the browser is turned off, or when the browser does not support cookies. A number of shopping cart implementations are available free, and one may be found at www.eff.org. An alternative to using a shopping card might be to create an order form

that is embedded in an HTML page using an appropriate scripting language or you may prefer to rely on the forms and templates provided by a Web development tool.

S-HTTP A means of seamlessly integrating encryption into HTTP. It was developed by Enterprise Integration Technologies, and supports RSA, DES, triple DES and DESX.

(See Encryption.)

SIG Special Interest Group.

Signature A means of securing transmitted matter that includes e-mail messages, and requires a Digital ID that may be purchased from many sources.

SIM (Subscriber Identification Module.) *(See 2G.)*

SIM chip *(See 2G.)*

Site Server A Microsoft solution for enhancing, deploying and managing e-commerce Web sites.

SITPRO Simpler Trade Procedures Board (U.K.)

SK8 ('Skate') A multimedia authoring tool/environment developed by Apple Computer.

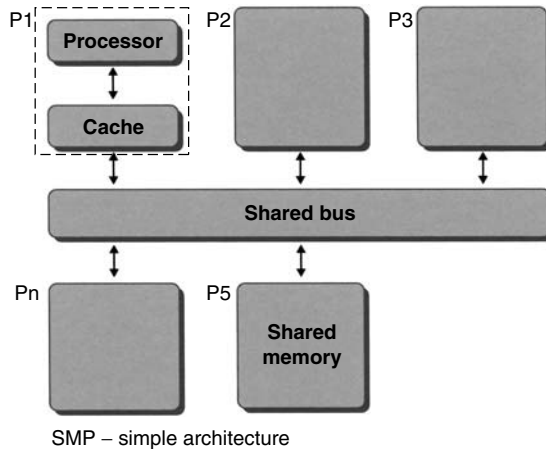
Skeleton A server-side program that accepts methods along with their parameters, and performs the necessary state changes and invocations on relevant remote objects.

SLIP (Serial Line Internet Protocol) A protocol often used for serial data transmission over media that include access technologies such as POTs.
(See PPP.)

Smalltalk An OO programming language.
(See OOP.)

SmartCard A credit-card size device that has an embedded processor chip that can store digital certificates and an e-purse that is a stored cash value for small purchases.

SMP (Symmetric Multi-Processing) A system architecture comprising multiple processors that share an interconnecting bus and memory. Such systems are applied as servers, and such processor designs as the Intel Pentium Pro are optimised for SMP. SMP systems offer processor scalability, but not in the precise processing increments associated with MPP systems. Unlike



MPP systems, limitless scalability is prohibited by the interconnecting bus bandwidth that is shared.

(See *MPP and NUMA*.)

SMPTE Society of Motion Picture & Television Engineers.

SMTP (Simple Mail Transport Protocol) A protocol used to transmit e-mail messages over the Internet, and across other compatible IP networks

(See *TCP/IP*.)

Sniffing A term used to describe the use of a sniffer program to monitor data traffic to a network or server. It may be applied to gather illegal passwords and IDs for ISP accounts, and passwords to mail accounts, and passwords to remote systems.

(See *Firewall*.)

SNMP (Simple Network Management Protocol) A protocol or set of rules for the exchange of operational statistics over the Internet. Such statistics may be Web server hits, or specific to routers that store the number of bytes, packets, and errors transmitted and received on each interface (port).

SOAP SOAP is an Internet protocol for XML Web services, and has a:

- Framework and content defining envelope.
- Rule set for handling data types.
- A convention for RMI (remote procedure calls) and responses.

Socket An interface that offers a peer-to-peer endpoint, and has a name and an address. Datagram sockets interface with UDP, Stream sockets interfaces with the TCP protocol, and Raw sockets interface with protocol levels which include the IP network layer. Berkeley sockets are the best known sockets for TCP/IP stack communications and were introduced in 1981. They have many variations, including the Microsoft WinSock API which is standardised TCP/IP implementation for Windows.

socket 1. A file descriptor allocated using `socket(2)` – in a BSD context. 2. A data structure allocated when a kernel's `socket(2)` is called – in a BSD context. 3. A socket may serve the same purpose as an IP port.

(*See Port.*)

Software Distribution A method of delivering software to users. Software distribution can be done by downloading from the Internet. Other distribution media include floppy disk, CD-ROM and DVD-ROM. The first commercial CD-ROM software distribution disc from a major producer was Microsoft Office. Farallon Computing released lesser known programs on CD-ROM prior to this, as did Microsoft itself. Also PC Sig released the world's first shareware compilation on CD-ROM in the US. Used as a distribution medium, DVD-ROM presents vendors with new opportunities: spare storage space may be used for program demonstrations, program documentation, training material and advertising using DVD (MPEG-2) video. Currently most leading software producers distribute their programs on CD-ROM, but a swing to DVD-ROM is imminent.

(*See CD-ROM and DVD.*)

Software key A method for unlocking encrypted data. It allows the customer to unlock the products purchased contained on a CD-ROM.

Sony Vaio A popular family of notebook PCs from the Sony Corporation, each including the iLink connector which is synonym for FireWire or IEEE1394.

Sound card A plug-in card which permits wave audio recording, multi-voice sound synthesis and speech synthesis

SoundBlaster A range of sound cards produced by Creative Technology.

SOX (Schema for Object-Oriented XML) A data description language that uses the XML data model to produce XML documents. Commerce One developed SOX to improve XML's data abstraction capability by improving communications with databases. SOX extends XML using:

- extensible set of data types

- object-oriented concepts such as inheritance
- namespace enhancements
- embedded documentation support
- polymorphic content, which allows instances to use element types from numerous schemas.

SOX enables developers to use XML/SOX processors to transform SOX documents into programming language code, XML DTDs, and into documentation. (See *xCBL*.)

SPAM A form of unsolicited e-mail: the Internet equivalent of junk mail. The originators of such e-mail are termed Spammers, and known Spammers may be filtered using appropriate software.

Speech recognition A technique by which a computer is able to recognise speech and perform tasks. Modestly specified speech recognition programs recognise a modest number of words. Commercial examples include Creative VoiceAssist and Microsoft VoicePilot (included in Microsoft Windows Sound System), both of which provide a means for operating Windows and Windows applications using voice commands. More advanced speech recognition systems are voice-independent, dictation systems, such as IBM ViaVoice, and competing, successful products from Dragon Systems.

(See *ViaVoice*.)

Speech synthesis A process of generating recognisable speech using digital data. Currently, most speech synthesis programs operate by combining a predefined set of phonemes. Such programs are sometimes called text-to-speech convertors. Commercial examples include Creative TextAssist which reads text, and ProofReader (supplied with Microsoft Windows Sound System) that read monetary and numeric data. TextAssist is useful for proof reading long documents in Windows applications. ProofReader is aimed at reading data entered in real-time. Both tools serve to increase productivity. Other commercial speech synthesis programs include Textto'LE that can be embedded into documents as an OLE object. Occasionally, the vocabulary of speech synthesis programs may be increased using a predefined set of phonemes, or sometimes it is necessary to add wave audio files.

spider A Search Engine Robot that reads your webpages and metatags.

Split shipment An instance where an order cannot be shipped fully, but must be shipped in part at various stages.

Sprite A screen image confined to a limited number of pixels, often used as 'characters' in computer games, and pointers in GUIs. Highly mobile, they may be defined by hardware or software.

SPX/IPX A network protocol.

SQL (Standard Query Language) A non-procedural language that is used to manipulate data stored in a relational DBMS. Like other procedural languages that include Prolog, it does not have a rigidly defined series of operations to perform a function. Some thirty commands are included in the SQL specification, of which a recent version is SQL-92. However, third-parties have extended it to semi-proprietary variants. The language permits:

- the creation of table structures
- the entry, correction and deletion of data
- the databases to be queried, to satisfy perhaps data requests.

The SQL syntax is easily learnt and understood as it depends heavily on English words and phrases. For example, creating a database requires the statement:

```
CREATE DATABASE datawarehouse
```

Further reading

Date. C. J., *A Guide to the SQL Standard*, Addison Wesley, 1987. (This text describes the original SQL standard.)

(See *Data warehouse, C++, Java and OOP.*)

Square mile A financial centre in the city of London.

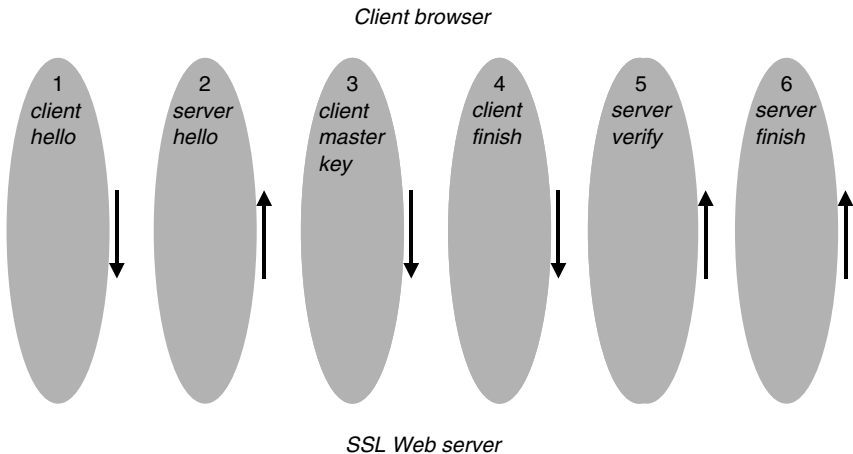
SRAM (Static Random Access Memory) A volatile form of electronic memory which is not constantly refreshed. It therefore consumes less power.

SSL protocol (Secure Sockets Layer protocol) A secure channel or protocol that is supported by the TCP transport protocol. It includes the higher level protocol SSL Handshake Protocol that authenticates the client and server devices, and allows them to decide upon an encryption algorithm and keys before data reception or transmission commences. Its ability to allow high level protocols to sit on top of it is perceived as an advantage. Used alone, SSL is not perceived as a complete security solution, though it does present one significant security perimeter in the eyes of many security analysts. It ensures a secure connection by authentication of peer's connection and uses integrity checks and hashing functions, to secure the channel between applications. It was designed to prevent:

- Information forgery
- Eavesdropping or sniffing
- Data changes.

Private or symmetric key is the basis of the SSL's cryptography, and it authenticates a peer's identity using asymmetric cryptography.

SSL handshake



SSL's flaws are documented widely and include:

- When a browser connects with an SSL server, it receives a copy of its public key wrapped in a certificate that the Browser sanctions by checking the signature. The flaw here is that the Browser lacks the means to authenticate the signature, as no verification is performed up the hierarchy because many certificates used by SSL are root certificates.
- It consumes client and server processing resources.
- It has operational difficulties with proxies and filters.
- It has operational difficulties with existing cryptography tokens.
- Its key management tends to be expensive.
- Expertise to build, maintain and operate secure systems is in short supply (1999).
- It creates network traffic when handshaking.
- The migration path from non-public key infrastructures is arduous.
- It requires Certificate Authority with appropriate policies.
- Its communication data does not compress and therefore steals network bandwidth.
- It is subject to certain international import restrictions.

(See *SSL, RSA and cryptography*.)

SSL Web Server A web server that supports the Secure Sockets Layer protocol.

(See *SET and SSL protocol*.)

SSL-enabled Web Server (See *SSL Web Server*.)

Stack A contiguous series of memory locations utilised as a storage area. It is a LIFO (Last In First Out) system because the order in which items are dispensed opposes that in which they were deposited. A stack is sometimes called a push-down store. It may be used to store the return addresses from subroutines.

