

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, which is used by Group 4 facsimile. This uses an ISDN 64 Kbps bearer channel.
(See *ASCII.*)

Tactile feedback A method of addressing the tactile senses of an interfaced user in a computer or virtual environment. The interfacing device can generally be assumed to be lycra-based clothing such as a body suit, partial suit, or even gloves fitted with inflatable bladders usually at strategic points.

Taos ('Dowse') An operating system for parallel systems. Taos's most unusual feature is that it incorporates an instruction set for a virtual processor. Code written for it may therefore be run using a number of different processor architectures.
(See *MPP, Occam and Parallel programming.*)

Tape streamer A magnetic tape storage device used to back up 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

TAPI

simply involves copying the contents of the tape streamer to a functioning hard disk.

TAPI (Telephony Application Programming Interface) A standard representation of a system's communications hardware. It yields broad compliance between different applications.

Target system A system for which a multimedia application or title has been developed. In terms of Web applications, the target system is any connected client system which has an appropriate browser. Generally it can be assumed that such systems feature modern Java-compliant browsers, which are able to deliver streaming media. They may also be assumed to possess at least 256 colour graphics and a 640×480 pixels screen resolution, and a SoundBlaster Pro sound facility. Deciding which system should be targeted depends upon a number of factors, foremost among which are the size and demographic breakdown of the user base. The technical specification of the target system also plays an important role, and it is imperative that it is able to deliver the sound quality required. You can assume that all CD-based systems are able to play standard audio CDs or Red Book Audio tracks. The sophistication and playback quality of MIDI files are driven by the level of polyphony and whether FM (Frequency Modulation) synthesis or wave table synthesis is used on the target system. FM synthesis is the most common and gives relatively crude renditions of musical instruments, whereas wave table synthesis is infinitely more realistic because PCM recordings of actual musical instruments are played. An important technical factor when considering which target system should be addressed is the sophistication of video that can be supported. Also, the video standard that can be delivered is important. For instance, can it support MPEG-1 or MPEG-2 video? The overall video bandwidth supported by any CD-based system can be assumed to be a combination of the CD data transfer rate and the graphics capability.

(See browser, CD-ROM, DVD, MPEG and Streaming*.)*

Taskbar A status bar used in Windows 98/NT that underlines all applications. It shows the Start button and illustrates all open applications, which 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 anchors the Start button, which invokes the Start menu. The Start menu bears options that lead to programs as well as to submenus. Once invoked, the menu system can be navigated by moving 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 set of protocols used in packet-switched networks. It consists also of standard and non-standard 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 performing 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; users are permitted to log in using any name in the file `/ETC/PASSWORD`.

(See ARPANET, DARPA, IP address and Security.)

TDM (Time Division Multiplexing) A technique by which several different signals may be transmitted concurrently over the same physical link.

Teleoperation The process of operating a remote robot or device.

Telepresence A process by which 3-D movements, manipulations and other variables can be communicated to a remote device. It is believed that the term was invented by Marvin Minsky.

(See VR.)

Telnet A connectivity mechanism which 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.

Telstra A large Australian telecommunications company.

Telstra Big Pond An Australian ISP.

Terminal A computer 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, only the mere presentation element of an application.

Thin client A system within a client/server architecture (such as that of the Web) that features:

- presentation, which 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++.

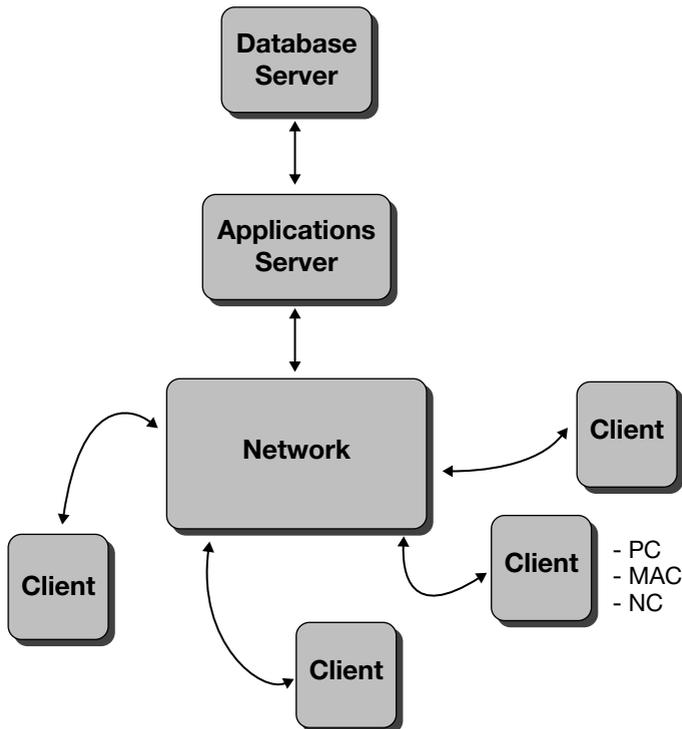
(See C++, Java and Visual Basic.)

