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PACS Education: Glossary of PACS Terms (3rd Edition)

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PACS Education: Glossary of PACS Terms (3rd Edition)

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Introduction

Introduction

The aim of this Glossary is to assist healthcare professionals, who may be new to PACS technology, to gain a quick understanding of the technical language and terminology used in this field of diagnostic imaging.

The Glossary is also a reference tool for healthcare professionals and contains explanations of terminology used in the implementation and maintenance of PACS.

It is envisaged that the Glossary will be read by any level of healthcare professional and hopefully by healthcare professionals across the whole of the healthcare service. Where ever possible internet web site addresses have been included to allow the reader to gain access to further detailed information on certain technical terms. All internet web site addresses for professional and standards bodies have been included.

PACSnet is happy to assist healthcare professionals in any area of PACS technology. Please make all enquires to the address at the front of this report or by filling in the query form at the PACSnet web site. <http://www.PACSnet.org.uk>

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A

Accession number A number, unique within an institution, given to each patient study. The accession number is usually generated by the RIS or HIS at the time that the study is ordered. See *Radiology Information System* and *Hospital Information System*.

ACR See American College of Radiology.

ACR-NEMA American College of Radiology-National Electrical Manufacturers Association. These two bodies together produced the ACR-NEMA standards that have evolved into the DICOM standards. See *Digital Imaging and Communications in Medicine (DICOM)*.

Active Matrix Liquid Crystal Display (AMLCD) See *Active Matrix*

Active Matrix This is a technology used in flat panel displays. It produces a brighter and sharper display with broader viewing angle than a passive matrix display. The LCD is constructed from a series of pixels which are each addressed individually using thin film transistor technology. See *Liquid Crystal Display (LCD)*, *Pixel*, *Passive Matrix* and *Thin Film Transistor (TFT)*

Adapter Is a physical device that allows one hardware or electronic interface to be changed, without loss of function, to another hardware or electronic interface. Adapters can come in two formats either cards that plug into the computer motherboard or connectors which attach to a port.

ADC See *Analogue to Digital Converter*.

Admit Discharge Transfer (ADT) Many PACS use patient location information, for example in the management of online storage and the creation of worklists. This information can be obtained from other hospital information systems in the form of messages containing details of patient admissions, discharges, or transfers between wards. These messages are usually referred to as ADT messages.

ADSL See *Asymmetrical Digital Subscriber Lines*

ADT See *Admit Discharge Transfer*.

Advanced Intelligent Tape (AIT) Advanced Intelligent Tape is tape technology that comes in two formats (AIT-2 and AIT-3) which hold 50 and 100 GB respectively. The tape has firmware that contains the indexing information and tape status, thus enabling rapid retrieval of data from anywhere on the tape. See *Digital Versatile Disk (DVD)*, *Linear Tape Open (LTO)*, *Jukebox*, *Digital Linear Tape (DLT)*, *Magneto Optical Disk (MOD)*, *Firmware*, *Digital Audio Tape (DAT)* and *Ultra Density Optical Disk (UDO)*.

Advanced Technology Attachment (ATA) This is a disk drive implementation that integrates the controller on the disk drive itself. This is also known as Parallel ATA., however it is more commonly known as IDE. See *Integrated Drive Electronics (IDE)* and *Serial ATA (SATA)*

AIT See *Advanced Intelligent Tape*.

Algorithm The series of rules that a computer follows to solve a problem. The rules in an algorithm should be clear and have a definite stopping point.

Ambient glare Light falling on an display device from external sources can produce a diffuse luminance that veils the intended image. This effect is known as the ambient glare and has the effect of reducing the contrast in the displayed image. See *Veiling glare*.

Ambient Light Ambient light is the light diffused in the environment surrounding an object of interest, for example a display device. Too much ambient light around a PACS display device can reduce the perceived image quality.

American Association of Physicists in Medicine (AAPM) This is an American institute involved in the practice of physics applied to medicine and biology. Its main goal is to advance public understanding of the field and to promote research and education in its application to healthcare (<http://www.aapm.org>). See *British Institute of Radiology (BIR)* and *Institute for Physics and Engineering in Medicine (IPEM)*.

American College of Radiology (ACR) This is the professional institute for radiologists in the USA. Its primary goal is the advancement of radiology to provide better patient care (<http://www.acr.org/>). See *British Institute of Radiology (BIR)* and *Radiological Society of North America (RSNA)*.

American National Standards Institute (ANSI) This standards agency creates standards for all equipment and goods sold in the USA. The ANSI standard has been adopted as the *de facto* world standard for some products such as software and technological equipment (<http://www.ansi.org/>). See *British Standards Institution (BSI)*.

AMLCD See *Active Matrix Liquid Crystal Display*.

Analogue A physical object or quantity which varies in a continuous manner and is not limited to discrete steps. An example of an analogue device is a mercury thermometer.

Analogue to Digital Converter (ADC) A device converting an analogue electrical signal into its digital representation so that it can be processed by a digital system. An example is the conversion of the light emitted from a CR plate during the read process, which is read by a PMT to form a digital image. See *Photo Multiplier Tube (PMT)* and *Computed Radiography (CR)*.

Analogue Signal Is a signal which varies in a continuous manner, unlike a digital signal which is made up of discrete units. See *Digital Signal*.

ANSI See *American National Standards Institute*.

Aperture Ratio In flat-panel displays, a pixel might utilize only a portion of the nominal pixel size. The ratio between the actual pixel size and the nominal pixel size is the aperture ratio. With higher aperture ratios, less pixel structure will be visible on the display, and the display may also be brighter.

Application Service Provider (ASP) An organisation which provides and manages archive storage space for image data. This archive space will frequently be located off-site, and may serve more than one independent PACS. See *Data warehousing*.

Archive The storage of large amounts of data. This data can be stored on various types of devices, examples being RAID, optical disk or digital tape. The use of the archiving media is dependant on the status of the images stored. Several terms are associated with archiving in PACS and are often used. See *Long Term Archive (LTA)*, *Short Term Storage (STS)*, *Online*, *Everything Online (EOL)*, *Nearline archive*, and *Offline archive*.

ASP See *Application Service Provider*.

Asynchronous Transfer Mode (ATM) A network technology based on transferring data in packets of a fixed size. The size of the data packets in ATM are relatively small compared to units used with older technologies. The small, constant size allows ATM equipment to transmit video, audio and computer data over the same network. See *Packets*.

Asymmetrical Digital Subscriber Lines (ADSL) This is an asymmetric technology, ie the downstream data rate, the ability to receive data, is much higher than the upstream data rate, the ability to send data. See *Digital Subscriber Lines (DSL)*

ATA See *Advanced Technology Attachment*

ATM See *Asynchronous Transfer Mode*.

Attenuation This refers to the reduction in signal strength as it is transmitted through a medium. This can occur with any type of signal; whether digital or analogue, and with all media types, however each medium type has its own unique effect. This effect is particularly important when dealing with signals transmitted over long distances.

Audio Video Interleave (AVI) A proprietary file format commonly used for storing low resolution video images. This format may be offered as an export option for the storage of cine images.

AVI See *Audio Video Interleave*

B

Backbone This is a computing term given to the physical computer network, and is usually used in reference to ethernet networks. All computers attached to the network are described as nodes. See *Ethernet*.

Backlight The light source behind an LCD panel that provides the illumination necessary for viewing the display.

Bandwidth The amount of data that can be transmitted in a fixed amount of time. For digital devices, the bandwidth is usually expressed in bits per second (bps) or more commonly Megabits per second (Mbps). It is also known as transfer rate.

Baud Named after Jean-Maurice-Emile Baudot, a French engineer who worked on early teleprinters, it is the name given to the measurement unit for data transmission speed. One baud is one electronic state change per second, or one bps.

Big endian Words in computers are created from 2 or 4 bytes. In big-endian architecture, the leftmost byte of a word is the most significant. In a little-endian architecture, the rightmost byte is most significant. Most PCs use little endian architecture; big endian architecture is mainly used in larger computers. See *Little endian*, *Word* and *byte*.

Biometrics is the science and technology of measuring and statistically analysing biological data. In information technology, biometrics usually refers to technologies for measuring and analyzing human body characteristics such as fingerprints, eye retinas and irises, voice patterns, facial patterns and hand measurements. The term biometrics is most often associated with security mainly for authentication purposes.

BIR See *British Institute of Radiology*.

bit The smallest unit of data storage on a computer. The word comes from binary digit: a bit can hold exactly one of two values, 0 or 1. However to hold meaningful information it is necessary to combine bits into larger units known as bytes. See *byte*.

Bit depth See *Image Depth*

bits per second (bps) A measure of the transfer rate that data travels over networks. It is usually expressed in Megabits per second, or Mbps. See *bit*.

bps See *bits per second*.

Bridge A device that connects two local-area networks (LANs), or two segments of the same LAN. The two LANs being connected can be alike or dissimilar, i.e. they may follow different protocols. Unlike routers, bridges are protocol independent. They simply forward packets (blocks of data) without analysing and re-routing messages. Consequently, they are faster than routers, but also less versatile. See *Hub*, *Router* and *Switch*.

Brightness An attribute of the visual sensation where an area appears to emit more or less light. Brightness is perceived by an observer when photons fall on the rods and cones of the eye's retina, and is not a measurable quantity. Luminance is the measured quantity which closely corresponds to brightness and is measured in candela per square metre. In PACS, it usually refers to the brightness of a display screen.

British Institute of Radiology (BIR) British based society with an interest in the promotion and study of radiology (<http://www.bir.org.uk/>). See *American College of Radiology (ACR)* and *Radiological Society of North America (RSNA)*.

British Standards Institution (BSI) This agency creates standards for all equipment and goods sold in the UK. The BSI also acts as a testing and inspection body for 'fitness for purpose' and safety for goods and commodities (<http://www.bsi-global.com/index.html>). See *American National Standards Institute (ANSI)*.

Browser See *Web browser*.

BSI See *British Standards Institute*.

byte The abbreviation for binary term, the smallest unit of storage capable of representing a single character. On all modern computers, a byte comprises 8 bits. See *bit*.