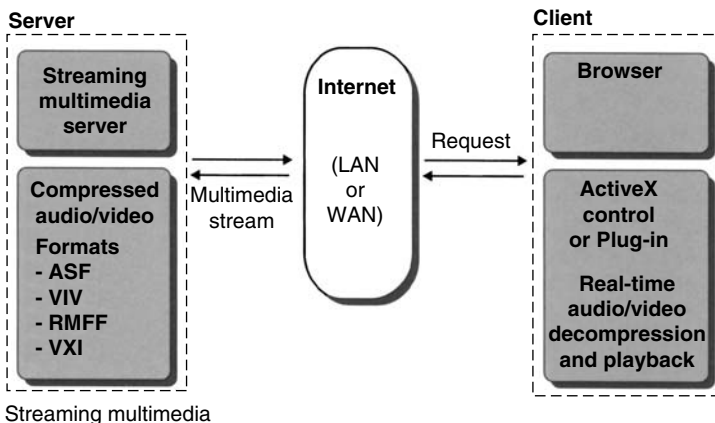
Start button A button that provides single-click access to the main menu system in Windows 95/NT. By default it appears at the bottom left of the screen and is anchored to the Task bar which underlines all applications. The menus that result from the Start button may be navigated by dragging the mouse, and highlighted menu items may be run by clicking them once. The Start button and Task bar were introduced into the Windows 95 design in order to replace the Program Manager.

stickiness (of web sites) The time spent at a site over a given period.

Store and forward agent An object or event generator that uses an intermediate object to relay notification of events to objects or event listeners that have expressed an interest in hearing them.

Streaming 1. Streaming audio. A method of playing audio while the audio stream is being downloaded. Streaming audio plug-ins are available for popular browsers such as Netscape Navigator. Such plug-ins are useful for tuning into radio broadcasting services on the Web. 2. Streaming video. A method of playing video while the video stream is being downloaded. Streaming video plug-ins are available for Netscape Navigator, while equivalent ActiveX controls operate with Microsoft Internet Explorer. (See *ASF and Microsoft NetShow.*)

Streaming media A means of distributing audio, video and multimedia in real-time over the Web or similar TCP/IP network such as an intranet.



Strong Cryptosystem A cryptosystem that is considered safe from attacks, and is difficult to crack using known techniques.

(See *SET*, *Brute Force*, *cryptosystem*, *RSA*, *public key encryption*, *asymmetric* and *Dictionary attack*.)

Structured programming A programming model which consists of procedures or subroutines, and has no GOTO commands in order to direct program execution unconditionally. All modern high-level languages may be assumed to comply with structure programming. One of the first implementations was structured BASIC that was launched in 1982 by Acorn Computer. It was integrated into its Acorn BBC microcomputer design in the form of a ROM-based Basic interpreter. One of the earliest structured programming languages was Algol, which was evolved into Pascal.

(See *Basic*.)

Stub A proxy object that is stored locally, and is usually downloaded, and provides an interface with a remote object or service.

Stylesheet An entity synonymous with template that imposes a presentation style on content that may include objects, text strings, graphics, UI components and hyperlinks.

External Style Sheet A template/document/file containing style information that may link with one of a number of HTML documents, permitting a site to be re-styled by editing one file. They may be linked to a HTML document using the form:

```
<HEAD>
<LINK REL=STYLESHEET HREF="style.css" TYPE="text/css">
</HEAD>
```

Embedded style A style attached to one specific document using the form:

```
<HEAD>
<STYLE TYPE="text/css">
<!--
P {text-indent: 14pt}
-->
</STYLE>
</HEAD>
```

Inline style An attached style that affects one element and is specified in the start tag as a value of the `STYLE` attribute:

```
<P STYLE="text-indent: 10pt">Indented paragraph</P>
```

Imported Style Sheet A style sheet that can be imported to (combined with) another sheet, combining:

- main sheet that applies to the whole site
- partial sheets that apply to specific documents.

Form:

```
<LINK REL=STYLESHEET HREF="main.css" TYPE="text/css">
<STYLE TYPE="text/css">
<!--
@import url(http://www.botto.com/fast.css);
@import url(http://www.botto.com/fast.css);
... other statements
-->
</STYLE>
```

Alternate Style Sheet A stylesheet used to define an *alternate* style to those declared as *persistent and/or preferred*. The persistent style is, of course, the default style and may be overridden by the alternate style.

Stylus A pen input device used to interact with, and write to, a computer or appliance. The first stylus was the light pen which was yielded by the US Defense SAGE project, an early warning radar system based upon digital graphics technology. A stylus might be used as a pen with a graphics tablet or bit pad. The stylus is used widely in pen computing with everything from notebook computers to PDAs. In pen computing the user simply writes directly on the screen, and data entry using normal long hand is valid.

Subnet A method of using an IP address so that a greater number of networks may be addressed. IP addresses are designed to accommodate networks that can have between 253 and several million hosts. In many instances, organisations wish to address a number of networks using a class C address. By creating subnets using their IP address, they can link the separate networks using a router. Subnets are created by dividing the last octet of an IP address. The division involves reserving the most significant bits of the octet to provide addressing information for subnets. This may yield one of the following configurations:

- 2 subnets, each with 62 hosts
- 6 subnets, each with 30 hosts
- 14 subnets, each with 14 hosts
- 30 subnets, each with 6 hosts
- 62 subnets, each with 2 hosts.

(See *IP address*.)

Subnotebook A portable computer that is smaller and lighter than conventional A4-size notebook computers.

(See *Notebook*.)

Substitution A cryptography technique that sees characters replaced by other characters.

(See *Encryption algorithm, SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetrical, Transposition and Dictionary attack.*)

Subsystem A physical element of a PC. Subsystems include graphics card, video capture cards, hard disks and sound cards.

(See *Hard disk, Graphics card and Sound card.*)

Sun Microelectronics A division of Sun Microsystems, and manufacturer of Chips that are optimised for the Java programming language, including:

- PicoJava chipset, used in cellular phones, and computer peripherals.
- MicroJava processor, used in network devices, telecommunications hardware and consumer games.
- UltraJava, optimised for use in 3D graphics and multimedia-related computing, much like Intel's MMX Technology.

(See *Java and MMX.*)

Superclass A class of objects that has subclasses which may inherit its attributes and behaviour.

(See *Inheritance.*)

Supercomputer An MPP architecture based on a network of parallel processors.

(See *MPP.*)

Supply chain A course or evolution that begins with raw materials and ends with the sale of a finished product or service, and includes entities such as buyers, manufacturers, distributors, suppliers and consumers. It is an e-commerce company's set of functions that may be internal or external, and allows the value chain to produce products and deliver services to customers. A supply chain includes information, communications and processes that bind the link between the supplier and customer.

(See *Supply Chain Management.*)

Supply Chain Management (SCM) A set of processes and sub-processes that attempt to implement and optimise the functions, connected entities, and interacting elements that are in a supply chain. It addresses a number of key business areas and may be assumed to improve:

- enterprise performance
- corporate growth
- customer service
- order management
- demand planning

- warehouse distribution
- partnerships
- Y2K compliance
- cash-to-cash cycle
- supplier/supply base management

Supply Chain Management's key processes, techniques, networks, channels and infrastructures include:

- information networks
- EDI
- Internet/Web
- Distribution Resources Planning (DRP)
- distributed warehousing
- Drop ship
- multi-sourcing
- Integrated ERP
- Interprise
- supplier scheduling
- virtual corporation

(See Supply Chain.)

Surf An alternative and popular term for browsing the Internet.

SWIFT Society for Worldwide Interbank Financial Telecommunications.

Swing (See Java Swing)

Switched network A telecommunications network that uses switches to route calls from one telephone to the next. A switch matrix may be used to allow intercommunication between connected terminals.

Symbolic constant A symbolic constant has a name, and is assigned an unchanging value. It may be used just like an integer constant. Symbolic constants improve program maintenance and updating: a single change may be made to a symbolic constant that might be used throughout a program. A symbolic constant multiplier may be assigned the value 10 using the C++ code:

```
#define multiplier 10
```

or,

```
const unsigned short int multiplier = 10
```

symbolic link A link that permits multiple references to files and folders.

Symmetric Cryptosystem Operation

Symmetric cryptography A cryptosystem where the processes of encryption and decryption each require the use of a single key. Unless the recipient of the encrypted data already knows the key, it may be left to the sender to transmit its details over a secure channel.

Symmetric Cryptosystem Operation A series of processes and sub-processes that:

- converts plaintext into ciphertext using a cipher or encryption algorithm
- returns ciphertext to plaintext using a decryption algorithm.

Using a symmetric key and the transposition technique, the processes include the following.

Encryption Send the key, such as UNLOCK for example, to the recipient using a secure channel. Arrange the key in a columnar fashion with numerals indicating their alphabetical sequence:

U 6
N 4
L 3
O 5
C 1
K 2

Arrange the plaintext, such as ATTACK VESSEL in columns as shown below:

U 6 A V
N 4 T E
L 3 T S
O 5 A S
C 1 C E
K 2 K L

Create the ciphertext by writing the row values in sequence dictated by the numerical value, i.e.:

CE KL TS TE AS AV

Send the ciphertext to the recipient where a secure channel is optional.

Decryption Again the key characters are assigned numerals indicating their alphabetical sequence:

U 6
N 4
L 3
O 5
C 1
K 2

Symmetric key cryptography

The decryption algorithm takes the ciphertext and, based on the numerical value, it creates the plaintext:

U 6 A V
N 4 T E
L 3 T S
O 5 A S
C 1 C E
K 2 K L

(See SET, Ciphertext, Plaintext, Encryption algorithm, SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetric, Transposition and Dictionary attack.)

Symmetric key cryptography A cryptosystem that uses the same key to encrypt and decrypt messages.

(See SET, Ciphertext, Plaintext, Encryption algorithm, SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetric, Transposition and Dictionary attack.)

T

T1 An AT&T designation for a digital link with a bandwidth of 1.544 Mbps. (See *ATM, Frame relay and ISDN.*)

T2 An AT&T designation for a digital link with a bandwidth of 6.312 Mbps. (See *ATM, Frame relay and ISDN.*)

T3 An AT&T designation for a digital link with a bandwidth of 44.736 Mbps.

T50 An ITU-T designation for Ascii.

T90 An ITU-T designation for image coding that is used by Group 4 facsimile. This uses an ISDN 64 Kbps bearer channel.

Tangible asset An asset that is physical and is normally listed in some form on a company's balance sheet.

Tape streamer A magnetic tape storage device used to backup hard disk data as a contingency measure against data loss or data corruption resulting from system failure or an interruption of the power supply. Data recovery simply involves copying the contents of the tape streamer to a functioning hard disk.

Taskbar A status bar used in Windows 98/NT that underlines all applications. It bears the Start button and illustrates all open applications that may be minimised or maximised. By default the Taskbar also illustrates the time of day. The Windows 95/98/NT user interface centres around the Taskbar, which provides buttons to select open applications, and it anchors the Start button that invokes the Start menu. The Start menu bears options that lead to programs as well as to submenus. Once invoked, the menu system may be navigated by dragging the mouse rather than by clicking on its menu items. Programs are opened through a single mouse click.

(See *Windows.*)

TCP/IP (Transmission Control Protocol/Internet Protocol) A standard network protocol used to transmit or route data from one IP address to the next. Protocols which use TCP/IP include:

- HTTP (HyperText Transfer Protocol).
- HTTPS (HyperText Transfer Protocol Secure), which integrates cryptography and forms the basis of a secure connection and secure site.
- SMTP (Simple Mail Transfer Protocol).
- FTP (File Transfer Protocol).