Three-dimensional (See 3-D.)

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

- presentation, which is the front-end
- application logic, which is the middle-tier
- data, which is the back-end.

The partition which separates these three entities in terms of those that reside on the client and those which reside on the server is a function of the client/server implementation. The clients might be PCs, Macintosh computers or NCs. The three-tier architecture offers:



Three-tier client/server

Throughput

- effective scalability paths
- wider distribution of processing than the two-tier model
- low cost of ownership
- industry standard applications and operating systems
- isolation of hardware/software faults, while prospective areas of failure increase in comparison to two-tier architectures

(See Application, Client/server, Distributed computing, Fat client, Glue, Thin client and Two-tier client/server.)

Throughput A measure of work implemented as a function of time. It may be measured in floating-point operations per second (FLOPs), instructions per second (MIPs) or another unit for measuring processing performance.

(See MPP, Processor and SMP.)

TIFF (Tagged Image File Format) An image file format maintained by the Adobe Developers Association (ADA).

Time line A method of helping users to navigate information by allowing them to click on a line that bears dates. Generally it is in graphical form and accompanied by relevant images for various named periods of time. Microsoft Encarta Encyclopedia features a time line, as does Software Toolworks' History of Science and Innovation, which also features a graph of the economic cycle derived by Schumpeter. The peaks and troughs of the graph illustrate periods of economic prosperity and recessions/depressions, respectively.

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.)

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, which include 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 may be used to create multimedia programs that can be distributed using CD-ROM, floppy disk, intranets and 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 welcome departure for Asymetrix and allows ToolBook to compete with tools like Authorware Professional, which has long 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 the 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. Turning to the subject of this review, ToolBook II Assistant uses the familiar book metaphor for authoring and running resulting applications, which can contain multiple books. Each page of a ToolBook application has a foreground and background upon which can be placed objects such as questions, buttons, graphics and stages for video. The source for most of the objects is the ToolBook II Assistant Catalog. This can be extended to include your own objects, such as custom backdrops, buttons and graphics. To help developers create ToolBook applications there is a Book Specialist, which walks users through the process of creating a book structure, and gives control over various basic properties. The many properties that can be specified using the Book Specialist include the page size, position of navigation buttons, backdrops, your e-mail address, whether to record scoring information that can be sent by e-mail to the student, and whether student results are e-mailed to the administrator. You can also choose from one of three methods for distributing your program, which includes a Windows application on hard disk, on a CD-ROM or on a LAN. You can also choose Asymetrix Neuron so that your application can be played using Netscape Navigator or Microsoft Explorer. This method of application delivery requires that users have the Asymetrix Neuron plug-in or ActiveX Control installed on the browser. You can also choose to