C

CAD See *Computer Aided Diagnosis*.

Candelas per metre squared (cdm^{-2}) The SI unit of measurement of luminance. See *luminance*, *nit* and *foot lambert*

Carrier Also referred to as carrier signal, it is a transmitted electromagnetic pulse or wave which forms a communications channel which can “carry” information, such as analogue or digital signal information.

Carrier Sense Multiple Access/Collision Detect (CSMA/CD) is the protocol for carrier transmission access in Ethernet networks. As part of the Ethernet protocol, any device can try to send a packet at any time. Each device senses whether the line is idle and therefore available to be used. If two devices transmit a collision occurs and the packets are rejected. Each device then waits a random period of time before retransmitting the data. See *Ethernet* and *Packet*

CARS See *Computer Assisted Radiology and Surgery*.

CAS See *Content Addressable Storage*

Cathode Ray Tube (CRT) A cathode ray tube is a specialized vacuum tube in which images are produced when an electron beam strikes a phosphorescent surface. See *Flat Panel*

CCD See *Charged Coupled Device*.

CCOW See *Clinical Context Object Workgroup*.

cdm^{-2} See *Candelas per metre squared*

Central Processing Unit (CPU) Often referred to as “the processor,” this is where calculations take place in a computer. On larger systems such as servers, there can be more than one CPU found on separate circuit boards; on smaller systems such as desktop machines the CPU is found in a single chip called a microprocessor. The CPU consists of two components: the Arithmetic Logic Unit (ALU) which performs all logical and arithmetic operations, and the control unit, which receives instructions from memory, decodes and executes them.

Charged Coupled Device (CCD) A CCD chip is an array of light-sensitive elements. When light impinges on the elements electrons are released, producing an electrical current. The elements within the CCD chip are discrete therefore the image produced from the elements contains discrete elements or pixels. See *Pixel*.

Clinical Context Object Workgroup (CCOW) An ANSI-certified standard, published by the HL7 group. It aims to facilitate the visual integration of applications at their point of use (e.g. a radiologist’s workstation). It complements the HL7 standard’s focus on workflow and integration of data between systems by focussing on the presentation of data to the end-user, such that the shared data appears to have come from a single system. See *Health Level 7 (HL7)*.

Clinical report A clinical report contains the clinical diagnosis of the image and is linked with the exam. The report can either be verified or unverified. See *Unverified report* and *Verified report*.

Clock, clock speed Computers have an internal clock which synchronises the various internal components and also regulates the rate at which the CPU (Central Processing Unit) executes instructions. See CPU (Central Processing Unit). Clock speed refers to the speed at which instructions are executed; they are expressed in MHz (megahertz) or GHz (gigahertz). The faster the clock or clock speed, the greater the number of instructions the CPU can execute per second.

Clustering This is the method of connecting multiple computers and making them act like a single machine. Corporations often cluster servers to distribute computing-intensive tasks and risks. If one server in a cluster fails, some operating systems can move its processes to another server, allowing end users to continue working while the first server is revived.

Commercial Off The Shelf (COTS) A description of a PACS solution supplied by a vendor using standard commercial products.

Common Object Request Broker Architecture (CORBA) A modern standard developed by the Object Management Group (OMG) to allow distributed objects, in this case software programs, to communicate. The standard allows any programs running on any operating system written in any language and on any network to communicate and cooperate. It is used when applications on one computer require the results of processing on a separate computer to perform a task.

Compression See *Data compression*, *Lossless compression* and *Lossy compression*.

Computer Assisted Radiology and Surgery (CARS) A society which has an annual conference to discuss the application of computers to radiology and surgery (<http://www.cars-int.de/>). See *EuroPACS*, *Radiological Society of North America (RSNA)*, *Society for Computer Applications in Radiology (SCAR)* and *International Society for Optical Engineering (SPIE)*.

Computed Radiography (CR) CR uses an imaging plate instead of film to capture an image. The plate is made of a storage phosphor that captures x-ray energy. When scanned with a laser the plate emits light. This is captured by the plate reader in order to build up an image from measurements made on the released energy.

Computer Aided Diagnosis (CAD) A sophisticated program which can aid the diagnosis of images. It usually has some artificial intelligence base.

Conformance statement A formal statement, provided by a vendor, associated with a specific implementation of the DICOM Standard. It specifies the service classes, information objects, and communication protocols supported by the implementation. This statement is usually several pages long, and specifies precisely how any item of equipment will implement the various options allowed within the DICOM standard. See *Digital Imaging and Communications in Medicine (DICOM)* and *DICOM conformance statement*

Content Addressable Storage (CAS) A storage technique developed by data storage manufacturer EMC designed for data storage which is fixed by location. CAS assigns an identifier to the data so that it can be accessed no matter where it is located.

Contrast The extent to which adjacent areas of an image on a display screen differ in relative brightness.

Contrast ratio – The ratio of intensity between the brightest white and the darkest black of a particular device or a particular environment

Contrast resolution This is the minimum perceptible difference in the luminance between two adjacent pixels a display. See *Spatial resolution*.

Co-processor A processor that assists the computer's main processor by performing specialist tasks, e.g. floating-point calculations or RAID 5 parity calculations. A co-processor can significantly increase processing speed. See *CPU*.

CORBA See *Common Object Request Broker Architecture*.

Corrective maintenance Maintenance carried out on hardware or software after fault finding in the system. See *Preventative maintenance*.

COTS See *Commercial Off The Shelf*.

CPU See *Central Processing Unit*

CR See *Computed Radiography*.

CRT See *Cathode Ray Tube*

CSMA/CD See *Carrier sense multiple access/collision detection*

D

DAS See *Direct Attached Storage*.

DAT See *Digital Audio Tape*.

Data Factual information, usually organised for analysis. It can also be thought of as information which is in a suitable form for processing by a computer.

Data Carrier Any medium that is used to transport and communicate data. This can include tape or disk. It is often used to refer to the signal used to carry data over a network.

Data Compression The compression of data to reduce its size by encoding it more efficiently. Data compression is used widely in the storing of data such as in backups and also in database management. Data compression also aids data transfer because devices are able to transmit the same amount of data using fewer bits, thus placing less overhead on the network. Data compression is performed by algorithms which reduce the size, and reversing the algorithm returns the data to its original form (lossless compression) or an approximation of its original form (lossy compression). See *lossless compression* and *lossy compression*.

Data mining A description for a class of database applications that look for hidden patterns in data. Data mining techniques can discover previously unknown relationships within data.

Data mirroring A technique in which data is written to two duplicate disks simultaneously hence providing redundancy in the system. If one of the disk drives fails, the system can instantly switch to the other disk without any loss of data or service, this is essentially an automatic backup of a hard disk. See *Redundant Array of Inexpensive Disks (RAID)* and *Data Striping*.

Data striping This is a method of combining multiple disks into one logical storage unit. This technique spreads the blocks of each file across multiple disks however this provides no redundancy of the data. Each file is separated into fixed sized blocks, or stripe units, and striped across multiple disks in a "Round Robin" manner which may be as small as 512 bytes or as large as several megabytes. See *Redundant Array of Inexpensive Disks (RAID)* and *Data Mirroring*.

Data transfer rate This is the rate at which data passes between devices. Normally it is represented in bits per second or multiples thereof, for example Mbps (Mega bits per second), Gbps (Giga bits per second). See *bits per second* and *baud*.

Data warehousing The storage of an organisation's data (e.g. medical imaging data) at a remote site, management of which may be the responsibility of a third party. See *Application Service Provider (ASP)*.

Database A collection of information organised in such a way that a computer program can quickly select desired pieces of data. A database can be constructed using several methods, examples are a relational database and a flat database; a relational database stores data in related tables whereas a flat database stores data in a single table. See *Database Management System (DBMS)*.

Database Management System (DBMS) A collection of programs that enable the user to access a database. See *Database*.

DBMS See *Database Management System*.

DDL See *Digital Driving Level*

DDP See *Default Display Protocol*.

DDS See *Digital Data Storage*.

Dedicated line (Also referred to as a dedicated link). A line reserved exclusively between two communicating systems, it can exist physically, such as a physical cable between two systems, or may exist logically. Often referred to as a leased line, the connection is always available. See *Virtual Circuit*.

Default Display Protocol (DDP) When the images in a PACS are displayed on a workstation for reporting they will be placed in a standard or default format known as the Default Display Protocol. This is also referred to as the hanging protocol.

DES See *Device Evaluation Service*.

Detailed Statement of Need (DSO) This is a procurement document which gives a framework for the purchaser to detail to the vendor their requirements for the project. See *Statement of Need (SON)*, *Image Management and Procurement of Systems* and *PaSA*.

Device Evaluation Service (DES) This is a division of the MHRA that deals with the Medical Devices Evaluation programme. See *Medicines and Healthcare products Regulatory Agency (MHRA)*.

Diagnostic Imaging Review (DIR) A magazine produced by the DES to highlight the work done by the diagnostic imaging evaluation centres. See *Device Evaluation Service (DES)* and *Medicines and Healthcare products Regulatory Agency (MHRA)*.

Diagnostic Medical Equipment (DME) A section in the NHS Purchasing and Supplies Agency (PaSA) that deals with the purchase of diagnostic imaging equipment. See *Purchasing and Supply Agency (PaSA)*.

DICOM See *Digital Imaging and Communications in Medicine*.

DICOM Compliant A device or imaging system which conforms to the DICOM standard and has a DICOM conformance statement is said to be DICOM compliant. See *Digital Imaging and Communications in Medicine*, *Conformance Statement* and *DICOM Conformance Statement*

DICOM conformance statement See *Conformance Statement*

DICOM gateway An interface between a modality and PACS. This will allow the transfer of images or data when the PACS and the modalities have DICOM conflicts.

Digital This describes any system that is based on discrete units, e.g. computers. Computers are digital because they operate on a series of discrete units called bits. See *bit* and *byte*.