Unix servers provide numerous commands and daemons that relate to TCP/IP. A standard set of protocols used in packet switched networks, it consists also of standard and nonstandard files, utilities, and daemons. It interprets a standard set of commands. TCP/IP originated from DARPA and ARPANET, and is one of the most established internationally agreed standard protocols. Occasionally, however, it includes proprietary files and programs through specific implementations which include that of Santa Cruz Operation (SCO). (*See ATM and Frame relay.*)

TCP/IP Daemons A daemon is a program or process dedicated to perform what is usually a singular given function, such as sending mail. TCP/IP daemons include those added by third-parties including SCO. The Daemons include:

- DNS (Domain Name Server), which is used to provide IP addresses for given host names.
- SYSLOG (System Logger), which stores messages pertaining to various operational events including status, detected errors, and debugging.
- SNMP, which is an implementation of the Simple Network Management Protocol, and is capable of receiving information from such compatible agents.
- INETD (Super Server), which monitors TCP/IP ports for incoming messages.
- BOOTP, which implements an Internet Boot Protocol server.
- ROUTE, which manages Internet routing tables, and is invoked when booted. The netstat command is used to print the routing tables. Among other details, the resulting listing shows gateways to networks.
- RARP (Reverse Address Resolution Protocol), which is able to provide a 32 bit IP address in response to a 48 bit Ethernet address.
- LINE PRINTER, which accepts incoming print jobs, and queues them for remote printing.
- SLINK, which links STREAMS modules and is included within Unix implementations that use STREAMS-TCP/IP.
- LDSOCKET, which initialises the System V STREAMS TCP/IP Berkeley interface.

Configuration Interfaced devices are configured in terms of IP address, netmask, and operational status using the command:

```
ifconfig
```


Configuration files include:

- /ETC/HOSTS, which provides a lookup table for finding IP addresses for host names.
- /ETC/ETHERS, which provides a means of converting IP addresses into Ethernet hardware addresses. An alternative conversion method is provided by ARP (Address Resolution Protocol).
- /ETC/NETWORKS, which provides a lookup table for IP addresses and their respective network names.
- /ETC/PROTOCOLS, which provides a list of DARPA Internet protocols.
- /ETC/SERVICES, which lists services that are currently available to the host.
- /ETC/INETD.CONF, which monitors a specified port, and invokes daemons when required.

Network access files Access files include:

- /ETC/HOSTS.EQUIV, which contains a list of trusted hosts, and is significant to system security. Each entry is trusted, in that users access their accounts without a password.
- RHOSTS, which lists system and user names, and users are permitted to log in using any name in the file /ETC/PASSWORD.

(See Operating System, Windows and e-business site development lifecycle.)

(See ARPANET, IP address and Security.)

(See IP address, Unix and Firewall.)

TDM (Time Division Multiplexing) A technique by which several different signals may be transmitted concurrently over the same physical link.

Technical specification A document that specifies the technical features and capabilities of software, hardware, or appliance.

Television shopping A application of television broadcasting where the user purchases items that are usually shown and sometimes demonstrated on screen.

Telnet A means of accessing a remote computer, and then using it as if it were a local system. A connectivity mechanism that permits a client system with Internet access to operate a remote computer. The screen images shown on the remote system are also seen on the remote user's client system.

(See CVS.)

Telstra A large Australian telecommunications company.

Template An entity that determines the presentation of a document including its page layout, typestyles, fonts and other content that may include text, fields and tables.

Terminal A system which is interfaced with a system (such as a main-frame computer). Typically it is dumb, meaning that it has no application logic or data, but the mere presentation element of an application.

Terminal Server A server that is used when a number of terminals are connected to a host over a LAN. It therefore provides an indirect connection with the host. Terminal data is assembled into packets that are sent over the LAN. At the host the packets are converted into data streams. The terminals or computers are connected to a terminal server and not directly to the network. Windows NT Terminal Server does all computation and storage and passes back screen updates to the client.

TFT (*See Monitor.*)

Thin client A system within a client/server architecture (such as that of the Web) that features:

- presentation that is typically in the form of a Web browser
- a portion of the application logic.

Many systems connected to the Web may be described as thin clients. Thin clients require less hardware resources, and are therefore cheaper to deploy than fat clients.

(*See Application, Client/server, Fat client and NC.*)

Third generation language A high level language such as Java, Pascal, BASIC, C and C++.

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

thread A processing task/unit implemented by a processor. Within the processor, the thread will have the processor resources associated with a normal running program, i.e. a program counter holding addresses of data and code (operands), a set of registers, and a stack pointer which refers to return addresses from subroutines.

thread-safe code An item of codes that may safely be used by multiple threads.

Thumb An instance of thumbprint.

Thumbprint A hash value that generates or verifies digital signatures.

Tier 0 A device that offers connectivity to tier 1, and sometimes to tier 2 also.

(*See 3-tier.*)

Tier 1 A client-side device or application that connects with tier 2.

(*See 3-tier.*)

Tier 2 A server-side device or application.

(See 3-tier.)

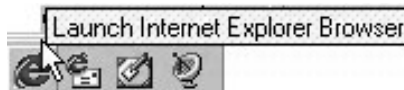
TIFF (Tag Image File Format) An image file format maintained by the Adobe Developers Association (ADA).

TMA (Telecommunications Managers Association) A body whose membership is composed largely of telecommunications managers. Each year there is a TMA convention featuring state-of-the-art communications systems, techniques and standards.

Token ring An IBM-developed network protocol and specification, officially named IEEE802.5.

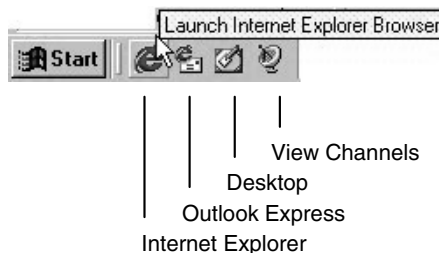
(See LAN.)

Toolbar An array of buttons that provide single-click access to features and/or applications.



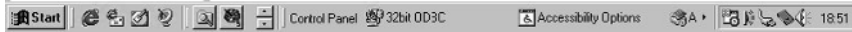
For example, the default Windows 98/2000 Toolbar that is on the right of the Start button, offers single-click access to:

- Internet Explorer Browser
- Outlook Express
- Desktop
- Active channels.



By right-clicking the Windows 98/2000 Taskbar, and then selecting Toolbars, it is possible to select alternatives to that of the default, Quick Launch

implementation. For instance, the Control Panel icons may be placed on the Taskbar as illustrated below:



(See *Windows, Windows Desktop and Active Desktop.*)

ToolBook A multimedia authoring tool for the PC, produced by Asymetrix Corporation. Recognised as the brainchild of Microsoft's co-founder Paul Allen, and as one of the first generic multimedia authoring tools, ToolBook is one of those products that has earned a much-deserved place in contemporary computing history. Its early implementations were used to create some of the first multimedia CD-ROM titles including Microsoft's Multimedia Beethoven: The Ninth Symphony. Since these memorable beginnings, Asymetrix's ToolBook has evolved into a formidable family of products aimed at the creation of CBT (Computer Based Training) courses, of which ToolBook II Assistant is the latest addition. Other members of the product range include ToolBook II Instructor, ToolBook II Librarian, and Designer's Edge for ToolBook II. ToolBook II Assistant version 6.0 can be used to create multimedia programs that may be distributed using CD-ROM, floppy disk, intranets, and over the Internet. Aimed squarely at trainers, teachers, instructional designers, and other similar professionals, it requires not even rudimentary programming skills. It does not possess the Asymetrix OpenScript programming language that has become synonymous with ToolBook. This is a welcomed departure for Asymetrix and allows ToolBook to compete with tools like Authorware Professional which has long since been regarded as an environment that does not require programming. Those with programming skills might be better served by ToolBook II Instructor, which also includes the OpenScript programming language. This gives programmers better control over resulting ToolBook applications by allowing them to define the behaviour of objects more accurately. ToolBook II Librarian is designed to help manage courseware deployed over the Internet and on corporate Intranets, by providing administrators with feedback regarding student progress. Designer's Edge for ToolBook II is a productivity tool used in the pre-authoring stages of development, and provides a walkthrough environment for developers, taking them from analysis to evaluation during the instructional design process.

(See *Authorware Professional.*)

Top-down analysis A design approach that begins at a high-level, and progresses to low-level component parts.

(See *Bottom-up analysis.*)

Touchpad An x - y input device consisting of a small touch sensitive pad or surface. It is the chosen device for notebook systems.

TP (Transaction Processing) monitor *(See Server.)*

TP-heavy server A server that runs TP monitors.
(See Server.)

TP-lite server A server that provides a portion of all the action required by full transaction processing (TP) monitors. Typically, it will be able to commit changes to, and roll-back, changes made to operational data, which is stored in an appropriate database variant. It may be devoid of:

- transaction coordination of multiple programs
- resource management.

(See Server and Transaction.)

Trackball An input device that is integrated in older notebook and sub-notebook designs. Physically, it is a ball joint. The ball may be rotated using fingers, so providing a means of manipulating a screen pointer or cursor in *X* and *Y* directions.
(See Touchpad.)

Transaction A term used to describe the data exchange and data changes which occur as the result of an interaction. The interaction might be the submission of an order form using a client Browser. A transaction server is allocated the task of transaction processing (TP), and often invokes the application logic necessary to perform database interactions and manipulations. The process(es) invoked directly or indirectly by the client are collectively referred to as the transaction. Transaction servers may include UI logic, driving the client UI, relegating the client device to little more than a dumb terminal. Typically, mainframe based transaction systems might adhere to this model. Alternatively, the UI logic, or presentation may be distributed to the client. The server consists of a TP monitor that performs transaction management and resource management. Transaction management ensures the so-called ACID properties of transactions. These include Atomicity, Consistency, Isolation and Durability. ACID property compliance is achieved through the two-phase commit protocol. *(See Jini, ACID and Two-phase commit.)* Resource management is intended to optimise the use of resources, which include memory, mass storage and processing. It may also be involved with load balancing between resources and between the software processes, which may be threads.

Transaction coordinator *(See Two-phase commit protocol.)*

Transaction management *(See Server.)*

Transaction processing ACID properties Atomicity, Consistency, Isolation and Durability (ACID) properties define the real-world requirements for transaction processing (TP) which are supported by Jini:

- Atomicity ensures that each transaction is a single workload unit. If any subaction fails, the entire transaction is halted, and rolled back.
- Consistency ensures 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 ensures that system state changes invoked by one running transaction do not influence another running transaction. The changes must only affect other transactions, when they result from completed transactions.
- Durability guarantees the system state changes of a transaction are involatile, and impervious to total or partial system failures.

Transaction server A transaction server allocated the task of transaction processing (TP).

(See *ACID, Server, Two-phase commit and Transaction.*)

transformation (See *2D and 3D.*)

Transposition A cryptography technique that rearranges streams of characters.

(See *SET, Brute Force, cryptosystem, RSA, public key encryption, asymmetric and Dictionary attack.*)

Tree of Trust A hierarchy specified by SET used for the management of Digital Certificates including their:

- maintenance
- issuance
- currency.

(See *SET and Certificate.*)

Triple DES An encryption technique based on a variation of the DES encryption technique. One variation sees three DES encryptions using three different keys.

(See *DES.*)

Trusted site A Web site that is secure and safe, and includes a secure connection. Netscape and Microsoft browsers have lists of Certificate Authorities. To see the lists using Netscape:

1. Click the **Security** button on the toolbar.
2. Click the **Signers** link under **Certificates**.

Using Microsoft Explorer:

1. Click the **View** menu
2. Click **Internet Options**.
3. Select the **Security** tab.

4. Click the **Zone** menu.
5. Select **Trusted site zone**.
6. Click the **Add Sites** button to add or remove sites.

(See *Orange book, RSA, Encryption, Certificate, Security and SET.*)

try block A try block is a section of code that is responsible for exception handling. Both Java and C++ support try blocks.

TTP (Trusted Third Party) A site that is secure and reliable, and is reliant on technologies and services such as SSL, SET, RSA, and digital certificates.

Turn-key Application (also Turn-Key solution) A complete solution that is deployed, tested and made fully functional by its vendors, so the end-user need only 'turn the key'.