distribute your applications as HTML files and Java applets over the Web. Having created a basic application framework using the Book Specialist, you can proceed to authoring the application at the Author level. While authoring you can test and play your application at any time by selecting the Reader level. You can toggle between Author and Reader levels using the Edit menu or by pressing F3. At the Author level multimedia production processes can be completed, including the addition of graphics, video, animations and text. The many aspects of the authoring process can be addressed, including the addition of a navigation scheme through the inclusion of hyperlinks. Page sequences of ToolBook applications can be viewed and edited using Book View on the View menu. The resulting window lists the hyperlink objects of selected pages, and can be used to rearrange pages simply by dragging thumbnail sketches of them. A vast library of objects is made available by the ToolBook II Assistant Catalog, which provides numerous categories of objects aimed at the development of courses as well as generic multimedia and interactive titles. These include questions, media players, clip art, video clips, animations, backdrops and user interface components such as buttons and hyperlinks. Many of the contained objects are not documented in the manual, so when familiarising yourself with ToolBook, browsing the Catalog should probably be on your list of starting points. Navigating through the various categories in the Catalog window reveals literally every component you could possibly need to build effective CBT courses. If you want to give your ToolBook applications a more original look, you might consider adding your own objects. The appearance and functionality of objects can be altered using the Properties dialog box, which can be invoked by right-clicking objects or by selecting the Properties button. Typically the Properties dialog box is used to alter fonts, change colours, establish object names and generally change the appearance of objects. The properties that can be altered depends on the selected object. In the case of a stage object that is used to accommodate video footage or an animation you can set the object so that it is transparent. Additional control over the behavior of objects is provided by the Extended Properties dialog box, which can be invoked by right-clicking the object or by selecting the Extended Properties button. As is the case with the Properties dialog box, the control that the Extended Properties dialog box gives over an object is a function of the selected object type. For instance, when using a video player object its extended properties include the video clip that it plays, as well as other properties of the playback sequence. Equally the Extended Properties of a selected question object will allow you to specify the correct answer, feedback for a wrong answer, and perhaps the score for the correct answer. In terms of adding multimedia content, the Catalog contains numerous media players, which include a number of video players with different controls. Video clips

are added to video players by right-clicking them in order to produce the Extended Properties dialog box. Similarly, the characteristics of stages can be changed through the Properties dialog box. The Catalog also has a category of buttons which Asymetrix has chosen to call Actions. Basically these are simply buttons with predefined behaviours that can be used to start and reset various actions. For example, they can be used to set the volume of wave audio and MIDI sequences, or to start media sequences which might be wave audio, MIDI, animations or video. You can trigger such actions using events other than mouse clicks, such as turning to a new page. A typical example of using Actions might be a simple path animation, where an object is moved from one point to the next. An Action trigger object would be used to move the object or sprite to a destination, and a Reset Trigger object would be used to return to the object or sprite to its starting point. As you would expect, the Catalog is also a rich source of question objects, which are among the most important components for course applications. Question types include selections of multiple choice buttons, where students simply click a button that is generally located to the left of text, and multiple choice fields where student can select buttons that show possible answers. Fill-in-the-blank and match-item question objects are also available in the Catalog. The former allows you to create questions where students are required to enter an answer, while the latter requires the student to match objects, perhaps by dragging an object onto an appropriate text item. Other question types include drop-target, which can be set up so that the student has to select one of a number objects and drag it onto an appropriate target object. And there is a question object which can be used to present lines of text, which the student must arrange in the correct sequence. A score-quiz object can calculate students' scores, which can be displayed in a feedback field. Using the Book Properties dialog box, it is possible to send student scores to specified e-mail addresses. Also included in the Navigation category in the Assistant Catalog is a Jump to URL button that will allow users to download ToolBook II Neuron from the Asymetrix Web site. There is also a button that allows users to download Java classes from the Asymetrix Web site. Some of the objects in the ToolBook II Assistant Catalog are Java-enabled, and their properties can be modified at Reader Level in the same way as any other object. Examples of Java-enabled objects include buttons in the so-called Course Action category and several of the objects in the Navigation category. When books are packaged for the Web, such objects become Java applets. Deploying a ToolBook course over the Web first involves selecting Export for Web on the File menu. It is then necessary to upload the application's exported HTML file and media files to the Web server, and an FTP utility is provided to carry out this operation. Having completed these operations you need only create a link to your application on a Web page. If the application

Top-down analysis

contains Java class objects it is necessary to upload a special file that contains Java code to the server. Additional applications provided include Microsoft's Bitmap Editor and Palette Editor, which have been around for some time, and Asymetrix's newer Palette Optimiser. Not much can be said about the Bitmap Editor other than it provides rudimentary editing features. The Palette Editor can be used to alter the colour information of video clips and graphics. It can also be used to generate common colour palettes, though this is best done with Palette Optimiser. A common colour palette ensures that the colours of video footage and graphics displayed together are reproduced accurately, and it also reduces so-called palette switching, which appears as screen flicker when switching between graphics and video clips.