Digital Audio Tape (DAT) A magnetic tape storage device used in the backup of large amounts of data which conforms to the DDS standard. The cartridges can store from 2 to 20 GB of native or uncompressed data with an archiving rate of 2 Mbps. See *Digital Data Storage (DDS)*, *Linear Tape Open (LTO)*, *Digital Linear Tape (DLT)*, *Advanced Intelligent Tape (AIT)*, *Digital Versatile Disk (DVD)*, *Jukebox*, *Magneto Optical Disk (MOD)* and *Ultra Density Optical Disk (UDO)*.

Digital Driving Level (DDL) A digital value, which given as input to a display system, produces a luminance. The DDLs associated with any display system give all the discrete values and hence luminance levels that the display is capable of. The DDL is derived from the input presentation value to the system, often equivalent to the pixel value. The mapping of DDLs to luminance values for a display system produces the characteristic curve of that display system. This characteristic curve may need to be corrected in order for the display to conform to the DICOM Part 14 Greyscale Display Function. See *Greyscale Standard Display Function (GSDF)* and *Digital Imaging and Communications in Medicine (DICOM)*

Digital Data Storage (DDS) This is the physical recording format adopted as an industry standard for DAT drives. See *Digital Audio Tape (DAT)*.

Digital Imaging and Communications in Medicine (DICOM) The ACR-NEMA standard protocol adopted by all manufacturers of equipment associated with medical imaging. The standard provides a method of linking a series of heterogeneous modalities, workstations and printers without the need for customised hardware to allow them to communicate and transfer images (<http://medical.nema.org/dicom.html>). See *American College of Radiology – National Electrical Manufacturers Association (ACR-NEMA)*, *Health Level 7 (HL7)* and *Integrating the Healthcare Enterprise (IHE)*.

Digital Linear Tape (DLT) A magnetic tape storage device used in the backup of large amounts of data. The tape cartridges can store from 20 to 40 GB of data and has a transfer rate of 6 MB/sec. The DLT system was improved to super DLT (S-DLT) which has a maximum storage of 110 GB with a transfer rate of 11 MB/sec. See *Advanced Intelligent Tape (AIT)*, *Digital Audio Tape (DAT)*, *Digital Versatile Disk (DVD)*, *Linear Tape Open (LTO)*, *Jukebox*, *Magneto Optical Disk (MOD)* and *Ultra Density Optical Disk (UDO)*.

Digital signal An electronic signal that is based on discrete units, and is either positive, which is represented by the number 1, or non-positive which is represented by the number 0 (also known as binary. See *Analogue Signal*.

Digital Subscriber Lines (DSL) A digital WAN technology that brings high-speed digital networking to the home or office. DSL are used only for connections from a telephone switching station to a home or office. See *Asymmetrical Digital Subscriber Lines (ADSL)* and *Wide Area Network (WAN)*

Digital Versatile Disk (DVD) This is a form of storage media which uses the same technology as CD-ROM but has a higher density of pits on each layer of the disk. A DVD can be a dual sided media and the technology also allows the DVD to have multiple layers, creating an increase in storage capacity. A DVD has the ability to store large amounts of data up to 4.7 GB per side for a single layer disk. See *Advanced Intelligent Tape (AIT)*, *Digital Audio Tape (DAT)*, *Digital Linear Tape (DLT)*, *Linear Tape Open (LTO)*, *Jukebox*, *Magneto Optical Disk (MOD)* and *Ultra Density Optical Disk (UDO)*.

Digitise To convert analogue data into binary or digital form. For example, it may be necessary to convert images stored on film into a PACS image data store, by using a digitiser, the analogue film data is converted into a digital form. See *Digitiser*.

Digitiser A device used to scan a traditional X-ray film to create a digital image data file. There are two types of film digitisers in common use. Both use lasers to scan the film to create the digital image; however one uses photo-multiplier tubes (PMT) to capture the light whereas the other uses charged coupled device (CCD) technology. See *Charged Coupled Device (CCD)* and *Photo Multiplier Tube (PMT)*.

Direct Attached Storage (DAS) This a term used to describe a storage device (usually a disk) attached to a server which can respond quickly to random requests for data.

Direct Image Capture The acquisition of image data from an imaging modality that itself originally acquired the image data in digital format.

Direct Radiography (DR) Technology where x-ray energy is converted directly into digital data without the need for an intermediate store-and-read step. The image data is sent immediately to a local computer where it is available for manipulation and transfer to a PACS. Direct Radiography is a process where the energy from the X-ray is converted directly to electron hole pairs in an amorphous selenium TFT flat panel detector. An electric field across the plate allows the separation of the electrons to the anode and the holes to the cathode; the image is then reconstructed. See *Thin Film transistor (TFT)* and *Computed Radiography (CR)*.

DIR See *Diagnostic Imaging Review*.

DLT See *Digital Linear Tape*.

DME See *Diagnostic Medical Equipment*.

DNS See *Domain Name System*

dpi See *Dots per inch*

Domain Name System (DNS) The Domain Name System is method by which Internet domain names are located and translated into Internet Protocol addresses. A domain name is alphanumeric and meaningful to a human reader whereas Internet Protocol addresses are purely numeric.

Dots per inch (dpi) A measure of the spatial resolution of images.

DR See *Direct Radiography*

DSL See Digital Subscriber Lines

DSO See *Detailed Statement of Need*.

Dumb terminal This is a terminal that has no processing capabilities. The information shown on the screen is taken from a central server where the processing is done.

DVD See *Digital Versatile Disk*.

Dynamic Range A measure of the range of data values that can be transmitted or reproduced by a device. It is generally calculated as a ratio of the maximum to minimum values available in the system and expressed in decibels (dB).

E

EOL See *Everything Online*.

eHealth This term covers the complete field of computer and electronic media in healthcare. As well as covering telemedicine, PACS and teleradiology this subject also deals with the control and flow of all types of information in the healthcare environment. See *Integrating the Healthcare Enterprise (IHE)*, *telemedicine*, *teleradiology* and *Picture Archiving and Communication Systems (PACS)*.

EHR See *Electronic Healthcare Records*.

Electronic Healthcare Records (EHR) An electronic health record is a longitudinal record of a patient's health and healthcare from cradle to grave. It combines the information about patient's primary healthcare with subsets of information associated with the outcomes of periodic care held in Electronic Patient Records. This term is defined in Information for Health.

(<http://www.nhsia.nhs.uk/def/pages/info4health/contents.asp>). See *Electronic Patient Records (EPR)*.

Electronic Patient Records (EPR) A record containing a patient's personal details (name, date of birth etc), their diagnosis or condition, and details about the treatment/assessments undertaken by a clinician. It typically covers the episodic care provided mainly by one institution. This term is defined in Information for Health. (<http://www.nhsia.nhs.uk/def/pages/info4health/contents.asp>). See *Electronic Healthcare Records (EHR)*.

EPR See *Electronic Patient Record*.

Ethernet This is the most widely used architecture in local area networks (LAN). It is defined by the IEEE as the 802.3 standard. Ethernet operates over various types of physical media such as coaxial, shielded or unshielded twisted pair and fibre optics. It normally operates at 10 or 100 Mbps but new versions can operate at Gbit (1000 Mbps) transfer rates. See *Institute of Electrical and Electronic Engineers (IEEE)*.

EuroPACS A European wide organisation involved in promotion and research in PACS. This organisation holds an annual conference to discuss progress in PACS (<http://www.europacs.org/>).

Everything Online (EOL) A PACS design where all exams are available in online storage, irrespective of the age of the exams. The RAID is backed up with an archive storage device such as DVD or tape. See *Long Term Archive (LTA)*, *Short Term Storage (STS)*, *Nearline archive*, *Online storage* and *Offline archive*.

F

Failover A backup operation that automatically switches to a standby system (database, server or network), if the primary system fails or is temporarily shut down. Failover is an important fault tolerance function of PACS.

FCIP See Fibre Channel over IP

FCP See *Fibre Channel Protocol*

FDDI See *Fibre Distributed Data Interface*.

Ferroelectric liquid crystal (FLC) See *Thin Film Transistor*

Fibre Channel over IP (FCIP) A protocol for transmitting Fibre Channel data over an IP network. Fibre Channel has been typically designed for local storage area networks (SANs), but FCIP extends the distance across any IP network by encapsulating the Fibre Channel frame in TCP/IP for linking SANs over a wide area network. See *Fibre Channel Protocol (FCP)*, *Internet Fibre Channel Protocol (iFCP)*, *Transmission Control Protocol/ Internet Protocol (TCP/IP)* and *Storage Area Network (SAN)*.

Fibre Channel Protocol (FCP) This protocol is used as the mechanism for the transfer and control of data in a Storage Area Network (SAN). The FCP serializes SCSI commands into a Fibre Channel frame. Though the term Fibre Channel Protocol suggests that this is designed only for optical fibre this is, in fact, incorrect as the protocol is also supported for use on coaxial cable and twisted pair . Fibre Channel uses the Gigabit Ethernet physical layer and IBM's 8B/10B encoding method, where each byte is transmitted as 10 bits. See *Fibre Channel over IP (FCIP)*, *Internet Fibre Channel Protocol (iFCP)*, *Transmission Control Protocol/ Internet Protocol (TCP/IP)* and *Storage Area Network (SAN)*.

Fibre Distributed Data Interface (FDDI) A method used to send data over an optical fibre network. This type of network supports data transfer rates in the order of 200 Mbps. This is more efficient at transferring data across a network than Ethernet networks (as the header used is smaller), and therefore allows greater amounts of data to be sent in the packets. See *Ethernet* and *Packets*.

Fibre Shortest Path First (FSPF) This is an intelligent routing mechanism which is part of Fibre Channel Protocol. This will analyse the path through the network between the transmitting and receiving nodes. A metric system is used to determine the shortest path through the network, optimising the bandwidth. See *Fibre Channel Protocol*

File A collection of data or information that is stored on a computer system.

File Transfer Protocol (FTP) A protocol used to transfer files and software between two computer systems. In a PACS environment this is often used to transfer files from the HIS or the RIS to PACS and vice versa. See *Transmission Control Protocol/Internet Protocol (TCP/IP)*.

