STORAGE OF FILES

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MEMORY
The internal language of a modern computer, called its machine code, has only two symbols, '0' and '1'. To allow computers to function these zeros and one's, the so called 'bits' of binary code are grouped together into bundles of eight to form 'bytes' (from the phrase 'by eights'). An American Standard Code for Information Interchange or ASCII was drawn up. In this code, byte values were assigned a function, an upper or lowercase letter, a number or a punctuation mark.

The number of bytes that can be stored in a computer is always a power of 2:

2^1 = 2 (2)
2^2 = 4 (2 x 2)
2^3 = 8 (2 x 2 x 2)
2^4 = 16 (2 x 2 x 2 x 2)
2^5 = 32 (2 x 2 x 2 x 2 x 2)

2^{10} = 1,024 bytes = 1 Kilobyte
2^{20} = 1,048,576 bytes = 1 Megabyte
2^{30} = 1,073,741,824 bytes = 1 Gigabyte

Read Only Memory (ROM)
Read only memory chips are the internal permanent memory from which the computer can read but not write. These chips are built into the motherboard

Random Access Memory (RAM)
This is the area of memory on a computer that is NOT permanent. If the computer is switched-off all data that is held in the RAM memory are lost, unless it has been saved. An example of this is a page that has been produced in QuarkXPress, if the computer is switched-off without saving this page, the file is lost.

A computer needs enough RAM memory to run the programs that are installed, this means that a computer cannot have too much RAM. The advantage of large amounts of RAM is that when a program is opened on the computer, if possible it is ideal to load the whole of the program into the RAM memory. The program will run must faster if this is possible. If the program cannot be fully loaded into the RAM memory the computer selects the most important parts and places them into the RAM area. This means that if a certain feature has not been loaded into the RAM memory the computer has to search for this and load it into the memory and this reduces the speed of the computer.

Virtual Memory
If the mac computer starts running out of memory when using certain programs, extra space can be used from the computer's hard disk, referred to as virtual memory. Unfortunately programs will run slower and some programs like photoshop may have problems when using virtual memory. Photoshop automatically uses space on the hard disk if the there is not enough RAM memory, it refers to it as scratch disk.

When virtual memory is turned-on, programs use less memory than when virtual memory is turned-off. This is because turning-on virtual memory allows the program to use memory more efficiently.

Switching-on virtual memory on a mac or PC:

Apple Macintosh
Apple menu / control panel / memory
Switch-on virtual memory

PC
Start menu / settings / control panel
Select: System file / performance / virtual memory

STORAGE OF FILES
When people think of storage on a computer, they think of possibly 4 types:

Hard Drives
Removable storage: Zip or Jaz
Archive storage: CD's
Back-up: DAT tape

Storage is much wider than the above, it is possible to get hard drives which are portable and can store up to 18GB of data.

There are many new media types that can operate with computers or digital cameras and it is worth checking them out to see if they fit your company's needs. With technology moving at such a rapid pace, it is important to remember that storage devices are always changing and normally this means that the media being used, increases in capacity, storing more and more data.

Network Server
One of the best ways of storing data is on a network server. A network server is located in a room which may not be near the computer workstations. The workstations are connected via a communication cable to a network socket which is linked to a hub which is then finally connected to the server.

A network of computers in the same building is referred to as a local area network (LAN). The most popular server used today is a Windows NT Server. Files are not stored on a local computer but centrally managed on the network server. The main advantage of this method of storing, is that files can be opened on any computer in the building. With this system all

computers are password protected with various levels of security for access to the data on the server. Certain staff will have access to all files, whereby other staff would just have access to the files that they are currently working with.

Hard Disk
Hard disks are the main storage device on computers. Sometimes referred to as a Winchester disk, this is because they were named after the 30/30 repeating rifle. They were originally constructed as twin disks with 30 megabytes of storage capacity. These disks run in hermetically sealed (airtight) environment. They are rigid rather than flexible pieces of plastic used in floppy disks. The reading head flies across the surface of the disk on a cushion of air which never touches the surface. This significantly reduces wear and tear on the disks, as dust and dirt are eliminated. Most hard disk units consist of at least two disks or platters, with some having five platters.

Pocketdrive
www.lacie.co.uk
Basically a tiny hard drive available in 6GB, 12GB and 18GB and takes advantage of USB connection or firewire.

Pocketdrive

The device measures 3.5 x 5.75 inches and weighs less than pound. It can be used for an entire hard drive back-up. The Pocketdrive has a very fast data transfer, which could be ideal for digital video.

Floppy Disk
They are the most common method of storing files when wishing to transfer data from one computer to another if the machines are not network. Floppy disks are 3.5 inches in size and can store 1.4MB of data. Apple no longer supports floppy drive technology on current machines.

The disk is held within an envelope which cleans and protects the disk. The disk is made of thin plastic with a coating of iron oxide. This allows the surface to be selectively magnetised and thus store coded information. The disk spins at a constant speed. A recording and playback head moves backwards and forwards across the surface of the spinning disk.

A disk is *formatted* in a series of concentric circles. Each of these sectors has an address. When data is to be recorded to a disk the first thing that happens is the head moves to the directory, a special file which acts as an index to the whole disk. This is examined to find out where to put the file. If it is being re-written the first sector of the old copy is found and the new data is stored starting there. If the data cannot fit into the sector, the extra data is placed on the next available space on the disk. A new file will not have an entry in the directory, so one must be made, then the first empty sector is filled with data.

A floppy disk should be handled carefully and kept in an environment which is free from dust, magnetic fields and heat. Do not bend the floppy disk and avoid touching the thin plastic

surface if the metal slide has been slid back. Do not use floppy disks with damaged metal slides, the disk may get stuck in the disk drive!