TV shopping (*See Television shopping.*)

Two-phase commit A method used in transaction processing that ensures ACID properties. It coordinates the changes made to system resources that result from transactions. It tests for their successful implementation, in which case they are committed. If not, and any one fails, they are all rolled back. The transaction coordinator is key to the two-phase commit protocol. This queries all subordinates to verify that they are ready to commit. If the subordinates have other subordinates, these must also be queried. When all subordinates are ready to commit, the transaction coordinator records the information to protect it against any interruption that might be caused by a system failure. Having received information of the readiness to commit, the transaction coordinator sends a commit command to its subordinates, and they do the same. Once the transaction coordinator has received confirmations from all subordinates, the client may be sent a transaction complete message.
(*See Server and ACID.*)

Two-tier client/server (*See 2-tier.*)

Typedef A C++ command that permits mnemonics to be assigned to the statements used to define variables. The following statement assigns the word `xxxx` to the `unsigned short int` statement:

```
#include <filename>
typedef unsigned short int xxxx;

int main ()
{
    xxxx coordinate;
    // define coordinate as an unsigned short integer
    variable
}
```

U

U A chrominance component in a video signal that comprises colour information.

UART (Universal Asynchronous Receive Transmit) An electronic device used for serial communications.

UDF (Universal Disk Format) A DVD disk file system.

UDP (User Datagram Protocol) A protocol that is used widely in streaming audio and video. Macromedia Shockwave Director 6.0 is among a number of leading streaming server technologies that use UDP. It does not feature the reliability of TCP, and is therefore appropriate for streaming media where intensive error detection and correction is less important. Dropped packets, which are those that do not reach their destination, are acceptable in streaming media. UDP therefore, optimises performance and makes better use of available bandwidth, because it does not insist on the retransmission of erroneous packets. (*See Streaming and ASF.*) A low-level protocol, unlike Hypertext Transfer Protocol (HTTP) which is considered an high-level protocol, UDP may be exploited by multimedia streaming technologies, including ASF (Advanced Streaming Format). ASF is a container format that offers compression and protocol independence. (*See ASF and TCP/IP.*)

UFS UNIX File System. A standard file-system used in UNIX, and in the Mac OS X (where it is compatible with 4.4BSD UFS).

UI (User Interface) A software module or program through which users interact with one or more applications.
(*See GUI, OOUI and Windows.*)

UI builder A development tool used to build user interfaces. Most modern UIs are OO. Resulting UIs may be text-based, or graphical as is common today. The latter naturally require the use of GUI builders that provide a means

of implementing the presentation element, together with its interaction with objects, applications and application logic. GUIs can be built using all modern multimedia authoring tools that include Authorware, IconAuthor, and Tool-Book. Programming tools such as Microsoft Visual Basic, and others included with Microsoft Visual Studio, also have the capability to construct GUIs using visual techniques. Such development tools, including GUI builders, feature standard UI components or widgets that include buttons, sliders, drop-down list boxes, scroll bars, dialogues, windows. Static GUI components might include fonts, colours, textures, patterns, etc. The GUI will also contain containers which act as receptacles for objects or components, which might be ActiveX or OLE objects. For example, using Visual Basic, a container may be used to integrate OLE objects such as the Media Player, or any compatible OLE object.

(See GUI, OOUI, Visual Basic and Windows.)

UltraJava A chipset from Sun Microsystems which is optimised for the Java programming language. Like Intel MMX Technology, it is application specific, thus optimised for 3D graphics and multimedia-related computing, including MPEG video playback. UltraJava is licensed to NEC, Samsung Electronics, LG Semicon, and Mitsubishi.

(See Java, MMX and Sun Microelectronics.)

UMTS Universal Mobile Telephone Service A mobile network providing global roaming, supplied by orbiting satellites that may integrate BTSs (Base Transmitter Stations) and BSCs (Base Switching Centers). To create this type of network, as many as 840 satellites may orbit at altitudes between 780km and 1414km to minimize signal transmission latency. It is 840 satellites, in fact, that make up Teledesic whose Consortium is LED by Bill Gates. Other mobile satellite services include Motorola's Iridium (with 66 satellites), Loran's/Qualcom's Globalstar (with 48 satellites) and TRW-Matra's Odyssey (with 10 satellites). These satellite mobile telephone systems offer data rates of 4.8Kbps to 9.6Kbps but have the potential to deliver wireless higher rates through other communications standards. They operate in the K-band (10.9–36 GHz) and L-band (1.6–2.1 GHz), and provide a basis for UMTSs (Universal Mobile Telephone Services). This means that a mobile device might 'roam' between terrestrial GSM-type services and satellite mobile telephone networks depending upon geographical location or at the speed of travel. Aeronautical and maritime telecommunications were catalysts in the development and deployment of satellite mobile telephone services with the first maritime satellite launched in 1976. Called MARISAT it consisted of three geostationary satellites and was used by the US Navy. This later evolved into the INMARISAT (International Maritime Satellite Organization) that provides public telecommunications services to airliners.

UMTS Network Architecture The shown UMTS network is essentially a GSM Phase 2+ core network that is optimized for higher bit rates, and includes:

- mobile switching centre (MSC) and gateway MSC (GMSC) for circuit-switched GSM networks.
- serving GPRS support node (SGSN) and a gateway GPRS support node (GGSN) because GSM Phase 2+ accommodates GPRS packet data.
- GSM base station subsystems (BSSs).
- UMTS radio network subsystems (RNSs).
- A-interface between a base station controller (BSC) and a mobile switching centre (MSC).
- Iups between a BSC and SGSN, where the subscript uPS signifies a packet switch interface.
- Abis interface between a BTS and a BSC.
- interfaces between the RNC and MSC, SGSN and RNC of I_uCS (circuit switched), Iups and Iur, respectively.

The physical channels in UMTS transfer information across the radio interface. A physical channel is defined by its:

- code and carrier frequency in an FDD version
- code, carrier frequency and timeslot in TDD.

Operations of a UMTS transmitter at the physical layer The transport channel data from layer 2 and above are arranged in blocks depending on the type of data. The blocks are cyclically redundancy coded (CRC) for error detection at the receiver. The data is segmented into blocks and channel coding ensues. The coding may be convolutional or turbo and sometimes channel coding is not used. Data is interleaved to decrease the memory of the radio channel and thereby render the channel more Gaussian-like. The interleaved data are then segmented into frames compatible with the requirements of the UTRA interface. Rate matching is performed next. This uses code-puncturing and call data repetition, where appropriate, so that after transport channel multiplexing the data rate and is matched to the channel rate of the dedicated physical channels. A second stage of bit FI interleaving is executed, and the data are then mapped to the radio interface frame structure. Suffice to say at this point there are different types of physical channels, namely:

- pilot channels that provide a demodulation reference for other channels
- synchronisation channels that provide synchronisation to all UEs within a cell
- common channels that carry 0.2 information to and from any user equipment (UE)
- dedicated channels that carry information to and from specific UEs.

The physical layer procedures include:

- cell search for the initial synchronisation of a UE with a nearby cell
- cell reselection which involves a UE changing cells
- access procedure that allows a UE to initially access a cell
- power control to ensure of that a UE and a BS transmit at optimum power levels
- and handover, the mechanism that switches a serving cell to another cell during a call.

UMTS Terrestrial Radio Interface The UMTS terrestrial radio interface (UTRA) frequency duplex (FDD) mode is the W-CDMA radio interface of the UMTS, and is designated by the ITU as IMT DS. The UTRA FDD mode uses segment 3 for up-link transmission, and segment 6 for down-link transmission. These segments are

Key

AuC – Authentication Centre
EIR – Equipment Identity Register
GGSN – Gateway GPRS Support Node
HLR – Home Location Register
MSC – Mobile Switching Centre
SGSN – Serving GPRS Support Node
VLR – Visitor Location Register

The nominal spacing between radio carriers is 5 MHz, with a channel raster of 0.2 MHz. This means that the carrier separation may be adjusted in steps of 0.2 MHz, e.g. the carrier spacing may be 4.8 MHz. The carrier frequency is defined by the UTRA absolute radio frequency channel number (UARFCN). This number is defined over a frequency band from 0 to 3.7 GHz, and is the transmission frequency multiplexed by five. The UARFCN (Nu-uplink and Nd-downlink) will always be an integer because of the raster frequency of 0.2 MHz. It cannot be assumed that radio channels in the UTRA FDD are paired as in GSM.

(See 1G, 2G, 2.5G, 3G, GPRS and GSM.)

Undo A feature provided by almost all fully specified programs. It simply cancels the last editing operation.

Uniprocessor system A system design based on a single processor. Such serial systems might be referred to as von Neumann implementations.

(See MPP, NUMA and SMP.)

Universal resource locator

(See URL.)

Unix A multi-tasking, multi-user operating system originally (OS) developed at Bell Laboratories for the creation of interdepartmental reports. It has since evolved into numerous commercial variants including XENIX. Typically Unix OS variants feature the X-Windows GUI.

(See X-Windows.)

Unix Daemon

(See TCP/IP.)

Unix grep filter A filter that allows you to search files for specified text strings.

Uploading A process of transferring files from a client system to a server. Usually the transfer takes place using the FTP protocol.

UpnP (Universal Plug and Play) A technology introduced in 1999 by Microsoft as a response to SunSoft's Jini technology, and features the same discovery protocol technique used to locate registered services on networks. (*See Jini.*)

UPS (Uninterruptable Power Supply) A device which prevents data loss following power supply failure or deviation.

URL (Universal Resource Locator) An address of a service or Web site or Web page, which can be used by the Web Browser to open specific sites and pages. For, example, the Web page www.altavista.digital.com is a URL, and may be opened. Additionally, the Browser permits such URLs to be stored in a directory, which might be called Favorites, or something similar. The user may then open frequently visited sites and pages, through one or two mouse clicks, depending on the Browser used. The underlying HTTP protocol implements a client/server connection for each URL which is opened by the client Browser. It transmits and receives data, and carries the subsequent contents of an opened URL. Typically, when a URL is opened, the first procedure involves finding the requested site or page on the Web. Having made an appropriate connection, the Browser waits for a reply, and then downloads the ensuing page data. Eventually, the HTTP breaks the connection with the remote server, where the requested site or page resides. This break may be carried out manually by selecting the stop button, or similarly named button. (*See HTTP and IP address.*)

URL encoding A serial interface for connecting peripheral devices.

USB (Universal Serial Bus) A serial interface for connecting peripheral devices.

USENET A worldwide discussion group service. It was originally designed to carry local news between two universities in North Carolina. It allows people to send messages or articles for other people to read.

User authentication A process of identifying the user of a system or program.

- The most common user authentication technique is based on tokens, such as ID names, passwords and PIN numbers.
- User authentication can also be implemented using biometric data, which may be a fingerprint, thumbprint, or retina image.

(*See Encryption, Firewall and Security.*)

User block data A CD-ROM Mode 1 block contains 2,048 Bytes of user data.

(See CD-ROM.)

User communication A rarely used term that describes the user's interaction with a system or application.

User-communication device A rarely used term that describes an input device such as mouse, touchpad, trackball, or touch screen.

UUENCODE A binary to text translator like BinHex. It was designed so UNIX binaries could be transferred through text-only interfaces like e-mail.

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.32 A standard modem speed capable of transmitting and receiving data at 9,600 bps.

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

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.

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

VAB (Value-Added Bank) A financial institution able to transmit electronic data between multiple trading partners.

Validating credit card numbers A process of authorising a creditcard transaction using a merchant bank. The numbers themselves may be validated by processing their checksum digits, because all the credit card companies adhere to a *mod 10* check digit algorithm.

Variable An entity that has a changing value.
(See C++ and Java.)

VAT (Value Added Tax) A tax added to many purchases in the UK, currently set at 17.5%, which requires VAT registered businesses to complete quarterly returns that present the difference between the amount of VAT charged and expended. The business has to pay the difference, or reclaim it should the business have paid more VAT amounts than it received.

VB.NET (Visual Basic.NET) *(See .Net and Visual Basic.)*

VBScript A scripting language that is a subset of Visual Basic, and can 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, and 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 that specialises in Visual Basic controls and add-ons.

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

Vendor Express A U.S. Treasury program for making Federal government vendor and commercial payments; it uses the CCD+, CTX and CTP formats.