Fill Factor See *Aperture Ratio*

Firewall A firewall is a set of related programs or hardware, located at a network gateway. This protects the resources of a private network from users of other networks. An enterprise with an intranet that allows its workers access to the wider Internet installs a firewall to prevent outsiders from accessing its own private data resources and for controlling the outside resources that users are able to access.

Firmware This is software that has been recorded onto read-only memory (ROM), which is retained when the hardware is turned off. The software contained in the ROM is used to set the start conditions when the hardware is switched on.

Flat panel A thin display screen that uses any of a number of technologies to display images. These were initially developed for laptops but are now replacing CRTs in the PACS environment. See *Cathode Ray Tube (CRT)* and *Thin Film Transistor (TFT)*.

fL See foot Lambert

FLC See *Ferroelectric liquid crystal*

Floppy disk A portable magnetic disk storage medium. The storage capacity of a floppy disk is generally between 350kB and 1.5MB and is thus too small to be of practical use in imaging systems. Floppy disks are being replaced by other portable mediums with higher storage capacity, such as DLT, DVD and MOD. See *Digital Linear Tape (DLT)*, *Digital Versatile Disk (DVD)* and *Magneto Optical Disk (MOD)*.

foot Lambert (fL) This is a unit of luminance often referred to in literature from the USA and in older literature from elsewhere. However the cd/m² (Candela per square metre) is now being adopted by all as the standard unit for the measurement of luminance. 1 fL=3.426 cdm⁻². See *Luminance, Candelas per metre squared (cd/m²)* and *nit*

Frame buffer This is the memory on a graphics card that stores the image information not being displayed on the screen. This memory buffer stores rendered frames off screen. The image data is then sent to the display through the ADC to display on the screen. See *Analogue to Digital Converter (ADC)*

Frame grabber A device that takes analogue video signal as input and converts it to a digital image file, using the synchronisation signals of the video to establish the beginning of each frame. With a large frame buffer it is possible to digitise the video in real-time.

FSPF See *Fibre Shortest Path First*

FTP See *File Transfer Protocol*.

Full duplex This is used to describe a connection where both ends can communicate i.e. send and receive simultaneously. See *Half Duplex*

G

GB gigabyte (1024 MB). See *MB*.

GIF See *Graphics Interchange Format*

Graphical User Interface (GUI) This allows the user to interact with a computer through pictorial means. This can be done in the form of windows with drop down menus and icons.

Graphics Interchange Format (GIF) This is a bit-mapped graphics file format which is particularly useful for smaller graphic images.

Greyscale, grayscale A grayscale image is one in which all the colours are shades of grey.

Greyscale display A grayscale display is one which is capable of displaying only shades of grey. The number of different grey levels available in the display depends on the number of pixels used for each pixel: an 8-bit display can display up to 256 grey levels, whereas a 12-bit display can display up to 4096 levels of grey.

Greyscale Standard Display Function (GSDF) This DICOM function describes the non-linear human perceptual response to different levels of luminance based on Barten's model of the human visual system. The GSDF defines a standard curve against which different types of display devices can be calibrated. The available contrast on the calibrated image display is then perceived by the user to be linear (i. e. the difference between black and 5% gray is perceived equal to the difference between white and 95% gray). The GSDF can be applied to all display monitors and hardcopy printers. See *Digital Imaging and Communications in Medicine (DICOM) and Workstation*

GSDF See *Greyscale Standard Display Function*

GUI See *Graphical User Interface*.

H

Half Duplex This is used to describe a connection that allows signals to flow in both directions i.e. send and receive, however the signals can only flow in one direction at a time. See *Full Duplex*

Hanging protocol See *Default Display Protocol*.

Hard disk An aluminium disk, or more usually a collection of disks, coated with magnetic material that is sealed within a unit known as a disk drive. It stores and provides access to large amounts of data. As at time of printing a single disk drive can store up to 250GB. See *Gigabyte (GB)*.

Hardware Interface the physical attachment of devices to allow communication with each other. See *Interface*, *User Interface* and *Software Interface*.

HBA See *Host Bus Adapter*

Header The initial part of a data packet or frame containing identifying information about the data contents, such as the source of the data, its destination, and length. In DICOM an image, which is the standard medical image, has an associated DICOM header. This contains information pertaining to the image e.g. patient name or image information such as the size of the image. The header contains the information that allows the computer to exchange information related to the image with other devices and perform tasks on the data.

A header is also used in networking and is attached to each unit of data sent across the network, the size of header being dependant on the network protocol being used. The header holds information about the data which allows the computer to combine all the data units after transmission to form the file sent across the network.

HealthCare Information and Management Systems Society (HIMSS) This is a society which provides a forum for multidisciplinary professionals in healthcare information services to discuss problems and provide educational facilities for its members. It also aids in the advancement of standards and initiative such as IHE (<http://www.himss.org/>) See *Integrating the Healthcare Enterprise (IHE)*.

Health Insurance Portability and Accountability Act (HIPAA) This is a USA law that came into effect in 2002. Principally the goals are the standardisation of information management and exchange in medicine, to maintain security, improve accuracy and assure privacy (<http://www.hipadvisory.com/> and <http://www.scarnet.org/>).

Health Level 7 (HL7) This is an ANSI accredited standard developed to allow transfer of data between different systems in healthcare. This operates at the top level of the open system integration model, the application layer (<http://www.hl7.org/> and <http://www.hl7.org.uk/>). See *Digital Imaging and Communications in Medicine (DICOM)*, *Open System Interconnection (OSI)* and *Integrating the Healthcare Enterprise (IHE)*.

High tide The online storage in a PACS will have an upper limit to the number of images that can be stored. As this upper limit is approached, decisions have to be made about which exams are to remain online, and which can be deleted (note that copies of all exams will always be available from the archive). Deletion of exams from the online storage starts at a point when the number of stored images is a little below the maximum capacity, for example 90%. This point is known as the “high tide” point. See *Low tide* and *Short Term Storage (STS)*.

HIMSS See *HealthCare Information and Management Systems Society*.

HIPAA See *Health Insurance Portability and Accountability Act*.

HIS See *Hospital Information System*.

HL7 See *Health Level 7*.

Hospital Information System (HIS) A computer system which stores demographic information on all patients. It may also store appointment details, clerical data or pathology reports. See *Radiology Information System (RIS)*.

Host Bus Adapter (HBA) This is a network connection device used in SANs performing a similar function as the NIC in Ethernet. See *Network Interface Card (NIC)*, *Ethernet* and *Storage Area Network (SAN)*

Hub A device to link a number of peripherals to a network through a number of ports. All the packets on the network are sent to all ports and are then sent to all devices. See *Bridge*, *Router* and *Switch*.

ICMP See *Internet Control Message Protocol*.

IDE See *Integrated Drive Electronics*

IHE See *Integrating the Healthcare Enterprise*.

Illuminance This is the density of light falling onto a surface. The light from the surrounding environment affects the luminance from the screen which falls onto an observer. This reduces the luminance of any display and can have a significant affect on the contrast in the image. This is also referred to as ambient light. It is measured in lux (Lumens per square metre). The footcandle (Lumens per square foot) is an older unit of measurement that may be encountered.

IMACS See *Image Management and Communication System*.

Image A general definition is a visual representation of a real world entity. However a more appropriate definition of a digital image would be an array of numerical values which may be meaningfully rendered as a visible image by means of an algorithm that maps between the array values and the displayed pixel values. The information in each of the pixels will be contained in bytes which will determine its level of grey on the greyscale. See *Pixels*, *Image depth* and *bytes*.

Image compression A reduction in the amount of data required to encode an image. This reduction can be accomplished by storing the data more efficiently (lossless compression), discarding some non-essential data (lossy compression), or a combination of the two techniques. See *Lossless compression and Lossy compression*.

Image depth An image consists of an array of pixels. Every pixel in the image will be made up of a number of bits. A common size for imaging systems is 16 bit pixels. This is known as the image depth, and determines the number of greyscale levels in the image. See *Bit depth*

Image Management and Communication System (IMACS) Synonymous with Picture Archiving and Communication System (PACS), though it may sometimes be used to mean a PACS that takes images from more than just the radiology department. See *Picture Archiving and Communication System (PACS)*.

Image Management and Procurement of Systems (IMPRESS) This is a model developed by the NHS Purchasing and Supplies Agency and PACSnet for the procurement of image and data management systems (PACS and RIS/HIS when purchased with a PACS) in the NHS.

IM&T See *Information Management and Technology*

IMPRESS See *Image Management and Procurement of Systems*.

Image Storage Unit (ISU) The online storage can be referred to as the “image storage unit” in a PACS. Copies of all the images of the in-patients, hospitalised patients, or patients attending clinics are held in this form of storage. The images can be removed from the ISU when no longer required online. However they will always be available from the nearline or offline archive. See *Working Storage Unit (WSU)*, *Nearline archive* and *Offline archive*.

Information Management and Technology (IM&T) This is the convergence of information management with computing and telecommunications technologies. This involves all aspects of information technology required to implement a solution namely equipment, software, facilities and human resources, and requires the same fundamental techniques involved in PACS i.e. the capture, storage, retrieval, transfer, communication or dissemination of information through the use of electronic media.

Institute for Physics and Engineering in Medicine (IPEM) This is an institute involved in the practice of physics and engineering as applied to medicine and biology. Its main goal is to advance public understanding of the field and to promote research and education in its application to healthcare (<http://www.ipem.org.uk/>). See *British Institute of Radiology (BIR)*.

Integrated Drive Electronics (IDE) An IDE interface is a storage device interface where the controller is integrated into the hardware. It is a term that is commonly used for the Advanced Technology Attachment (ATA) technology. See *Advanced Technology Attachment (ATA)* and *Serial ATA (SATA)*.

Integrating the Healthcare Enterprise (IHE) An initiative by HIMSS and RSNA to establish the integration of all hospital information and imaging systems. Its aim is to encourage manufacturers to establish common protocols that will allow this integration to take place (<http://www.ihe-uk.org/>). See *Healthcare Information and Management Systems Society (HIMSS)*, *Radiological Society of North America (RSNA)*, *Digital Imaging and Communications in Medicine (DICOM)* and *Health Level 7 (HL7)*.