(See Lingo and OpenScript.)

Top-down analysis A design approach which 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.

Touch screen A screen which is responsive to touch, and provides a means of establishing interaction between the user and a running application or environment. It can be described as an input device or a user communication device. Touch screens are used widely for kiosk applications, where a multimedia title might be interfaced with the general public, for example. They can be assumed to make applications more intuitive.

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.)

TP (Transaction Processing) monitor *(See Server.)*

Trackball An input device that is integrated in older notebook and subnotebook designs. Physically it is a ball joint. The ball can be rotated using fingers, so providing a means of manipulating a screen pointer or cursor in the *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 it 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, which performs transaction management and resource management. Transaction management ensures the so-called ACID properties of transactions. These are 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, 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.

(See MPP and Server.)

Transaction coordinator *(See Two-phase commit.)*

Transaction management *(See Server.)*

Transaction server A server allocated the task of transaction processing (TP).

(See MPP and Transaction.)

Transputer A processor designed for the construction of parallel processing systems or personal supercomputers. It is a complete microcomputer on a single chip, including a processor, memory and input/output devices in the form of communication links that can be used to interface one transputer with another. Initially it was developed by Inmos (Bristol, UK) using state funding, but it has been evolved into its current state using private investment. Inmos is currently owned by the SGS-Thomson group. Early

Triple DES

transputer designs include the 16 bit IMS 212 processor, which provided 10 MIPS, and the 32 bit IMS 414. The language of the transputer is considered to be Occam. Meiko (Bristol, UK) was among the first companies to develop transputer-based computers, most notably the Computing Surface. This system was used in the development of DVI (Digital Video Interactive) to research and implement digital video compression at the David Sarnoff Research Centre, New Jersey.

(See MPP, Occam and SMP.)

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.)

TTL (Transistor–Transistor Logic) A standard representation used in logic devices and in systems, denoting digital data.

Turnkey system A system which is installed and made fully operational on site.

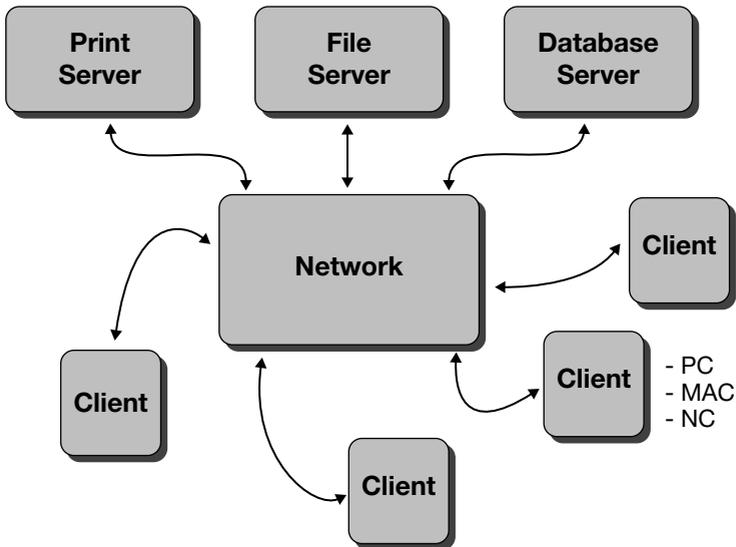
Twain A standard interface for scanners. Such compliant devices may be used directly with many graphics-oriented programs.

(See Scanner.)

Two-phase commit A method used in transaction processing which ensures ACID properties. It coordinates the changes made to system resources which 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 about 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 An architecture where application elements are distributed across two tiers of hardware. Physically logic and presentation elements may reside on intelligent client systems, and the data element may



Two-tier client/server

be on a back-end server or mainframe system. Client systems might be PCs, Macintosh computers or NCs, while the server might be based on one or more of the latest generation of Intel processors and running the Windows NT Server OS. Equally, the server might be a powerful RISC platform running the Unix operating system. 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 Application software, Client/server and Three-tier client/server.)

typedef A C++ command, which 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
}

```