dictionary of multimedia and internet applications: a guide for developers and users. francis botto

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R

RAD tool (Rapid Application Development tool) A development tool that expedites application development. Its identity hinges on a number of identifying features, which 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 that they may be developed.

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

Radio button A series of buttons in which only one may be selected at a time.

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 OSes
- high speed interfaces such as Fibre Channel and Ultra SCSI.

The original RAID specification originated in 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, which is typically in the Gbyte range for a single RAID unit and in the Tbyte range for multiple connected units
- average access time measured in milliseconds (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 the following.

- Level 0, which stripes data across multiple disks but provides no error correction or redundancy.
- Level 1, which uses duplexing or mirroring, where data is written concurrently to pairs of independent disks, promoting a high degree of fault tolerance.
- Level 2, which 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 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 volatile form of electronic memory which loses its contents when electrically isolated or powered down. It is a *readable* and *writable* memory store. It is the most common type of electronic memory. Its name derives from the constant access time taken to read data, irrespective of where it is held in the cell array. As this is also a feature of read-only memory (ROM), the name RAM is a misnomer, and tells little of the key properties of RAM, i.e. it is readable and writable.

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.)*

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.

Record A row in a database table, or a collection of fields that contain field values.

Recursion A property of a programming language which 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.

Reflective light system An optical storage device that operates by reading encoded data using a reflected laser beam. CD-ROM is a reflective light

system, where a laser beam is shone against turns of track which are encoded with digital data using pits and areas of land. Pits scatter the laser light, while areas of land produce reflected light. Reflected light is diverted to a photodetector that produces a series of electrical pulses corresponding to encoded data. The underlying technology of CD-ROM is markedly similar to that used in Philips' first optical video disc system, demonstrated in Eindhoven as early as 1972. This research and development led to LaserVision.

(See CD-ROM and LED.)

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 can 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 RDBMSes (Relational Database Management Systems), whereas flat-file databases are termed simply DBMSes (Database Management Systems). Commercial examples of software products that permit the development of RDBMSes include Borland Paradox for Windows, dBase, Microsoft Access, Ingres, and Compsoft 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 which 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:

- MTTR (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.

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Availability (A) = MTBF/(MTBF + MTTR)
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Collective Availability (Ac) of a complete system is equated to the product of the availability for each individual component. For example:

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Availability (Ac) = Clients (Au) * Server (As) *
Network (An) * ...* Router (Ar)
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Removable medium A storage medium that can be removed from the computer. Examples include floppy disks, CD-ROM disc, DVD disc and Iomega Zip disks.

(See CD-ROM and DVD.)

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 × 480 pixels, 800 × 600 pixels, 1024 × 768 pixels, 1280 × 1024 pixels and 1600 × 1200 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 300 dpi. More expensive variants offer 600 dpi and 1200 dpi resolutions. Inkjet printers typically offer resolutions between 300 × 300 dpi and 1200 × 1200 dpi. Another popular resolution (for inkjets) includes 1440 × 780 dpi, which is offered by Epson versions.

(See Monitor.)

Restore A method by which a maximised or minimised application or document window is returned to its previous size and position.

RGB (Red Green Blue) A computer monitor output where each colour component, red, green and blue, is represented by an individual signal. The range of colours which can be generated depends upon how many bits are used to represent each (primary) colour component.

RGB (5:5:5) (Red Green Blue 5:5:5) A technique used in CD-I giving 5 bit RGB, where each colour component may be excited to produce one of 32 shades, giving a total of 32 768 ($32 \times 32 \times 32$) colours.

Rhapsody An operating system built around OpenStep technology, which was developed by NeXT Software.

(See NeXTStep.)

Risk exposure (RE) A product of risk probability (RP) and risk cost (RC):

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RE=RP* RC
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- 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.

(See DCT and JPEG.)

ROLAP (Relational On-line Analytical Processing) A data analysis environment using RDBMS data structures and query language implementations and techniques.

(See Data warehouse and OLAP.)

ROM (Read-Only Memory) An electronic memory device from which it is only possible to read data.

Root directory A top (or highest level) directory in a storage medium. All other subdirectories originate from the root directory.

Rosenblatt, Frank A computer scientist who put forward the idea of the perceptron neuron.

(See KBS and Neural network.)

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 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 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 Frame relay, Packet-switched network, Protocol and Screening router.)

Routing An action which sees a packet, cell or frame allocated a path.

(See Frame relay, Packet-switched network, Protocol, 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, so as to increase transmission distance and give interchangeability of computer peripherals.

RSA (Rivest, Shamir and Adleman) Encryption An encryption technique that uses public and private keys. RSA is integrated into numerous protocols, including: SSL (Secure Sockets Layer) and S-HTTP (Secure HTTP).

(See Cryptography and SSL.)

RTP (Real-time Transport Protocol) A protocol which supports real-time audio/video communications.

(See ASF.)