Using Floppy Disks
Every Mac since the eighties has been able to 'read' PC disks. If disks are being used on both PC or Mac it is advisable to format for PC. This is not a problem as most disks when purchased are already formatted for PC. Disks can be formatted for both PC or Mac on a Mac computer! When receiving files on floppy disk it is advisable to copy the files onto the hard drive. This is useful in case the customer has sent the only copy of the file. Also the hard disk runs faster than a floppy drive.

Jaz Disk Drive

Zip and Jaz Disk Drives
www.iomega.com
They are considered the next technological step up from the floppy disk available for Apple Macintoshes and PC's. On certain computers they are fitted as standard items.

Jaz drives use SCSI connection which runs at a blistering speed. They run faster than many hard drives, and are ideal for digital video.

Zip drives use USB connection and at present the capacity of the disks is considerably less than its Jaz counterpart. The disk drives are physically very small and ideal as a mobile data device for transporting data. Zip drives are very popular with the print and web design market.

Zip Disk Drive

Compact Disk (CD-Rom)
The standard CD-ROM disk drive, which is fitted on most computers, can only *read* CD's. To record data to CD's a *compact disk writer* is required. CD's can hold 650MB or 730MB of data.

Re-Writable Compact Disk Drive

The data is buried deep inside the plastic as a series of pits in a sheet of metal foil. As on a floppy disk, the stored information is catalogued, therefore it is possible to move instantly to any file. Once the read head is in the desired location, the information is read back from the disk by the laser beam. The main areas where CD technology is being used, is for, backing-up and archiving files, distribution of computer software and the production of self study learning packages.

There are 2 types of compact disks:

CD-R
This is a recordable compact disk. Data can be recorded in one session or multi-session. As soon as the session has been 'closed' the CD cannot be used for adding extra files. Data on disk cannot be erased.

CD-RW
This is a re-writable compact disk which can be used in a similar way as a floppy disk. Data can be erased and additional information can be re-written to the disk.

CD-RW can be ideal for backing up files, as they can be overwritten and can be used in a similar way to DAT tape. CD-R disks have a far more limited use, but can be useful for backing-up client's completed files when space is required on the hard disk.

Optical Disk
www.olympus.com
www.maxoptix.com
www.hp.com/go/optical
www.lacie.com
There are sometimes referred to as magneto optical (MO) disks. The disks are ideally suited for large file exchanges as well as computer back-up/archiving, the disks have a 100 year shelf life. Optical disks are available from 640MB to 9GB capacity. There are two sizes of disk, 3.5 inches and 5.25 inches. Most disk drives are separate units.

Optical Disk Drive

BACKING-UP AND ARCHIVING

Backing-up files on a computer is an important part of any production routine. It needs to be considered from a number of perspectives:

- What would happen if a computer or server crashed and could not be re-started.

- What systems are in place if a computer was stolen which held valuable data.

In most cases the data is more important than the computer hardware.

What is a Back-Up
If after a file has been copied from a hard disk, the original is deleted, this is *not* a back-up, but rather an archive. A true back-up is a copy of something that still exists. The standard form of back-up, is a copy kept on another site, of the data already on the main computer server.

Back-Up Methods

DAT Tape (Digital Audio Tape)
Magnetic tape is the Rolls Royce of back-up systems and is the standard used in all larger computer installations. Typical DAT tape can store between 40GB to 80GB of data. Data can be compressed to fit onto DAT tape. While the initial cost of tape units has typically been higher, than for removable disks, they are cheaper to run as the cost of tapes is much lower than disk/cartridges and they can hold a lot more data.

DAT tape is not in sealed cassette and is liable to be affected by dust which can corrupt the data. They are slow as they write the data in much the same way as a tape recorder does, by starting at one end and running through the tape. As a result, if a file needs retrieving, the whole tape with hundreds of files, may need to be read before the file is found.

DAT devices are relatively slow to read and write data, although they can be set to perform this function without the users presence with software packages such as Retrospect. This is normally carried out overnight. Good back-up practice is to have a daily, weekly, quarterly and yearly back-up system.

Software can be configured to back-up files which have been changed since the last back-up, or all files over a certain age. If there is more than one computer on a network, it can back-up each one in turn to a single back-up device.

QUESTIONS ON STORAGE OF FILES

(1) How many kilobytes in a megabyte?

(2) A computer has 3 megabytes of RAM in its memory, what is this in kilobytes?

(3) The hard disk has 40MB of storage space. There is 24,246K used for storing programs and data. Two illustrations have been scanned into the computer, one of 8MB and the other at 7MB. How much space is left on the hard disk?

(4) What is the difference between ROM and RAM memory chips?

(5) Give an advantage of having a large amount of RAM memory in a computer?

(6) If a computer runs out of RAM memory when using certain programs, how can extra space be obtained?

(7) What is virtual memory?

(8) What is a Local Area Network?

(9) When working with files on a network of computers, where are the files stored?

(10) List the main features of a hard disk drive?

(11) How much data can be stored on a floppy disk drive?

(12) List the main features of a floppy disk drive?

(13) What is the function of the directory file on a floppy disk?

(14) Name a hazard to avoid when using floppy disks?

(15) If floppy disks are being used on both a PC and a mac, what format should be used?

(16) Why is it advisable when receiving files on a floppy disk to copy data to the hard disk?

(17) The Iomega company produce 2 portable disk drives, what are they called?

(18) Name the main feature of a CD-ROM disk drive?

(19) Give an example of where CD technology is being used?

(20) Name and describe the 2 types of compact disk?

(21) Give another name for an optical disk?

(22) Why are optical disks ideal for archiving data?

(23) Describe the difference between ‘backing-up’ and ‘archiving’ data?

(24) Name the media which is used for ‘backing-up’ files?

(25) List the disadvantages of DAT tape?