L

LAN (Local Area Network)   A number of computers connected together so that users may share directories, applications, services and resources such as printers and 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 have approximate speeds between 10 and 1000 Mbps. There are a number of internationally agreed standards by which computers forming a LAN are connected. Network topologies include the:

- 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 Fibre Channel (FC). The latter may be used to implement FC arbitrated loops.

(See 10base*, Active Web Architecture, Client/server, Ethernet, Inactive Web Architecture, Master/slave processing and Server.)

LAN segment   A section of a LAN which is detached from the remaining network.

Lanier, Jaron   A VR specialist/evangelist recognised as having invented the term virtual reality. He founded VPL, one of the earliest VR companies.

(See VR.)

Laptop computer   A portable computer compact enough to be operated from a person's lap. Modern (about A4 size) versions are more often called notebook computers, or simply notebooks. Smaller than notebooks are the sub-notebooks, and smaller than these are palmtops manufactured by companies like Psion.

(See Display and Notebook.)

Large-Scale Integration (LSI)   (*See LSI.*)

Laser (Light Amplification by Stimulated Emission of Radiation)   A light source able to emit a coherent beam of light which is of a fixed wavelength. The device is said to 'lase' when producing such a ray of light.
(See LED and Optical fibre.)

Laser printer   A printer which operates using toner deposits. Most are monochrome, though there are a few colour variants (1998). Generally, they are low-cost and provide high-speed operation, and are therefore an ideal network printer solution.

Laser Vision   A standard videodisc player and disc format developed by Philips. Manufactured by Philips and other manufacturers (e.g. Pioneer), and now commonly used in IV applications as well as multimedia, it is largely a consumer product.
(See CD-ROM and DVD.)

Launch   1. The process of starting a program or application. Synonyms: Load, Open and Run. 2. A range of angles at which a ray of light must be injected into an optical fibre so that it may propagate along the cable's entire length. The angles are within the fibre's *acceptance cone*, whose size is a function of the fibre's NA or *numerical aperture*. The higher the NA, the greater the light-gathering ability of the fibre.
(See Optical fibre.)

Layer   An array of functions which are defined as part of a network or communications protocol and specification. They partition functions into logical parts.

L band   A section of the electromagnetic spectrum which ranges from 1.53 to 1.66 GHz and is used in satellite and microwave communications.

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.)

LED (Light-Emitting Diode)   A semiconductor/optoelectronic device which emits visible light when excited electrically. It may provide a basis for:

- display technology, such as that used in notebooks and consumer electronics devices such as pocket televisions
- laser light sources for fibre optic lightwave communications
- read heads for CD-ROM and DVD drives.

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, physical robustness, ease of manufacture in different colours, low power consumption and cheapness. Liquid Crystal Displays (LCDs) have displaced alphanumeric (LED) and graphical displays. 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:

$f = c/\lambda$
$f = (3 \times 10^8)/(8.00 \times 10^{-7})$
$f = 3.75 \times 10^{14}\,\text{Hz}$

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 a 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.

Radiative recombination
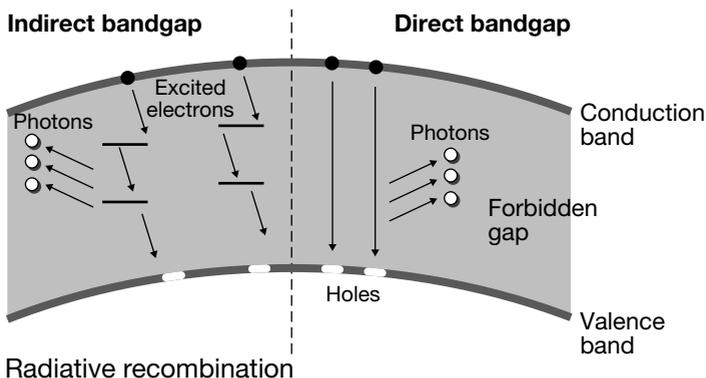
The difference that exists between the valence and the conduction bands is described as the forbidden gap. The type of semiconductor determines the behaviour of the bandgap, which may be:

- *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 an 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 micrometres) 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} micrometres per second) and E is the energy difference between the valence and conduction bands, which may be expressed in electronvolts.

(See LCD and Display.)

Legacy   A system, application or operating system (OS) that is of a past generation, 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.)

Lempel-Ziv   A data compression algorithm.

(See Compression.)

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 they include C++ and Visual Basic. 3. A US-defined series of security grades. *(See Security.)*

Lexical analyser   A compiler function which parses character sequences in the source code and converts them into tokens. In the case of Java it generates Java tokens from Unicode.

(See Java* and Java Unicode.)

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).
(See EMS.)

Line speed A data transmission rate over media which 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, which 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, which 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 can be defined.

Lingo `if...then` form

```
on keyDown
  if the key = ESCAPE then
    alert "Cue previous video clip"
    beep
  else
    alert "Escape?"
  end if
```

See the following works:

Roberts, Jason, *Director Demystified.* Berkeley, CA, Peachpit Press, 1995.

Thompson, John and Gottlieb, Sam, *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 object (.OBJ) files are linked with libraries, which 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. Links provide the user with a means of touring non-linear paths

through information. Such links of association are taken to limits which 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. 3. A means by which tables/files may be connected in a relational database management system (RDBMS). 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, which can 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 Database, Data warehouse and Relational database.)* 4. A communications path between devices, which may be processors, as is the case in MPP designs. *(See MPP.)*

List box   A windows component that provides a means of selecting files or options. Where the number of files or options exceeds a certain figure, a vertical scroll bar is provided in order to assist in the process of selection.

Literal constant   A variable may be assigned a value, which is considered a literal constant. In C++, this is implemented using codes such as:

```
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
```

(See C++.)

Literary Machines   A book written by Theodore Nelson, which 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, which could be accessed through specific technologies.

(See Bush, Vannevar and Xanadu.)

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 computing.)* 2. A method of distributing the workload in an MPP architecture, so that 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, Parallel programming and Transputer.)*

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. Local bus standards have emerged, including VL-bus and Intel's PCI (Peripheral Component Interconnect). PCI generally performs better than VL-bus.

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

LocalTalk   Cabling system for Macintosh computer, supported by integral AppleTalk^{TM}. It uses the RS-422 signalling standard and twisted pair media, and provides for up to 32 connections.

Local variable   A variable that is confined to a single procedure or routine in a program.

Logical client/server model   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, which 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.)

Logical operators   A term describing the notation for performing logical operations using a programming language, search engine or querying

language/tool. Using C++, for instance, logical AND, OR and NOT are implemented using the syntax '&&', '||' and '!'.

(See C++ and Search engine.)

Login and Log off   The processes 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.)

Lomem   The lowest user memory address in a system.

Look-and-feel   A term which broadly describes the user interface or presentation element of an application.

(See Application software.)

Loop   1. A repetition of code in a program. The loop is normally conditional, and rarely unconditional. 2. A series of video frames which is repeated.

(See Micon.)

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. Optical fibre signal losses are caused by impurities in the silica core and by fibre 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, the attainable compression ratios are lower than those of lossy compression algorithms.

(See DCT, JPEG and MPEG.)

Lossy compression   A compression technique which omits pixel information from the original uncompressed video or image file. In theory it should lead to unnoticeable loss of image quality. MPEG is a lossy compression technique.

(See DCT, JPEG and MPEG.)

Lotus Notes   A Groupware implementation 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, which replace, and translate into, hexadecimal processor instructions

(See Assembly language.)

LSI (Large-Scale Integration)   A semiconductor chip which integrates between 100 and 1000 devices.

(See VLSI.)