Integrated Services Digital Network (ISDN) This is a digital communications network designed to carry voice, data, images, and video. However when run over copper wiring ISDN runs at a considerably slower speed than the fibre cable it was designed for. ISDN does however provide point to point connection between two sites.

Interface Enables two independent systems to interact or communicate with each other. There are three main types of interfaces: user interface, software interface and hardware interface. See *User Interface*, *Software Interface* and *Hardware Interface*.

International Society for Optical Engineering (SPIE) Formerly known as the Society of Photo-optical Instrumentation Engineers, this is a body which covers a wide variety of interests from optics to medical imaging. It plays a significant role in education and emerging technologies and runs many conferences and courses (<http://www.spie.org>).

Internet Control Message Protocol (ICMP) This is an extension to the internet protocol, which supports error and control messaging. See *Transmission Control Protocol/Internet Protocol (TCP/IP)*.

iFCP See *Internet Fibre Channel Protocol (iFCP)*

Internet Fibre Channel Protocol (iFCP) A protocol that converts the 24 bit frames of fibre channel protocol to a unique IP address. This enables native Fibre Channel devices to be connected via an IP network. The IP network could be a LAN, WAN or MAN . See *Fibre Channel over IP (FCIP)*, *Fibre Channel Protocol (FCP)*, *Transmission Control Protocol/ Internet Protocol (TCP/IP)* and *Storage Area Network (SAN)*.

Internet Service Provider (ISP) A company that allows subscribers to gain access to the Internet, usually via a modem over a telephone line.

Interoperability is the ability of a system or a product to work with other systems or products without special effort on the part of the user. Interoperability becomes of significant importance with the integration of medical systems to form the Electronic Patient Records. See *Integrating the Healthcare Enterprise (IHE)* and *Electronic Patient Records (EPR)*

IPEM See *Institute of Physics and Engineering in Medicine*.

Irreversible compression Compression of data such that some of the original data cannot be restored on decompression. See *lossy compression*.

ISDN See *Integrated Services Digital Network*

ISP See *Internet Service Provider*.

ISU See *Image Storage Unit*.

J

JBOD See *Just a Bunch Of Disks*.

Joint Photographic Experts Group (JPEG) JPEG is a group of experts which was formed to produce a standard for compressing images, (ISO/IEC JTC1 SC29). JPEG is also a lossy compression technique that reduces the size of the image data file. However the cost of this is the loss of some information. JPEG is never used for text compression (<http://www.jpeg.org/>). See *Lossy compression* and *Moving Photographic Experts Group (MPEG)*.

JND See *Just Noticeable Difference*.

JPEG See *Joint Photographic Experts Group*.

Jukebox An archiving jukebox can contain one of many types of media (CD-ROM, tape or disks). The jukebox moves the media from its location by means of a robot or carousel to a reading /writing area. The time for this movement of disk to read is usually 10 – 20 seconds. See *Advanced Intelligent Tape (AIT)*, *Digital Linear Tape (DLT)*, *Magneto Optical Disk (MOD)*, *Linear Tape Open (LTO)*, *Digital Audio Tape (DAT)*, *Digital Versatile Disk (DVD)* and *Ultra Density Optical Disk (UDO)*.

Just a Bunch Of Disks (JBOD) A multiple-disk based archiving system, analogous to a large disk in a PC, which contains no fault tolerance management of the data. See *Redundant Array of Inexpensive Disks (RAID)*.

Just Noticeable Difference (JND) This is the smallest amount of difference in brightness between two adjacent points on a display that can be perceived by an observer. See *Brightness*.

K

KB kilobyte (1024 bytes). See *byte*

KBS See *Knowledge Based System*.

Knowledge Based System (KBS) Also known as expert systems. These are used in the fields of medicine and engineering. A KBS uses knowledge, gleaned from human expertise, which is entered as a series of rules for problem solving. The KBS ability to solve the problems is only as good as the rules entered into the system. KBS are very specialised in the functions they perform.

L

LAN See *Local Area Network*.

Latency This is the delay in the time from an instruction being implemented to the command being carried out. This could include the time for a packet to cross a network, as it is possible to be held up on slow links or because of congestion. Latency also occurs in the time for a pixel in a TFT screen to switch from on to off state or vice versa. See *Packet*, *Pixel* and *Thin Film Transistor (TFT)*

LCD See *Liquid Crystal Display*

Linear Tape Open (LTO) This is an open tape standard developed by IBM, Hewlett-Packard and Seagate, which has two formats based on the physical size of the storage; 25 GB for the Accelis, 100 GB for the high capacity Ultrium. See *Advanced Intelligent Tape (AIT)*, *Digital Linear Tape (DLT)*, *Magneto Optical Disk (MOD)*, *Jukebox*, *Digital Audio Tape (DAT)*, *Digital Versatile Disk (DVD)* and *Ultra Density Optical Disk (UDO)*.

Liquid Crystal Display (LCD) A type of display that has become increasingly common in recent years. These displays use a layer of liquid crystals sandwiched between two sheets of polarisers, with all three layers being positioned in front of a very bright backlight. The light from the backlight is polarised by the first polarising layer. The liquid crystal can rotate the orientation of the light, allowing it to pass through the second polarizer if rotated appropriately. If a voltage is passed across the Liquid crystal cell the liquid crystal structure deforms and the liquid crystal is unable to change the orientation of the light, hence when the light is incident on the second polarizer no light is transmitted. See *Active Matrix*, *Response Time*, *Passive Matrix* and *Thin Film Transistor (TFT)*.

Little endian Words in computers words are created from 2 or 4 bytes. In little-endian architectures, the rightmost bytes are most significant. In big-endian architectures, the leftmost bytes are most significant. Most PCs use little endian architecture; big endian architecture is mainly used in large computers. See *Big endian*, *Word* and *byte*.

Local Area Network (LAN) A computer network that spans a small area, e.g. an office, with each computer being a node on the network. See *Wide Area Network (WAN)*.

Logical Unit Number (LUN) is a unique identifier used on a SCSI bus that enables it to differentiate between up to eight separate devices, each of which is a logical unit. LUNs can be individual disks, groups of disks, or individual parts of multiple disks defined by a RAID controller or other intelligent storage controller. LUNs are sometimes also called 'logical disks', 'partitions', or 'virtual disks'. See *Small Computer System Interface (SCSI)* and *Redundant Array of Inexpensive Disks (RAID)*.

Long Term Archive (LTA) This refers to two types of archives nearline and offline. See *Short Term Storage (STS)*, *Nearline archive*, *Online storage*, *Offline archive*, and *Everything Online (EOL)*.

Look-Up Table (LUT) A Look-Up Table is used to transform an input value to an output value by finding the appropriate entry in a table. For example, it is a technique that can be used to perform a conversion on pixel data, so that when the pixel values are transformed they are in a normalised range.

Lossless compression A data compression technique which results in data being returned to its original form without any loss of information when it is decompressed. The decompressed file and the original file are identical. See *Lossy compression*.

Lossy compression This is a data compression technique; which results in data not being returned to its original form when it is decompressed. The benefit of using this technique is that it provides a high degree of compression, saving on storage space and transmission time over a network. See *Lossless compression*.

Low tide As the online storage reaches its working capacity or high tide point the system will remove the 'old' images. The criteria for removal being defined by the system administrator. The images will be deleted until the online data store has reached a predefined low tide point, thus creating space for the acquisition of new images. See *High tide*.

LTA See *Long Term Archive*.

LTO See *Linear Tape Open*.

LUN See *Logical Unit Number*

Luminance This is the luminous intensity per unit area projected in a given direction from a surface, i.e. the measurable amount of light emitted from a surface. Luminance in the international system unit (SI) is measured in Candela per metre squared (cdm-2), this unit is also referred to as a nit in the USA. See *Brightness*, *Candelas per metre squared*, *foot Lambert* and *nit*.

LUT See *Look-up Table*.

M

MAC address This is a unique serial number residing in the firmware of a network interface card that identifies the network card on the network.

Magneto Optical Disk (MOD) A type of disk that combines magnetic disk technologies and CD-ROM technologies. MO disks can be read from and written to and can be removable. Their storage capacity is approximately 1.3 GB, (650 MB per side). See *Digital Audio Tape (DAT)*, *Linear Tape Open (LTO)*, *Digital Linear Tape (DLT)*, *Advanced Intelligent Tape (AIT)*, *Digital Versatile Disk (DVD)*, *Jukebox and Ultra Density Optical Disk (UDO)*.

Managed Services Contract (MSCON) A contract that organises the management of the equipment and services in an IT system by a third party.

Managed Services See *Managed Services Contract*

Matrix size The size of an image measured in pixels. Images from CT, for example, tend to have a small matrix size (typically 256 pixels square); images from CR tend to have a large matrix size (typically 1560 x 2048 pixels).

Maximum intensity projection (MIP) is used in medical imaging to visualize blood flow. MIP finds the brightest voxels in the volume, the voxels lying in front of and behind the bright voxel are not displayed. As a result depth information is lost but density information is preserved.

MB megabyte (1024 kB). See *byte* and *kB*

Mbps See *bps*.

MHRA See *Medicines and Healthcare products Regulatory Agency*.

Medicines and Healthcare products Regulatory Agency (MHRA) This is an executive agency of the Department of Health whose function is to ensure that medicines, healthcare products and medical equipment meet appropriate standards of safety, quality, performance and effectiveness when used in the UK. (<http://www.mhra.gov.uk/>)

Memory The part of a computer that is used to store data and programs. There are two types of memory: RAM (Random Access Memory) and ROM (Read Only Memory) See *RAM (Random Access Memory)* and *ROM (Read Only Memory)*.

Middleware In the computer industry, middleware is a general term for any programming that serves to "glue together" or mediate between two separate (and usually pre-existing) programs. A common application of middleware is to allow programs written for access to a particular database to access other databases. Messaging is a common service provided by middleware programs so that different applications can communicate. See *Open Database Connectivity (ODBC)*.