Verisign VeriSign Inc (Nasdaq VRSN) is a provider of trusted service technologies to e-business sites, Web sites, enterprises, and users. The company's services include:

- Domain Name
- Digital certificate
- Payment services.

(See Certificate and www.verisign.com.)

Vertical market A market that is limited in size and is therefore of a specialist nature.

(See Marketing and Mass market.)

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.)

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 a potential killer application. IBM's research program has also led indirectly to some pretty impressive offshoots, including the DragonDictate program from speech recognition specialists Dragon Systems. This company 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 review, 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.

VidCap A video capture program supplied with Video for Windows.

(See Video.)

Video capture A 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 real-time video capture technique involves digitising the incoming video source signal on the fly, 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 possible 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, including colour depth, video capture frame rate, frame dimensions, audio sample frequency and audio sample size. If 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 video data is written to a contiguous series of blocks making, thus 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 colour palette that can be edited using programs such as PalEdit. 16 bit and 24 bit formats are described as truecolour, giving a maximum of 65 K (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 is also influential as is the capture frame rate. 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 also can 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 playback 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, also can 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 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. Important points to consider when purchasing a video capture card include:

- 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 Premier 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 implementation 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 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 VL channel connector. Occasionally, such cards can be slightly less expensive, as well as be expendable to incorporate additional functionality such M-JPEG video capture facility.

Manufacturers of mainstream video capture cards include Creative Labs, Fast Electronics, Intel, VideoLogic, and Spea.

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 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 MPEG1 video on single density CD variant. It can be assumed to store approximately 74 minutes of MPEG1 video. Discs are interchangeable between appropriately specified PCs and appliances. It can be assumed that a Video CD, or a White Book disc, can store around 74 minutes of MPEG1 video, the quality of which may be equated to an analogue VHS video recording. A key advantage of Video CD over analogue VHS video cassette is there is no incompatibility between PAL and NTSC recordings, so eradicating the need for separate NTSC and PAL versions as is currently the case with VHS cassette video distribution.

(See MPEG.)

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

- Copying frames from 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 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 superimposed over video sequences perhaps to add captions or credits. Control is given over the font, type style and size, font 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 Premier 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 can also accommodate multiple open video sequences, so 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 *MPEG*.)

Video for Windows A video standard. Video for Windows (VfW) permits video playback, capture and editing. Microsoft Video for Windows 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 resultant 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 Interleaved) format and features a number of compressors including Microsoft 1, Microsoft RLE and Intel Indeo.

(See *MPEG and JPEG*.)

Video on demand (VOD) An e-commerce implementation that permits customers to view selected purchased movies.

Video playback fps The playback frame rate of a video sequence.

Video playback frame resolution The frame resolution of a video sequence.

Video server A server that provides streaming or real-time video to connected users.

(See *Server*.)

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, and thereafter use an Internet-based videoconferencing solution such as CU See-Me
- a cable modem providing high-speed internet access via cable
- an ISDN interface, which provides connection to the Internet or appropriate IP network
- a Network Interface Card (NIC) that connects to a LAN
- a wireless interface, which provides connection over GSM or other 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 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, ISP, ISDN, T1 and Video.)

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 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

$$\begin{aligned}\text{Transmission time} &= (960 \times 8) / 16,000 \\ &= 480\text{mS}\end{aligned}$$

ISDN B channel

$$\begin{aligned}\text{Transmission time} &= (960 \times 8) / 64,000 \\ &= 120\text{mS}\end{aligned}$$

(See DCT and MPEG.)

Virtual memory A hard disk store used to hold data that would otherwise be held in electronic memory.

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

(See *Java and VR.*)

Virtual Reality (See *VR.*)

Virtual shopping An activity where the consumer purchases items from intangible stores which are usually on the World Wide Web.

Virtual Shopping Cart (See *Shopping Cart.*)

Virtual store An intangible store that exists on the World Wide Web.

Virtual Web server A Web server that is not physically implemented, but rather it may exist with a number of other such virtual Web servers on the same site. Virtual Web Servers can 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.*)

Virtual window shopping An Internet equivalent to window shopping that is a leisure activity for many.

(See *On-line*)

Virus An entity that causes a program or operating system to function incorrectly and may result in the loss or corruption of data.

VisiBroker An ORB from Borland.

VisiBroker for C++ An ORB that forms the basis for middleware implementations.

VisiBroker for Java An ORB that forms the basis for middleware implementations.

Visio A Microsoft drawing package widely used in industry.

VisualAge (IBM) An IBM initiative and family of software development tools, languages and environments – and address 4GL.

VisualAge for Java This is a key part of the IBM Framework for e-business, and accommodates the building of Java applications, Java applets, servlets, and EJB (Enterprise JavaBeans) components.

VisualAge Generator, Version 4.0 This is a rapid application development environment for e-business applications, and is integrated with VisualAge for Java. It generates 4GL code and has visual development facilities. It can be used to build:

- CICS, IMS, TXSeries, and OS/400 transactions, including Web transactions
- Java GUIs, applets, or servlets communicating with transaction programs
- Batch programs.

Visual Basic A programming language and programming tool that may 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.

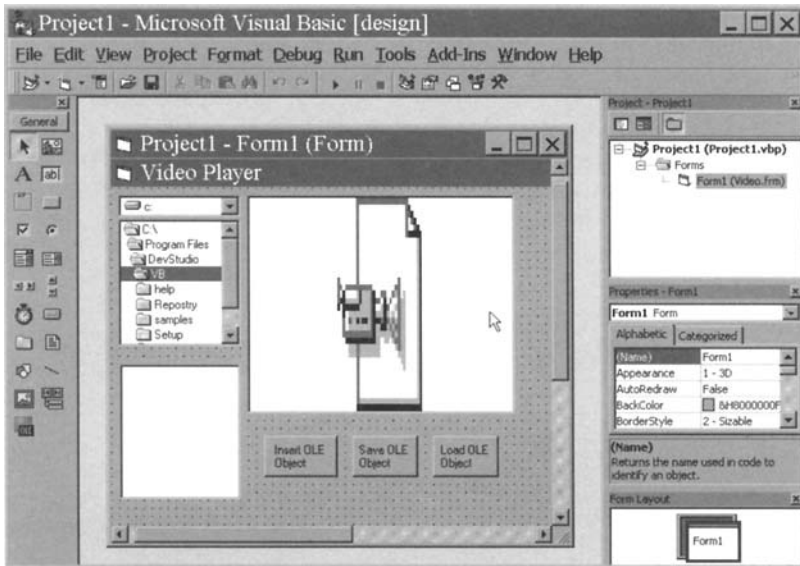
Microsoft Visual Basic forms part of its Visual Studio package, and is also available in standalone form. (1998) Editions of Microsoft Visual Basic are:

- 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 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 below.

1. It is necessary to draw:

- 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.
5. Modify the OLE1 object properties so as 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 and are executed when the application is loaded through the Form, Load event.

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

The code segment merely ensure that the drive an pathname default has 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 is 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 determine whether or not the selected file is in the root directory or in 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, and assigns the file name 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`, or 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. To add the `VideoPlayer`’s `EXE` file to the `Start` menus, right click the taskbar and select `Properties`. Then select `Start Menu Programs`, and click on the `Add` button. Click on the `Browse` button and locate the `EXE` file for the `Video Player` program. Click on the `Open` button, and then click `Next`. To complete the operation, select or create a folder, select `Next`, and then

click Finish. OLE provides a quick method of including wave audio, Midi files, animations and video, and helps 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, et al. This can be achieved by including Paste Special or Insert Object dialogue boxes in the program. The Paste Special dialogue box is produced using the PasteSpecialDlg method. The Insert Object dialogue box is produced using 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 dialogue 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 subsequently 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 C++ A Microsoft C++ programming environment that may 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 that is used to create Web and intranet applications. Briefly it may 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 on in a Web). The Web project includes the Web files on the server, and the client-side, local project files. A Web Project File is available or 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 Multimedia Production, MIDI and WAV audio.)

Visual Java++ A Microsoft development environment for writing, compiling and debugging Java applications and applets. Visual J++ may be used to integrate JDK packages into Java programs, and to create multithreaded Internet and intranet applications. InterDev is included in Microsoft Visual-Studio 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 can 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 useful Microsoft solution that 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 that 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 can 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 that 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 1990s.

VOD server A server that provides streams of video.

(*See Server.*)

VOD service provider A company engaged in providing video on demand.

VOD usage habits A profile of users' habits when using VOD services indicating the most popular movies and the most popular viewing hours.

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

Vortal Vertical Industry Portal. A Web site that provides information and resources for a particular field of interest such as an industry.

VPL 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 that 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.

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 span from intricate muscular contractions to intimate vessel expansions and retractions, and surface movements of the skin to eye movements. Trends point to a yet more sensitive interface able to reap 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 compose 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 compliment 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, to a complex supercomputer architecture including multiple processors, such as transputers as used by Division (Bristol, England) working in concurrence. Graphics performance of the collective virtual engine and accompanying graphics engine/controller, is key to determining overall complexity and effectiveness of supported applications. Obvious VR applications may 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; 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 may be carried out using the multimedia authoring tool itself, which is the case with Asymetrix ToolBook and many others. 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, may 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, 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 may 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 Creditcards 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 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, hypermedia and hypertext authors familiar with two dimensional environments will appreciate fully the advantages of a third dimension: both the storyboard and interactive design are implemented and overviewed more easily; while testing the interactive design and debugging is made easier.

Further reading

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 that is dedicated to the class
- parameters that 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`

that typically changes a property of the node, or

EventOut

that 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 an eventIn processes.

(See VRML.)

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

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

V.21	300 bps
V.22	1,200 bps
V.22bis	2,400 bps
V.32	9,600 bps
V.32bis	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 defenses against illegal access.

(See Firewall and Security.)

W

W3C (The World-Wide Web Consortium) An organisation dedicated to the standardisation of Internet related technologies such as HTML.

WAIS (Wide Area Information Systems) A generic engine for maintaining and searching databases and is frequently used by Internet information searching services.

Wall street The financial epicentre of New York City.

WAN (Wide Area Network) A network of computers and interconnected LANs. Typically, a WAN is spread over a greater area than a LAN.

WAP (Wireless Applications Protocol) A standard that permit mobile WAP devices such as compliant mobile phones to access Internet information. The accompanying architectural model consists of a WAP gateway that unites the Mobile network (that is typically GSM) and the IP based Internet. A WAP mobile phone or ‘user agent’ consists of a WAP browser, and interpreter able to display WML scripts. The WAP protocol layers include the:

- (WAE) Wireless Application Environment
- (WDP) WAP Datagram Protocol
- (WSP) WAP Session Protocol
- (WTP) WAP Transport Protocol
- (WTLS) WAP Transport Layer Security.

(See WML.)

WAP gateway *(See WAP.)*

WAP security *(See WAP.)*

WASP (Wireless Application Services Provider) A company that specialises in implementating, deploying and sometimes hosting, wireless applications.

(See 2G, 2.5G and 3G.)

WAV A Microsoft standard file format for storing wave audio data. It can be used to store 8 bit and 16 bit wave audio at sample rates of 11.025 KHz, 22.050 KHz and 44.1 KHz. WAV files are compatible with all fully-specified multimedia presentation programs, and multimedia authoring tools. They are also compatible with all modern Windows wave audio recorders and editors, including Sound Recorder, Creative Wave Studio and QuickRecorder.

(See ASF, MPEG, Wave audio and Streaming.)