Mini-PACS If it assumed that a PACS must be as a minimum hospital wide, a mini-PACS can refer to a department based system, such as Radiology, A & E or Orthopaedics, or to a modality based system such as CT and MRI or CR.

MIP See *Maximum intensity projection*

MIU See *Modality Interface Unit*.

MOD See *Magneto Optical Disk*.

Modality A generic term used to describe an imaging device such as MRI, CT, Ultrasound, DR and CR.

Modality Interface Unit (MIU) All modern imaging modalities should be DICOM compliant. However specific DICOM interpretations may have compatibility problems. A MIU will allow modalities to be interfaced to the PACS where any areas of DICOM conflicts occur. See *Digital Imaging and Communications in Medicine (DICOM)*.

Modality Pull This is a DICOM term where the modality acts as a storage class provider and accepts the data sent from the PACS. See *DICOM, Service Class User (SCU)* and *Service Class Provider (SCP)*.

Modality Push This is a DICOM term where the modality acts as a storage class user and sends data to the PACS. See *DICOM, Service Class User (SCU)* and *Service Class Provider (SCP)*.

Modem This is an abbreviation for the term modulator-demodulator. A modem is a device used to allow the dial-in from a remote computer into any computer system.

Monochrome, monochrome display A monochrome display is synonymous with a grayscale display, i.e. one which is capable of displaying only shades of grey. The number of different grey levels available in the display depends on the number of pixels used for each pixel: an 8-bit display can display up to 256 grey levels, whereas a 12-bit display can display up to 4096 levels of grey.

Mouse A device that is connected to a computer, either physically using a cable or wirelessly, which when moved by the computer user in turn moves a cursor around the screen in order to select an item or point to a place on the screen.

Moving Picture Experts Group (MPEG) MPEG is a group of experts that meet to produce standards for digital video and audio compression (ISO/IEC JTC1 SC29 WG11). The standards define the compressed bit stream hence defining the decompressor, however the compression is not stated in the standard each manufacturer using their own preferred algorithm (<http://www.mpeg.org/>). See *Joint Photographic Experts Group (JPEG)*

MPR See *Multiplanar reconstruction*

MSCON See *Managed Services Contract*.

Multiplanar reconstruction (MPR) MPR uses the slice images that have been acquired in a defined plane to reconstruct other slice images in another plane. There is no loss of information with this method

N

NAS See *Network Attached Storage*.

National Electrical Manufacturers Association (NEMA) This is a trade organisation in the USA who make a significant contribution to the development of industry standards affecting the imaging community. They also develop and promote new technologies (<http://www.nema.org/>).

National Health Service Information Authority (NHSIA) This is a special health authority whose remit is to setup a national infrastructure and facilities for information systems in the NHS (<http://www.nhsia.nhs.uk>). It is due to cease operation in April 2005, with some of its responsibilities being transferred to the National Programme for Information Technology and the remainder being taken over by a new SHA, the Health and Social Care Information Centre. See *National Programme for Information Technology*

National Programme for Information Technology (NPfIT) UK government based programme to implement an integrated care record system for England. The core to the project is the implementation of an EPR; however PACS will also be involved as part of the project. See *Electronic Patient Record (EPR)* and *Picture Archiving and Communication Systems (PACS)*.

Nearline archive A nearline archive generally comprises image data storage that is of much higher capacity than the online storage, but is slower. The images on a nearline archive are accessible at any time, however, they do not have the instant access of the online storage, and will typically have an access time of tens of seconds. See *Everything Online (EOL)*, *Long Term Archive (LTA)*, *Short Term Storage (STS)*, *Online storage* and *Offline archive*.

Negotiated procedure A procedure where the final product is not definable and is used in the procurement of services and solutions. See *Restrictive procedure*.

NEMA See *National Electrical Manufacturers Association*.

Network Attached Storage (NAS) This is a device that contains a number of disk units attached to a dedicated server. The NAS device appears as a server on the network. It is possible to communicate with it using standard file sharing protocols, therefore no specialised hardware is required. See *Storage Area Network (SAN)*.

Network File System (NFS) A file system protocol developed by SUN Microsystems™. It is now a standard protocol in UNIX that allows computers to access each others' files. NFS allows files on a remote workstation to appear as part of the local storage.

Network Interface Card (NIC) This is a circuit board that allows a computer to communicate on the network. There are NICs available for all network protocols. See *Host Bus Adapter (HBA)*

NFS See *Network File System*.

NIC See *Network Interface Card*.

NHSIA See *National Health Service Information Authority*.

nit A unit of luminance equal to 1 Candela per metre squared (cdm^{-2}). Used in the USA. See *Candelas per metre squared (cdm^{-2})*, *Luminance* and *foot Lambert*.

Node A node can be a computer or some other device, such as a printer attached to a network. Every node has a unique network address, known as a Media Access Control (MAC) address. See *MAC address*.

NPfIT See *National Programme for Information Technology*

NT This is an abbreviation of the term New Technology, and is a multiprocessing operating system produced by Microsoft™. This is most commonly used in office environments.

Nyquist Limit A signal must be sampled with a frequency at least twice the frequency of the signal itself. The maximum measurable frequency is the Nyquist limit or frequency and is thus half the sampling frequency. If the signal frequency is higher than the Nyquist limit, aliasing occurs.

ODBC See *Open Database Connectivity*.

Offline archive An archive that is not permanently attached to the PACS network. The nearline archive will eventually reach its capacity, at this point the archiving media (CD, DVD or tape) are removed and the data stored physically off the system in the offline archive. Data stored here is only accessible through manual intervention. See *Everything Online (EOL)*, *Long Term Archive (LTA)*, *Short Term Storage (STS)*, *Nearline archive* and *Online storage*.

OJEC See *Official Journal of the European Community*.

Online storage Data that is available for instant access. An example of this is when a patient is an in-patient or has an appointment in the out-patient clinic their folders will be stored or moved to the online storage. See *Everything Online (EOL)*, *Long Term Archive (LTA)*, *Short Term Storage (STS)*, *Nearline archive* and *Offline archive*.

Open Database Connectivity (ODBC) A standard database access method developed by Microsoft™. ODBC should make it possible to access any data from any application regardless which DBMS is handling the data. ODBC manages this by inserting a middle layer between the application and the DBMS. This layer will translate the applications queries into commands the DBMS will understand, however both the application and DBMS must be ODBC compliant.

Official Journal of the European Community (OJEC) A journal for the advertisement of tenders for public procurement of capital purchases in member states of the European community.

Operating System (OS) The software/program used to control all of the main activities and other programs of a computer. There are several different operating systems used, the choice depending on the function and power needed. See *NT*, *UNIX* and *Windows*.

Optical disk A storage medium that can be written to and read by lasers. Examples of optical disks are DVD (Digital Versatile Disk); which as at time of printing can store up to 9GB of data, CD (Compact Disk); which as at time of printing can store up to 700MB and MOD (Magneto Optical Disk); which as at time of printing can store up to 9.1GB of data. See *Digital Versatile Disk (DVD)* and *Magneto Optical Disk (MOD)*.

Optical jukebox See *Jukebox*.

OS See *Operating System*.

OSI See *Open System Interconnection*.

Open System Interconnection (OSI) A model (ISO/IEC 7498-1:1994) which defines a networking protocol framework and defines all functions for communication between any two machines.

P

Packet Data sent over a LAN is separated into blocks known as packets to create optimum transfer over a packet-switching network. One of the key features of a packet is that it contains the destination address in addition to the data. See *Packet-switching*.

Packet-switching Refers to protocols in which messages are divided into packets before they are sent. Each packet is then transmitted individually and can even follow different routes to its destination. Once all the packets forming a message arrive at the destination, they are recompiled into the original message. Packet switching is more efficient and robust for data that can withstand some delays in transmission, such as e-mail messages and web pages. See *Packet*.

PACS See *Picture Archiving and Communication System*.

PACS broker A device that allows the PACS to interface with the Hospital Information System (HIS) and/or the Radiology Information System (RIS). This is not essential in all systems as the RIS and HIS may be able to interface directly with the PACS using the HL7 standard. See *Hospital Information System (HIS)*, *Radiology Information System (RIS)* and *Health Level 7 (HL7)*.

PACSnet The national evaluation centre funded by the MHRA to evaluate PACS and its components (URL:<http://www.pacsnet.org.uk/>). See *Medicines and Healthcare products Regulatory Agency (MHRA)* and *Picture Archiving and Communication System (PACS)*.

PACS Pull This is a DICOM term where the PACS acts as a storage class provider and accepts the data sent from the modality. See *Service Class User (SCU)* and *Service Class Provider (SCP)*.

PACS Push This is a DICOM term where the PACS acts as a storage class user and sends data to the modality. See *Service Class User (SCU)* and *Service Class Provider (SCP)*.

Pan The ability to move an image around a PACS display. This is useful when displaying full resolution images on a smaller display, where it is not possible to view the whole image at once. By panning the image, it becomes possible to view different parts of the image. See *zoom* and *roam*.

PaSA See *Purchasing and Supply Agency*.

Passive matrix A passive matrix display is created by depositing fine wires over a liquid crystal cell, which are multiplexed to address each individual pixel. When the voltage is placed across the wires the liquid crystal aligns with the electric field, this remains in this state as long as there is an applied voltage, if removed the liquid reform to their original state. See *Liquid Crystal Display (LCD)*, *Active Matrix* and *Flat Panel*.

Peripheral A device such as a DVD drive or a printer that is not part of the main computer system. Peripherals can be internal such as a DVD drive or external such as a printer, keyboard, mouse, monitor and scanner.

PB Petabyte (1024 TB). See *Terabyte (TB)*.

Photometer This is an optical instrument used in the measurement of luminance. The output is recorded in Candelas per metre squared. See *luminance*.

Photo Multiplier Tube (PMT) A device that captures light and transforms it into a digital signal. Its use in the PACS context is in digitisers and CR readers. See *Digitisers and Computed Radiography (CR)*.