Wave audio A term often used to describe digital audio recordings, usually made using an analogue signal provided by a source device. Such wave audio may be distributed in real time over the Internet using streaming server technologies, or it may be distributed using CD- and DVD-based variants. It may provide content for CD-ROM, DVD or Web applications. Generally it may be distributed and played back using any medium that is capable of sustaining an average data transfer rate appropriate to the recorded wave audio quality level. Principal parameters which drive the quality of wave audio recorded using PCM (Pulse Code Modulation) include the sampling frequency and the sample size. The wave audio quality levels that may be achieved are a function of the wave audio recording software and the sound facility on the recording system. MPC2/3-compliant sound cards may be used to record and play wave audio in mono and in stereo at sampling rates of 11.025 KHz, 22.05 KHz and 44.1 KHz, using 8 bit or 16 bit samples. Used with appropriate software, highly specified sound cards offer higher sampling frequencies and larger sample sizes. They can make DAT quality wave audio possible that equates to 16 bit samples recorded at a frequency of 48 KHz. Simple calculations imply that one minute of uncompressed CD-quality wave audio, which amounts to 10.08 Mb (10321.92 KBytes), requires a DSM capable of providing an average data transfer rate of around 172.032 KBytes/sec. Approximate file sizes when recording one minute of 8 bit stereo wave audio at different sampling rates are as follows:

11.025 KHz	1.25 Mb
22.050 KH	2.52 Mb
44.1 KHz	5.04 Mb
48 KHz	5.49 Mb

Approximate file sizes when recording one minute of 16 bit stereo wave audio at different sampling rates are as follows:

11.025 KHz	2.52 Mb
22.050 KHz	5.04 Mb
44.1 KHz	10.08 Mb
48 KHz	10.98 Mb

The memory capacity consumed by a sequence is a function of quality. If it is necessary to calculate the exact memory/data capacity consumed, then the following simple formula may be applied:

$$\begin{aligned} &\text{Memory capacity required (bits)} \\ &= \text{Sequence duration (secs)} * \text{Sampling rate (Hz)} \\ &\quad * \text{bits per sample} \end{aligned}$$

For example, if an 8-bit sound digitiser with a sample rate of 11 KHz were used to digitise a 15-second sequence, then:

$$\begin{aligned} &\text{Data capacity required (bits)} \\ &= 15 * 11,000 * 8 \\ &= 1,320,000 \text{ bits} \\ &= 165,000 \text{ Bytes} \\ &= 161.13 \text{ KBytes} \end{aligned}$$

Memory or disk data capacity required naturally increases linearly with increased sample rates.

(See MPC-3 and Streaming audio.)

Web A global hypertext-based structure that can be navigated and browsed. It provides links to information sources and services that are termed Web sites. Tim Berners-Lee is accredited with the Web's invention, and his initial work was carried out by Berners-Lee when he was a computer scientist at the Swiss' Center for Nuclear Research (CERN). Web is based on the hypertext model for information storage and retrieval. URLs are key to permitting the implantation of hypertext links and navigation schemes on the Web. The initial model was static. It was released in 1992 by CERN. Its origins are in hypertext, hypermedia and multimedia models and concepts.

(See Bernes-Lee, Tim, W3C and Web.)

Web analytics company A company that is engaged in performance testing and performance renovation of on-line and real-time information services such as e-business sites. The company may provide automated solutions to generate performance indicators and usage habits in the form of reports and alerts. This information may be used for critical decision making. Visitor behaviour is also studied by such companies.

Web cam A Web site that features real time video broadcasting from one or more locations. The screen updates, or the frame playback speeds, vary according to the site implementation, and may be quoted as frames per second, frames per minute, or even frames per hour. Generally Web cams provide images of locations and people from around the world and serve as

entertainment, while more serious applications include CCTV-type applications, remote viewing of child care centres, etc. Web cams generally provide non-linear broadcasting, while video-conferencing provides a bi-directional communications.

(See *MPEG*.)

Web-based company A company that uses the Web as its marketing and selling channel. Historically, such e-commerce Web sites require CGI scripts and programs in order to implement processing logic. Typically, forms posted from the Browser are validated in terms of credit card details and so on, and if accepted the customer's order is placed in the database, and processed by the vendor at an appropriate point in operations.

(See *ASP, CGI, Perl and Transaction*.)

WebBot A name given to components included with Microsoft FrontPage. They each have a specific functionality:

- *Comment* is used at Web documentation, which is only visible at design time
- *Confirmation* echoes entered user data
- *Include* replaces the contents of a Web page with another
- *Scheduled Include* echoes the Include WebBot functionality, except it may be scheduled for a future date
- *Scheduled Image* echoes the functionality of the Scheduled Include WebBot, except it includes an image rather than Web page contents
- *Search Component* provides Web site search facilities
- *Table of Contents* generates a Web's outline, together with its hyperlinks
- *TimeStamp* is used to display the date and time the Web page was last updated.

(See *ActiveX, FrontPage, Java and Plug-in*.)

Webcasting A process by which a Web server serves clients or users with specific data or files. The user merely specifies what is required. Webcasting software includes Intermind Communicator and PointCast. Such a process exists within the push model.

(See *Application and Client/server*)

Webmaster An individual that manages and maintains a Web site. His/her duties are numerous and include updating Web pages, adding new content, removing old content, overlooking integrated security features and policies.

Web Page A page that may be accessed via the Web. A Web page may include links to other pages, 2-D and 3-D graphics, sound bites, video, an e-mail address, and various forms for user feedback. Its underlying code or

glue is HTML, which may be used for formatting, as well as for holding together such components as ActiveX controls.

(See ActiveX and Web.)

Web Page Description A stream of 200 characters that exists after <BODY> tag on a Web page, and is retrieved by search engines as a description of the document.

(See HTML, Search engine and Web page title.)

Web page title A Web page's title that is enclosed by HTML <TITLE> tags. It is used as meta data by popular search engines when retrieving Web documents, and displayed as the document's title.

(See HTML, <TITLE>, Search engine and Web page description.)

Web phone *(See Internet telephony.)*

Web proxy An agent that may be perceived as existing between the Browser and the Internet or intranet. Typically, they are used for caching Web pages in order to improve performance, hence the term caching proxy.

(See Security proxy.)

Web Security A method of securing Web applications and their associated data from illegal unauthorised use. Securing Web applications and their data typically involves:

- implementing a firewall, restricting access to selected Web applications and data
- using client-side security features of Windows NT, and security programs like Virtual Key
- restricting access to server-side data and components, which might include CGI scripts and ISAPI filters
- monitoring system logs
- restricting user's rights to upload files to server-side directories, to minimise the possibility of virus infections
- adhering to SET guidelines
- designing a security regime, where users require membership to the complete site or to selected components
- requiring site members to change their passwords
- granting users' guest rights, where they may peruse demo Web applications and data.

(See Encryption, Firewall, Security and SET.)

Web Server An architecture which maintains the connection between the server-side processing and data, with that of the client-side. The mainstay of

one or more Web applications, the Web Server may also implement interactions between users and server-side databases. User interaction via the browser might be processed on the client side, or on the server side. ActiveX Controls might form a basis for such client-side processing. The Web Server interprets user requests, and implements specified tasks, such as:

- serving HTML pages that are interpreted by the browser
- downloading files
- downloading Java applets
- downloading ActiveX controls
- interacting with server-side databases.

Web servers include the Microsoft Personal Web Server, which may be used for prototyping and for proving conceptual designs. With Microsoft IIS, Windows NT is used as the Web server's operating system.

(See IIS and MCIS.)

Web server security A set of issues that relate to securing data traffic between servers and clients so legal usage is maintained.

(See Firewall and Security)

Web site 1. A physical server (or collection of such servers) and software that supports the server-side applications and data of Web applications. Users may connect with the physical or virtual Web servers contained therein, using Web addresses such as `www.server.com.au`. Server-side components of Web applications are numerous, including:

- software server components
- ActiveX controls
- Java applets
- Perl scripts.

2. A software solution that serves clients with a Web application. The application contains a page, or number of pages, and has a Web address (i.e. `www.testsite.com.`). Such sites may be created with numerous software packages. Microsoft Publisher 98, for instance, has numerous useful wizards that guide you through the design of Web sites. The site's interactive and media content will reside physically on the Web server, and be distributed across:

- HTML code
- Scripting languages such as JScript and VBScript
- ActiveX controls
- Java applets.

(See Web Server, Active Web Server, Active Server, Active Desktop, Virtual Web server and Server.)

WebSphere-IBM An IBM Internet software infrastructure and middleware solution used to develop and deploy e-business applications. The core element is the WebSphere Application Server powered by a single Java™ engine:

- Standard Edition: transforms static Web sites' Web content by introducing servlets, JavaServer Pages, and XML.
- Advanced Edition: has an Enterprise Java Bean component server.
- Enterprise Edition: builds high-volume e-business applications, and uses EJB and CORBA.

(See *CORBA*.)

Web TV 1. A Web site used in television broadcasting capacity. 2. An Internet access appliance that connects with a television. It may take the form of an STB (Set Top Box.)

(See *Streaming video and Video*.)

WEP Wired Equivalent Privacy A security protocol specified in IEEE Wireless Fidelity standard, and gives wireless local area networks (WLANs) security and privacy. Data encryption secures links between clients and access points. Other security measures include password protection, end-to-end encryption, virtual private networks (VPNs), and authentication.

What-if A term commonly applied to hypothesising in a computer environment. Using fully specified relational databases, it is possible to play What-if by querying stored information. The querying process involves using either standard SQL such as ANSI-92 SQL, OQL (Object-oriented Query Language), or a proprietary querying language or feature such as Borland's QBE (Query By Example). Querying may be used to set up hypothetical situations such as increasing a product price, for instance. The consequences can be viewed almost immediately.

(See *Data warehouse and OLAP*.)

White Book (See *Video CD*.)

White list (See *2G*.)

Wildcard A shorthand for search strings. For example, Van Gogh AND Amsterdam may be exchanged for Van *gh AND ?Amsterdam where '*' represents any series of characters and '?' replaces any single character.

WIMP (Windows, Icons, Mouse and Pop-up menus) A traditional term for the GUI environment such as OS/2 Warp and Windows.

Winamp An MP3 wave audio file player.

(See *MP3*.)

Windows A GUI operating system and environment that has proved a core software technology since circa 1990, and the chosen client side operating system for almost all client/server applications (including the World Wide Web). Its roots are entrenched in research carried out at the Xerox Palo Alto Research Center (PARC), and in the first commercial multi-tasking GUI implemented by Apple Computer for inclusion in the Apple Macintosh, launched in 1984. Windows is the realisation of Bill Gates' early vision of the computer as a universal and invaluable support mechanism. Wherever you may be, close by there is almost always a running copy of Windows. This means that we must all use Windows, and preferably use it well. Don't worry, it's not the nightmarish scenario of George Orwell's novel *1984* where workers are slaves to machines. Far from it, because Windows 98 actually frees users. The most notable freedoms it gives are those of browsing the Internet, and permitting users to make purchase through e-commerce Web sites. Users can also publish documents on the largely unregulated World Wide Web, and communicate in real time. Equally, Windows may be used to run day-to-day applications that include word processors and spreadsheets, and even voice operated dictation systems such as IBM ViaVoice. Windows is quite literally a single gateway, through which everything is accessible. Combined with its underlying and surrounding technologies, its impact greatly surpasses that of any other operating system. For some time Microsoft has sought to make transparent the boundary that separates the Windows Desktop from the Internet. Windows 98 achieved this through the Active Desktop, where Active Channels provide single-click access to Web sites. Windows 98 has pretty much everything required to exploit all its target platforms and software applications, and the technologies that surround us. No stone has been left unturned, through the support for hardware devices from numerous manufacturers. Windows 98 is an operating system that has evolved over a number of years to become a feature rich environment. It is increasingly difficult to cite omissions from new versions, and Windows 98 is no exception. The obvious absent features and applications are the result of continuing pressure to steer Microsoft away from monopolistic practices. Included in Windows 98 is an impressive array of features, and where you begin and end with them, rather depends on what you want to do. Equally, features that are important to one user, may not be to another user. Generally, however, key features of Windows 98 include:

- Windows Explorer, which permits you to browse files, manage files and disks, open applications, and to do a host of other operations.
- Windows Desktop, upon which are: Program icons, Active Channels, and the Taskbar that also has toolbars.
- Active Desktop, which integrates the World Wide Web more tightly with the Windows Desktop. So-called Active Channels may be placed on the Desktop, and provide single-click access to Web sites, and the dynamic reception of information. You may also add Active Channels of your own.

- Start button, which provides single-click access to Start menus. This is used to open documents and applications.
- Taskbar, which anchors the Start button, and shows the time of day, and buttons that are used to activate open applications. It also has icons that are used to access various background applications such as Internet and network connections. There are also toolbars that provide single-click access to selected applications and features.
- Dial-up Networking (DUN), which provides access to remote networks, and to ISPs.
- Internet connectivity and e-mail features, including the software required to connect with CompuServe and other ISPs.
- File Allocation Table32 (FAT32) filing system that is an advancement of the FAT16 implementation.

The listed features, and a plethora of others, will be explained in this text. It will be the aim of this book to reveal how they are best exploited, to get things done quickly and effectively. (*See FAT32.*)

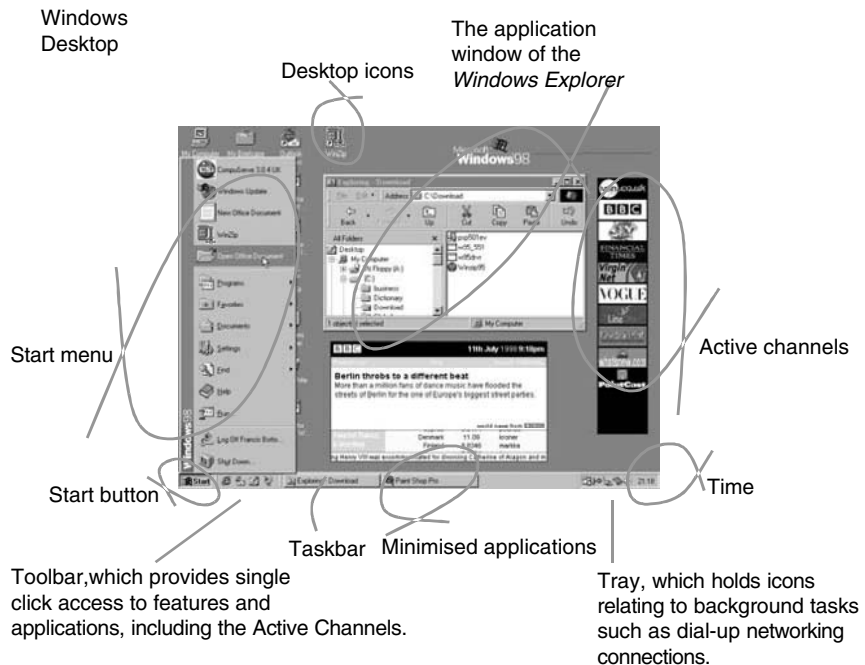
The founding father of the Windows concept is Douglas Engelbart, whose work was built upon at Xerox PARC (Palo Alto Research Center). Microsoft's Bill Gates, and Apple Computer's Steve Jobs, learned of the modern Windows implementations that were developed at PARC. This yielded the graphical user environment (GUI or 'goosey'), included in the Apple Macintosh that was launched in mid 1984. The success of the Apple Mac led Microsoft to develop a competing GUI in the form of Windows. Work on Microsoft Windows began in earnest, with Scott MacGregor from the PARC windows initiative playing a key role. However, the early releases of Windows had little impact in a world where the PC software market was dominated largely by text-based DOS applications. Windows was finally accepted as the de facto PC environment in the late 1980s, when version 3.0 was released. The Microsoft Windows continuum approximates: Windows 3.0 that supported 16-bit instructions only, and featured the Program Manager that was used to organise applications and to launch them. It also featured the File Manager that was to be renamed the Windows Explorer through the launch of Windows 95. It integrated no multimedia support, because Microsoft had yet to specify the Multimedia PC-1 (MPC-1). At this time, PCs were little more than text-based appliances that offered fairly crude graphics. Microsoft's Multimedia Extensions were launched in 1990, and could be added to Windows 3.0. These included the Media Player that is used to play audio, midi and video files. As such the Windows PC had become a multimedia enabled appliance. However, it continued to be devoid of network connectivity features, and was very much a standalone implementation. Windows 3.1 that integrated the Multimedia extensions as standard. Windows 3.11 for Workgroups included support for creating peer-to-peer Local Area Networks (LANs), in which connected computers could share their resources with other connected systems. Windows

NT (New Technology) supported 32 bit instructions, and as is the case today, was aimed at the corporate market. It's key strength is improved robustness when compared to Windows 3.1/3.11 and Windows 95/98. Windows 95 saw the introduction of the Start menu and Taskbar that replaced the Program Manager as a means of opening applications. It also supported 32 bit instructions, and was aimed at home and small office users. Networking features found in Windows 3.11 for Workgroups were also integrated in the design. Windows 98 included new features such as the Active Desktop.

Windows 2000. (See *Windows GUI.*)

Windows Desktop A term used by Windows, providing numerous features, including:

- Start button, which may be used to open applications and documents
- Taskbar, which anchors the Start button and shows the date, as well as other important icons
- Program icons, which can be double-clicked to open applications
- Buttons for open applications, which are displayed on the Taskbar
- Time, which when double-clicked invokes the Date/Time Properties
- Channel bar, which provides single-click access to Web sites and information services.



The Taskbar also serves to display numerous icons, such as those associated with connections to networks and to the Internet.

(See *Windows*.)

Windows Explorer (See *Explorer*.)

Windows for Workgroups (See *Windows*.)

Windows Help system A Windows Help system that uses Hypertext-based navigation.

Windows Media Player A Windows program that is able to play audio, video and Midi.

Windows NT Registry A configurable set of parameters that allow Windows NT to optimise resources for applications. The registry is stored in an initialisation (INI) file, and is also used to register components including:

- ActiveX
- OLE
- DCOM
- COM.

The `regsvr32` program is used to register such components.

Windows NT Server A Microsoft 32 bit operating system that includes the functionality of Windows NT Workstation, and an additional array of server-orientated features. (Refer to the *Microsoft Web site*.)

Windows NT Workstation A Microsoft 32 bit operating system that has a graphical front-end. Windows NT Workstation is a complex OS, and suite of integrated applications, and includes:

- Windows Explorer, which is used to browse local and remote files, open files, and launch programs
- Start menu, which permits applications to be launched
- Desktop, upon which icons reside
- NotePad, which is a simple word processor
- Network connectivity functions
- Internet connectivity functions, but has no browser (1998)
- E-mail functions.

Windows origins An industry standard graphical user interface (GUI) and OS for the PC platform. Its origins are embedded in work carried out at Xerox PARC (Pala Alto Research Center). In the mid 1980s Microsoft set up the Interactive Systems Group (ISG), a team assigned with the task of developing a GUI for the PC. Ex PARC researcher Scott MacGregor was a

member of the Microsoft ISG. The founding father of the Windows concept, however, is deemed to be Douglas Engelbart, who is also accredited with the invention of the mouse. Windows 1.01 was shipped in November, 1985. It was a success, but nothing like that of the Apple Macintosh GUI launched over a year earlier. Windows 2.x was shipped in September 1987. Not until May, 1990 when Microsoft began shipping version 3.0 did Windows become a widespread success.

(See *Microsoft*.)

Windows Sound Recorder A Windows program able to record wave audio.

WINS Warehouse Information Network Standard.

Winsock A Windows Application Programming Interface (API) that provides input/output operations for Web applications. Its implementation takes the form of a DLL (Dynamic Link Library), and is an evolution of the Berkeley Unix sockets which provide interprocess communications both locally and over networks.

WinZip A batch file compression/decompression utility that may be used for archiving, transmitting digital matter over narrow-bandwidth network and access technologies such as analogue modems.

Wireless LAN A LAN that uses RF (radio frequency) technology to receive and transmit data over the air. IEEE 802.11 defines the standard and internationally agreed components and protocols for a wireless LAN.

Wizard A software feature that guides the users through the steps required to perform a specific task. The task might be the addition of computer hardware or programs.

WML (Wireless Markup Language) A markup language used to create WAP sites and applications that may be accessed by WAP phone users.

```
<? xml version='1.0'?>
```

```
<! DOCTYPE wml PUBLIC "-//WAPFORUM//DTD WML 1.2//EN"
```

A WML document prologue that all WML scripts contain. In the shown example, the first line declares that the WML deck consists of XML statements. The second line defines the document using the DTD (Document Type Definition) mnemonic as adhering to the WAP Forum WML 1.2 specification.

```
<tag attr = "wxyz"/>
```

A WML attribute that specifies additional information about an element.

`<tag/>`

A WML structure that identifies elements without content. (*See WML and <tag> content </tag>.*)

`<tag> content </tag>`

A WML expression that specifies elements holding content in the WML deck. These may be:

- Tasks performed in response to events
- Character entities
- Card delimiters.

Workflow management A broad term used to define the coordination of processes necessary to implement a given task, or given set of tasks.

WorldPay WorldAccount A service for micropayments where the user deposits a small amount using a credit or debit card, that can be spent at WorldAccount Payment sites.

World Wide Web (WWW) The Web is a global hypertext-based structure that may be navigated and browsed. It provides links to information sources and services that are termed Web sites. Tim Berners-Lee is accredited with the Web's invention, and is currently the Director of W3C (World Wide Web Consortium). Berners-Lee carried out the initial work when he was a computer scientist at the Swiss' Centre for Nuclear Research (CERN). A key facet of the Internet, the Web is based on the hypertext model for information storage and retrieval. Universal Resource Locators (URLs) or Web addresses are key to permitting the implantation of hypertext links and navigation schemes on the Web. It can support mixed media including video. It was released in 1992 by CERN. Its origins are in hypertext, hypermedia and multimedia models and concepts. A Web page may include links to other pages, 2-D and 3-D graphics, sound bites, video, an e-mail address, and various forms for user feedback. Its underlying code or glue is HTML, which may be used for formatting, as well as for holding together such components as ActiveX controls.

The World Wide Web Consortium (W3C) A publisher of specifications of web technologies that include HTTP, HTML and CGI. Further information may be obtained at www.w3c.org.

Wozniak, Steve A technologist and co-founder of Apple Computer, and responsible for the design of the early Apple microcomputer. His most significant achievements are those at the early years of Apple Computer, an era when a clutch of American companies largely run and owned by college drop outs (including Bill Gates) revolutionised the computer industry by designing

affordable microcomputers and accompanying software. Steve Wozniak, and Steve Jobs revolutionised the world of computing by mass producing one of the world's most affordable PCs known simply as the Apple, and later the Apple II. It was designed by Steve Wozniak, whose dream was always to own a computer, once saying 'I don't care if I live in the smallest house, just so long as I have my very own computer.' This was a dream that he almost single handedly made reality for himself and for millions of people around the world.

(See Apple Computer.)

Wrappering A process used to migrate a conventional program structure to that of an object. The program is renovated in terms of the addition of an object interface. Thereafter, it can be stimulated as any other object.

(See Object.)

WWW *(See Web.)*

www.netcraft.co.uk/ A Web site that may be visited to gain information about Web servers.

WYSIWYG (What-you-see-is-what-you-get) A term applied to a program which is capable of generating on screen exactly what will be printed.

X

X3 An ANSI Committee dedicated to Information Processing Systems.

X9 An ANSI Committee dedicated to Financial Services.

X12 An ANSI designation and committee dedicated to EDI.

X.25 A standard set of protocols for packet-switched networks, introduced by the CCITT, but now comes under ITU-T. It covers the protocols between DTE (data terminal equipment) and DCE (data circuit terminating equipment). X.25 were developed in the 1970's, when data transfer rate requirements were slow in comparison to today's. High-speed data transmission using the X.25 protocol is possible, but increasingly modern communications networks integrate frame relay. The X.25 error-correction is accommodated using a scalable acknowledgement window that may typically include seven packets. This means that the sending device must wait for an acknowledgement for each group of seven packets. The maximum packet size is defined as 256 Bytes, so the transmitting device may send $n \times 256$ Bytes of data before receiving an acknowledgement that verifies data reception. The error correction that is integrated into X.25 is robust because earlier networks were unreliable. Today's digital networks are much more reliable; thus there is an opportunity to develop far more efficient protocols. These need not include the intensive error detection and correction of previous packet switched protocols. Frame relay is one such relatively contemporary protocol designed for modern communications networks.