Picture Archiving and Communication System (PACS) The acquisition, archival and retrieval of digital images over a computer network, for diagnosis and review at dedicated workstations. See *Image Management and Communication System (IMACS)*

Pixel This is a word derived from the term “picture element” and is the smallest viewable element, usually rectangular or square, in an image or display. The function of a workstation will determine the number of pixels required in its display. See *Workstations*.

PMT See *Photo Multiplier Tube*.

POISE See *Procurement of Image Systems Effectively*.

Policy Directorate A division of the Department of Health which examines new methods in healthcare and develops policy for the NHS.

Port This is a socket that enables the physical connection to some other device. There is not a single standard port but many different types from serial port which allows the transmission of sequential data to parallel ports such as SCSI which allows for multiple data streams. See *Small Computer Interface System (SCSI)*

Preventative maintenance Maintenance performed on a regular basis which is intended to prevent failures or detect failures before they impact on the user. See *Corrective maintenance*.

Protocol A predefined set of rules that dictate how computers or devices communicate and exchange data on the network.

Purchasing and Supply Agency (PaSA) A Department of Health funded agency involved in the purchasing and supply of all goods and services for the NHS (<http://www.pasa.nhs.uk/> , <http://www.pasa.doh.gov.uk/>).

PRINCE See *Projects in Controlled Environments*.

Procurement of Image Systems Effectively (POISE) This is a procurement model for the purchasing of information systems in the NHS.

Projects in Controlled Environments (PRINCE) This is a standard methodology used by the Department of Health which defines the responsibilities of a project and outlines the project control (http://www.ogc.gov.uk/prince/about_intro.htm).

Q

QA workstation See *Workstation*.

Query / Retrieve This is a DICOM service class. It supports the ability to query a device for a list of patients, studies or series and to initiate the transfer instances of patients, studies or series, this is the MOVE operation. See *DICOM*.

R

Random Access Memory (RAM) is temporary memory in a computer. RAM is volatile, i.e. information stored in RAM is lost when the computer is switched off. The advantage of RAM is that it is fast to load data into it and to retrieve data from it. It is where the operating system, application programs and data currently in use are stored. When the computer is started, programs are loaded into RAM as and when they are needed. See *Memory* and *Read Only Memory (ROM)*.

Read-Only Memory (ROM) Memory that is built-in to the computer, and contains the necessary program that enables the computer to be started or booted up. ROM can only be read from and cannot be written to. Unlike RAM, ROM data is not lost when the computer is turned off. See *Memory* and *Random Access Memory (RAM)*.

RAID See *Redundant Array of Inexpensive Disks*.

Radiology Information System (RIS) A computer system which stores the appointment information for a radiology department and may be linked to the HIS. A PACS may take exam booking information and demographics from the RIS to form worklists. See *Hospital Information System (HIS)* and *Worklists*.

Radiological Society of North America (RSNA) An organisation based in the USA whose purpose is to promote radiology and related sciences through education and research, and forward research in both clinical and basic sciences including IT to improve and promote healthcare (<http://www.rsna.org/>). See *British Institute of Radiology (BIR)*.

Redundancy A process built into the system that allows for the failure of one or more components to occur but does not reduce the system's functionality.

Redundant Array of Inexpensive Disks (RAID) A RAID is a multi disk system where one or more of the disks provides fault tolerance. A RAID should be able to withstand disk failure and have the ability to reconstruct the data from a failed disk. See *Just a Bunch Of Disks (JBOD)*.

Relational Database See *Database*

Remote dial-in This allows an authorised user to login to the system from a remote site. This is achieved by the use of a modem and telephone line. See *Modem* and *Internet Service Provider (ISP)*.

Remote Procedure Call (RPC) A protocol which allows a program on one computer to execute a program on a server computer. When using RPC, the client program sends a message to the server and the server returns the results from the executed program.

Repeater A physical layer device that amplifies the signals it receives on one port and resends or repeats these signals out of another port. Repeaters are used to extend the length of a network segment.

Request For Proposal (RFP) This is a detailed document from both a technical and business perspective. A document that has been written thoroughly will ensure the organisation gains valuable information about the vendors. It will also aid the vendors to provide the system that the organisation requires.

Resolution This defines the ability to discern the detail in an image. See *Spatial resolution* and *Contrast resolution*.

Response Time The time for the pixel on a TFT to switch from the on to the off state or vice versa. Typically this is around 25ms, which is fast enough to give the naked eye the illusion of fluid movement. The quoted response time does include an element of latency, when a pixel remains lit for a short time after the current has been removed. See *Thin Film Transistor (TFT)* and *Pixel*

Restrictive procedure A procedure where the final product is definable at the outset of a project when purchasing goods. See *Negotiated procedure*.

Reversible compression The compression of data to reduce its size by encoding it more efficiently, but which allows for the exact recreation of the original data on decompression. See *data compression*, *irreversible compression* and *lossless compression*.

Review workstation See *Workstation*.

RFP See *Request For Proposal*.

RIS See *Radiology Information System*.

Roam The ability to move a region of interest around an image on a PACS display. Often used in conjunction with zooming. See *zoom*.

Router A device which is used to link heterogeneous networks. Routers use headers and a forwarding table to determine where packets go. They use ICMP to communicate with each other and configure the best route between any two hosts. See *Internet Control Message Protocol (ICMP)*, *Bridge*, *Hub* and *Switch*.

RPC See *Remote Procedure Call*.

Rotation Error An image which does not appear square on a display i.e. it has a tilt away from the vertical position is said to have a rotation error. Monitors include a function to correct this rotation error so that the image is displayed perpendicular to the screen. See *Tilt Error*

RSNA See *Radiological Society of North America*.

S

SAN See *Storage Area Network*.

SATA See *Serial ATA*

SCP See *Service Class Provider*.

SCSI See *Small Computer System Interface*.

SCAR See *Society for Computer Applications in Radiology*.

SCU See *Service Class User*.

Secondary image capture The acquisition of image data where that data is not originally in digital format. It is often performed through an intermediate step, e.g. digitization of film or video capture from an analogue display.

Serial ATA (SATA) This is the evolution of the ATA architecture from a parallel to a serial link significantly increasing the transfer rate. SATA uses thinner cabling which aids in the chassis design. ATA cables are bulkier and have a maximum length of 40 cm whereas the SATA cables are much thinner and can have a maximum length of 1m See *Integrated Drive Environment (IDE)*, *Small Computer System Interface (SCSI)* and *Advanced Technology Attachment (ATA)*.

Server A computer which controls the function of network resources. A server is often applied to a dedicated task, e.g. a file server controls delivery of files and a network server controls network traffic. However it is possible for servers to fulfil more than one task if they have multiprocessing operating systems.

Service Class Provider (SCP) This is a DICOM term. A Service Class Provider acts as a server and provides a service to a client or user, where the client is a workstation or modality that requires information from the server. An example of this is an archiving device which acts as a service class provider (SCP) when receiving images from a modality (which acts as a service class user (SCU)). See *Digital Imaging and Communications in Medicine (DICOM)*, *Server* and *Service Class User (SCU)*.

Service Class User (SCU) This is a DICOM term. A Service Class User is a 'client', where a client is a workstation or modality, and hence uses a service provided by the SCP. An example of this is the a modality (which acts as a service class user (SCU) when sending images to an archiving device (which acts as a service class provider (SCP)). See *Digital Imaging and Communications in Medicine (DICOM)*, *Server* and *Service Class Provider (SCP)*.

Service Level Agreement (SLA) This is a contract between a service provider and a customer that specifies, usually in measurable terms, what services the provider will furnish.

Shielded Twisted Pair (STP) Cable which has a metal sleeve covering two shielded twisted copper wires, which allows protection from electromagnetic interference, whereas the UTP, although of similar design and function, allows no interference protection. See *Unshielded Twisted Pair (UTP)*.

Short Term Storage (STS) This is online or working storage in a PACS. The time an image stays in this storage will depend on the individual storage system the hospital employs. See *Long Term Archive (LTA)*, *Nearline archive*, *Online storage*, *Offline archive* and *Everything Online (EOL)*.

Simple Network Management Protocol (SNMP) This protocol because of its simplicity has become the de facto standard for internetworking management and the monitoring of network devices and their functions.

SLA See *Service Level Agreement*

Small Computer System Interface (SCSI) A parallel interface that provides fast data transmission.

SMPTE See *Society of Motion Picture and Television Engineers*

SMPTE test image A standard test image used in the television industry. It allows the user to make judgements on the quality of the display monitor by looking at the contrast resolution, spatial resolution and any distortion. See *Society of Motion Picture and Television Engineers (SMPTE)*.

SNMP See *Simple Network Management Protocol*

SNOMED See *Systemised Nomenclature of Medicine*

Society for Computer Applications in Radiology (SCAR) This a multi-disciplinary body involved in the advancement of computer applications and information technology in medicine. This is achieved through educational bodies and conferences (<http://www.scarnet.org/>). See *Computer Assisted Radiology and Surgery (CARS)*, *EuroPACS*, *International Society for Optical Engineering (SPIE)* and *Radiological Society of North America (RSNA)*.

Society of Motion Picture and Television Engineers (SMPTE) This is the organisation that sets agreed standards for much of the video and audio industries around the world (<http://www.smpte.org/>). See *SMPTE test image*.

Software The term given to application and operating system programs, which the computer uses to function. Application software examples are word processing packages such as Microsoft Word, and an example of operating system software is Microsoft windows. See *Operating System (OS)*.

Software Interface also known as a programming interface it allows programming data and application codes to communicate with both the hardware and each other. See *Interface*, *User Interface* and *Hardware Interface*.

SON See *Statement of Need*.

Spatial resolution Defines the smallest feature that can be detected in an image. This is often defined as line pairs per mm.

SPIE See *International Society for Optical Engineering*.

SQL See *Structured Query Language*.

Storage Area Network (SAN) A network topology which has a series of servers linked through a series of switches through a dedicated network to a central storage. This allows all servers to access a large storage and improves access times. This topology would be most suitable in a distributed PACS, with the PACS servers at remote locations accessing a central data store. A dedicated high speed network, usually fibre channel connects the storage elements (RAID, JBOD and tape), to the servers. See *Network Attached Storage (NAS)*, *Redundant Array of Inexpensive Disks (RAID)* and *Just a Bunch Of Disks (JBOD)*.