(See ATM, Frame relay and ISDN.)

X.509 An internationally agreed standard for digital certificates designated by the CCITT. SET specifies a modified X.509 implementation for payment cards.

(See SET.)

X/OS A Unix variant developed by Olivetti.

XA 1. A standard protocol that is used to coordinate transactions. 2. A shorthand term for CD-ROM XA (Compact Disc-Read Only Memory eXtended Architecture). Published by Microsoft, Philips and Sony in March 1988, XA permits a near-CD-I title to be delivered using a conventional desktop computer with installed CD-ROM drive and XA decoder. Initially, it appeared for the PC and was seen as a response to Intel's DVI (Digital Video Interactive) digital video compression. It brought CD-I level B and level C audio quality to the PC: Level B audio is equivalent to a high quality stereo FM broadcast transmitted under optimum conditions. An entire CD-I disc gives a maximum of four hours B-Level stereo playback. Technically level B audio is an 8 bit recording digitised at a sampling frequency of 37.7 KHz. Level C audio equates to an AM radio broadcast transmitted under optimum conditions. A whole disc could yield over 16 hours playing time. It is also termed mid fi quality. It equates to a 4 bit ADPCM wave audio recording sampled at 37.7 KHz. (*See CD-ROM and DVD.*)

Xanadu A unified repository of literature and information, invented by Theodore Nelson. It was conceived before the Web, and abstracts much of the thinking embedded in the work of Vannevar Bush, and his momentous article, 'As We May Think.' Conceptually, Xanadu was the Web. And if Vannevar Bush and Ted Nelson were responsible for putting forward the concept of the Web, then Tim Berners-Lee must be considered its architect. (*See Web.*)

xCBL (XML Common Business Library) A set of XML business documents and components distributed by XML.org and other relevant organisations. These sites allow users to use the component library to construct documents. xCBL provides interoperability between applications and is made available as a set of SOX schemas. (*See www.xcbl.org.*)

XDSL (Digital Subscriber Line) A digital access technology that provides sufficient bandwidth for multiple virtual lines over a single physical telephone connection to accommodate, for example, concurrent Internet access and voice/fax communications. Supporting data transfer rates that approach 2 Mbps, xDSL applications include video on demand, and interactive video and data communications, and because it may use twisted pair (or telephone lines) as its medium its deployment is cost effective. (*See Access technology and ADSL.*)

XENIX A Unix variant developed by Microsoft.

Xeon A shorthand term for the Pentium II Xeon processor, originally aimed at Workstations and servers. (*See Pentium II.*)

Xerox PARC (Palo Alto Research Center) A research establishment founded in 1970 by Xerox. It is the birth place of many multimedia-associated technologies and concepts including laser printing, local area networks, the graphical user interface (GUI), and object orientated programming (OOP). The GUI system integrated into the Apple Macintosh launched in 1984 was a direct result of Apple's Steve Jobs visiting PARC. During his visit he saw the GUI platformed on PARC's Alto system. The same may be said of Microsoft's Bill Gates and the Windows OS.

XHTML (eXtensible Hypertext Markup Language) A redesigned version of HTML 4.01 that offers an XML vocabulary.

XHTML Basic A rationalised version of XHTML.

Xing Technology Corporation A company engaged in the development of MPEG encoding and editing products, and audio and video compression in general. Its headquarters are in Arroyo Grande, US. Products include the XingCD, which may be used to compress video according to MPEG-1 compression algorithm, and XingSound, which may be used to produce and edit MPEG-1 audio streams.

(See MPEG., Streaming video and Video.)

XingCD A software product from Xing (Arroyo Grande, US) capable of compressing video according to the MPEG-1 compression algorithm. Used without an MPEG-1 player, it is able to play MPEG video without sound.

XingSound A software product from Xing (Arroyo Grande, US) useful for compressing wave audio according to the MPEG-1 audio compression standard. It can 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, copy and paste.

XLink (XML Linking Language) A markup language that offers comprehensive linking features and integrates part of other hypertext features including HyTime and SGML.

XML (eXtensible Markup Language) An open standard markup language proposed by the W3C in December 1997. It is 'a data format for structured document interchange on the Web'. It is comparable to HTML and is also a variation of SGML.

XMS (eXtended Memory Specification) A software specification that provides access beyond the 1Mb boundary of PC architecture machines. Access to extended memory is provided by an appropriate driver in the CONFIG.SYS file that may be assumed to be HIMEM.SYS.

XNET An interprocessor communications scheme used by the MasPar MP-1 SIMD processor. It addresses processors as a two-dimensional network topology.

(See *MPP*.)

XPATH (XML Path Language) A common syntax and semantics for functionality shared between Xpointer and XSL Transformations (XSLT), and is used to provide addressing to XML documents which it models as a tree of nodes. Xpath expressions may yield an object type that can be:

- node-set (or set of nodes)
- boolean (true or false)
- number (that is a floating-point number)
- string (or sequence of UCS characters).

(See *Xpointer*.)

XPointer A language expression that gives specific references to XML document content. An XPointer expression may search a document's structure based on criteria that include properties such as element types, attribute values, character content, and sequence. Xpointers can:

- address into XML documents
- be used over the Internet
- be integrated in URLs.

(See *XML*.)

Xpress A shorthand name for the QuarkXpress desktop publishing package.

XSL (eXtensible Stylesheet Language) A language used to create stylesheets that describe XML data files in terms of the style, page format and pagination, for electronic media like windows and Browsers or printed matter. An *XSL stylesheet processor* generates XML source from the XML document and the XSL stylesheet by:

- tree transformation, which constructs a result tree using the XML source tree
- formatting to produce a formatted presentation using the result tree.

XSL is based on Cascading Style Sheets (CSS2) and on the Document Style Semantics and Specification Language (DSSSL), and has many of CSS' formatting objects.

(See *CSS*.)

XSLT (eXtensible Stylesheet Language Transformations) A part of the XSL language that transforms XML documents into other XML documents. The XSL Transformations (XSLT) Version 1.0 was published in October, 1999

as a W3C Proposed Recommendation. XSLT accommodates XSL related transformation types that are expressed as a well-formed XML document, which complies with Namespaces in XML Recommendation. A transformation describes rules for transforming a source tree into a result tree, and is achieved by associating patterns with templates:

- patterns are matched against source tree elements
- templates are instantiated to build the result tree.

(*See XSL.*)

X-standards A series of evolving recommendations covering data networks. Among the most significant X standard is X.25.

XT A shorthand term used to describe the IBM PC XT. And early desktop computer design produced in the very early 1980's. Its specification is now defunct.

X-Windows A GUI often used with almost all Unix OSs, and was developed at Massachusetts Institute of Technology (MIT), who surrendered it to the public domain. X-Windows implementations include Motif and OpenLook.

X-Y input device An input device that measures input movement in two dimensions only.

Y

Y 1. A horizontal dimension of a coordinate in a 2- or 3-dimensional vector coordinate representation. The value may be absolute, measured from the origin $[0, 0]$ or relative such as $[X_0 + X_1, Y_0 + Y_1]$. A 2-D computer image or animation might be stored and generated using absolute or relative coordinates that include X (horizontal) and Y (vertical) dimensions. Authentic 2-D animations depend upon matrix multiplication where sets of coordinates are multiplied by a transformation matrix. 2-D vectors $[X, Y]$ might be exchanged for homogeneous vector coordinates $[X, Y, H]$. The homogeneous dimension (H) is added to accommodate a three-row transformation matrix, so increasing the number of possible 2-D transformations. (*See 3-D.*)
2. A luminance component of video signal.

Y2K (Year 2000) A term used to describe the so-called year 2000. The lead up to the end of the millennium saw numerous IT systems being renovated to accommodate the need for date stamping using the year 2000 and its increments. Many non-compliant Y2K IT systems were created decades ago, when little consideration was given to the future.

Yahoo An immensely successful Web site featuring multiple information sources, services and search engine facilities.

Y-axis A horizontal axis on a graph or drawing.

Y-dimension A horizontal measurement that might be absolute or relative, in a 2-D or 3-D coordinate.
(*See 2-D and 3-D.*)

Yellow Alarm An alarm state that forms part of the T1 circuit specification. (*See T1.*) The Yellow Alarm is activated by:

- the receipt of a Red Alarm signal
- severe burst traffic.

Yellow page service A directory service for a Web site or suite of services running on a network or server.

Yield A measure of the amount that an investment such as an ordinary share generates.

YMODEM A protocol that supports data transfer using 1,024 Byte blocks, and is also referred to as XMODEM 1K.

YMODEM G A protocol that transmits a complete file before an acknowledge signal is received. It is intended for modem devices that have built-in error detection and correction.

Z

Z 1. A dimension of depth in a 3-D image or animation. A 3-D computer image or animation stored and generated using absolute or relative coordinates that include X (horizontal), Y (vertical) and Z (depth) dimensions. It may be:

- an absolute measurement from the origin
- a relative measurement from another coordinate.

Standard file formats and standard languages for developing 3-D animations for multimedia and virtual reality (VR) have emerged. The VRML (Virtual Reality Modeling Language) is suitable for the development of 3-D World Wide Web (WWW) pages. 3-D engines that may be used to generate 3-D animations include:

- Microsoft Direct3D
- Apple QuickDraw3D
- Silicon Graphics OpenGL.

Authentic 3-D animations depend upon matrix multiplication where sets of coordinates are multiplied by a transformation matrix. 3-D vectors, or ordinary 3-D coordinates, $[X, Y, Z]$, are exchanged for homogeneous vector coordinates $[X, Y, Z, H]$. The homogeneous dimension (H) is added to accommodate a four-row transformation matrix, so increasing the number of possible 3-D transformations. The transformation of homogeneous coordinates is given by:

$$[X \ Y \ Z \ H] = [x \ y \ z \ 1]\mathbf{T}$$

The resulting transformed coordinates may be normalised to become ordinary coordinates:

$$[x^* \ y^* \ z^* \ 1] = [X/H \ Y/H \ Z/H \ 1]$$

2. A measurement of impedance. Connected electronic devices typically have an input and output impedance. By matching these using the maximum power transfer theorem, an optimum electronic/electrical connection may be

made. 3. The dimension (n) in which a processor exists in an MPP network configured as a cube or hypercube.

Z80 An ANSI Committee dedicated to Ophthalmics.

Z80 (Zylog 80.) An early processor from Zylog.

ZAP A process of eradicating data or applications from a system.

Zero beat A state where two frequencies are the same.

ZIF socket (Zero Insertion Force socket) A type of socket commonly found on motherboards that permits the safe and easy removal and replacement of processors. The socket is fitted with a lever which is used to lock the processor in place and release it. ZIF sockets are also available for DIL (Dual In Line) devices such as ROM (Read Only Memory) chips.

Ziff-Davis A large corporation engaged in the computer book and computer magazine publishing sectors.

ZIP 1. A file format from PKware that is used for batch file compression. WinZip is an application that can be used to zip and unzip such compressed files. 2. A removable storage device manufactured by Iomega. Its removable discs store 100 MBytes of data.

ZOG A hypertext system developed at Carnegie-Mellon University in the 1970s. Among other applications it was used for teleconferencing and CBT. It is best known for its role on the *USS Carl Vinson* where it is used as a shipwide information and management system. Incorporating graphics, the Knowledge Management System (KMS) became the commercial face of ZOG.

Zoom A feature on many graphics and video editing programs that permits the user to enlarge a frame or image. All Windows applications feature such a control which may typically be invoked from the View menu. The user may be presented with zoom-in values, such as 75%, 100%, 125%, 150%, etc, or a value may be specified. Alternatively scale ratios may be selected such as 2:1, 3:1, 4:1, etc., which may be used to zoom in and out.

ZX80 An early Sinclair microcomputer.