STS See *Short Term Storage*.

Statement of Need (SON) This is a procurement document which gives a framework for the purchaser to give a potential vendor their requirements for the project. This is a pre-cursor to the Detailed Statement Of Need (DSO) and gives a general framework to the purchaser of the requirements for the project. See *Detailed Statement of Need (DSO)*..

Statistical report A report produced by a PACS or other system calculated on the data stored in the system. Examples of a statistical report are the number of chest exams per month or the number of exams reported by any single radiologist. All these calculations are presented as a report and are made available to the relevant members of the department.

Structured Query Language (SQL) The high level language used to query databases and obtain information.

Storage This is defined as the data which requires fast access, this access does not require any robotic or manual intervention, and will be stored on a disk system either RAID or JBOD. See *Redundant Array of Inexpensive Disks (RAID)*, *Just a Bunch Of Disks (JBOD)* and *Online storage*.

STP See *Shielded Twisted Pair*

Subnet IP networks can be divided into smaller networks called subnets. Subnetting enables a network administrator to use network addresses and the number of allowable nodes on the network more efficiently. See *Node*

Switch A device that filters and forwards packets between LAN segments. Switches, because of their design, support any packet protocol. See *Bridge*, *Hub* and *Router*.

Systemised Nomenclature of Medicine (SNOMED) A set of controlled vocabularies containing codes for indexing various attributes of the healthcare record. Developed and maintained by the American College of Pathologists.

T

TB terabyte (1024 MB). See *MB*

TCP/IP See *Transmission Control Protocol/Internet Protocol*.

Technology refresh This is a term used in most of the IT business to describe the upgrading or purchasing of new equipment. This is agreed at the time any contract is signed as to what should be replaced and after what time period.

Telemedicine The delivery of healthcare and the sharing of knowledge over a distance using telecommunications network. This is much more comprehensive than teleradiology in that it allows a broad range of medical information, including radiological, to be shared. This allows remote sites access to major centres of excellence. See *eHealth* and *Teleradiology*.

Teleradiology The ability to acquire a diagnostic image at one location and review it at a remote location that is not part of a LAN. This allows an information system to be spread over a large distributed area, and is most effective in allowing small hospitals access to centres of excellence. See *Local Area Network (LAN)*.

Terminal A display and input device, usually comprising a display monitor and keyboard only, which is attached to a remote computer. It has no local computing power of its own.

Terminal emulator A program that can run on a personal computer or workstation and which can imitate the functionality of a terminal. See *terminal*.

TFT See *Thin Film Transistor*

Thin Film Transistor (TFT) A type of LCD flat-panel display screen, in which each pixel is controlled by transistors. The pixels are switched between two states on or off. The transfer between the two states has a high response time, hence TFT technology provides the best resolution and the highest luminance of all the current flat-panel techniques. TFT screens are also known as active matrix LCDs. See *Liquid Crystal Display (LCD)*, *Passive Matrix*, *Active Matrix*, *AMLCD* and *Response Time*

Throughput The rate that data is transferred through a network. Usually expressed in bits per second (bps) or multiples thereof (e.g. kbps or Mbps). See *bandwidth*.

Tilt error See *Rotation error*

Traffic A term used to describe the flow of data across a network.

Transfer rate See *Bandwidth*.

Transmission Control Protocol/Internet Protocol (TCP/IP) TCP is one of the main protocols in TCP/IP networks. Whereas the IP protocol deals only with packets, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent. See *File Transfer Protocol (FTP)*.

Transmission Media Refers to the physical cables and/or wireless system used to connect network devices, across which they can communicate.

Transmission Speed See *Bandwidth*

U

UDO See Ultra Density Optical Disk

Ultra Density Optical Disk (UDO) This is state-of-the-art optical drive technology developed by Plasmon. The UDO will be dual-sided and will have capacity of 30 GB. The first generation is planned to be released in August 2003. See *Digital Versatile Disk (DVD)*, *Linear Tape Open (LTO)*, *Jukebox*, *Digital Linear Tape (DLT)*, *Magneto Optical Disk (MOD)*, *Firmware* and *Digital Audio Tape (DAT)*.

Uninterruptible Power Supply (UPS) A device which provides back-up power in the event of failure in the primary power supply system. If there is a power-cut or drop-out the UPS will keep the system running for a finite period of time, allowing the primary power supply to be repaired and/or the system to be powered-off in a controlled manner. This protects the equipment and the stored data.

Universal Serial Bus (USB) This is a new external bus standard that supports data transfer rates of 12 Mbps. USB supports Plug- and-Play installation and hot plugging ie it is possible to add and remove devices from a computer whilst in operation.

UNIX A multi-user operating system that runs on a server or workstation. It is used to control both network and file handling resources. See *Operating System (OS)*.

Unshielded Twisted Pair (UTP) Cable that consists of two unshielded wires twisted around each other and is used extensively in LANs due to its low cost. See *Shielded Twisted Pair (STP)*.

Unverified report This is a clinical report that the radiologist has dictated about an examination but awaits verification after typing by secretarial staff. This is a final check to eliminate human errors. See *Clinical report*, *Verified report* and *Unverified report*.

User interface Allows the user to communicate and use the computer and applications. Examples of a user interface include mouse, keyboard, GUI (Graphical User Interface). See *Interface*, *Software Interface* and *Hardware Interface*.

UPS See *Uninterruptible Power Supply*.

USB See *Universal Serial Bus*

UTP See *Unshielded Twisted Pair*.

V

Veiling glare Light scattered within an imaging device can produce a diffuse luminance that veils the intended image. This effect is known as the veiling glare and has the effect of reducing the contrast in the displayed image. See *ambient glare*.

Verified report The final state of the clinical report. The unverified report is checked by the radiologist and changes are made if the report is incorrect. If the report is correct it is marked as verified and is made available to the relevant parties. See *Clinical report*, *Verified report* and *Unverified report*.

Verify A term used by both radiographers and radiologists. A radiographer uses it when they mark an acquired image as being completed and ready for reporting. A radiologist uses it when an examination is reported and the report is marked as correct. See *Verified report*.

Video The displaying of images and text on a computer monitor with a video adapter being responsible for sending signals to the display device.

Video capture The creation of a digital data file from a video signal. The video signal is generally that used to send image data to the video display of an acquisition modality such as CT or ultrasound.

Virtual circuit Sometimes called a logical circuit, it is a path between two or more points that seems like a fixed physical path, but actually is one path out of many possible physical paths.

Virtual Private Network (VPN) Enables IP traffic to travel securely over a public network (such as the Internet) by encrypting all traffic prior to transmission over the public network, data is then decrypted at the receiving end.

Voice recognition A process which takes the spoken word as its input and produces text as the output. It can be used in an imaging department to aid in the production of clinical reports.

Voxel A single element in a 3-dimensional image (for example, a 3D reconstruction from multi-slice CT data). It is the 3-dimensional equivalent of a pixel. See *pixel*.

W

WAN See *Wide Area Network*.

Web browser An application used to display images in clinical environments. The workstations used are normal PCs with high quality monitors. The application used is similar to the web browser used in the World Wide Web, for example Netscape Navigator or Internet Explorer.

Wide Area Network (WAN) A computer network that spans a relatively large geographical area and typically consists of more than one LAN. See *Local Area Network (LAN)*.

Windows® This is an operating system written by Microsoft™ which runs on the majority of personal computers. This OS currently comes in a variety of versions (NT, 2000, XP). This allows the user easy access to the computer functions and programs through a series of menus and GUIs or icons. See *Graphical User Interface (GUI)* and *Operating System (OS)*.

Word A word is a series of bytes, however unlike the byte which is eight bits, the size of the word can vary depending on the computer system.

Working Storage Unit (WSU) A synonym for the online storage device. See *Image Storage Unit (ISU)* and *Online storage*.

Worklist The list of patient studies sent from the RIS and displayed at the appropriate acquisition modality. See *Radiological Information System (RIS)* and *Hospital Radiological Information System (HIS)*

Workflow The relationship between the activities and the processes arising from a patient consultation from start to finish. The movement of the patient or associated information around the hospital is related by a series of procedures and examinations which are controlled by different events which may possibly be triggered by external factors.

Workstation In a PACS can be several types of workstations that are used for differing purposes. The functionality the user requires from a workstation is a determinant on the software functionality needed. However the displays used on a workstation will be dependant on the task required i.e. primary diagnosis will require high resolution displays. These workstations are described below:

Reporting workstation A workstation used for viewing images for primary diagnosis and/or production of clinical reports. A reporting workstation will commonly have multiple displays, usually 2 or 4 screens, to allow for the simultaneous display of multiple images. These displays will be of high quality and resolution.

Review workstation

1. A workstation used for checking that acquired images are of the required quality and that all necessary views have been performed.
2. A workstation used on a ward or in a clinic to view images in conjunction with the associated clinical report. A review workstation will usually have one or two display monitors, which are likely to be of lower display quality than the monitors used in reporting workstations.

QA workstation This term covers two types of workstation

1. A workstation dedicated to quality assurance of the PACS, i.e. used by support staff to ensure that the PACS is functioning correctly. The display used for the QA workstation should be of equivalent quality to the display used for the reporting workstations. See *Greyscale Standard Display Function (GSDF)*.
2. A workstation often attached to a CR reader and used to assess the images before being sent to PACS. See *Computed Radiography (CR)*

WORM See *Write Once Read Many*

Write Once Read Many (WORM) is an optical storage technology which allows information or data to be written onto a disk once only. The data is then permanently stored on the disk and can not be erased. It can be read as often as required. Recordable CD is an example of a WORM medium.

WSU See *Working Storage Unit*.

X - Z

X-Windows A Windows-like interface that runs on a UNIX operating system. See *Graphical User Interface (GUI)* and *Windows*.

Zoom The ability to magnify a selected portion of a displayed image. Often used in conjunction with Roam. See *Roam*