

OTHER INPUT DEVICES

Mouse

A mouse is the most common pointing device that you will come across. It enables you to control the movement and position of the on-screen cursor by moving it around on the desk.

Buttons on the mouse let you select options from menus and drag objects around the screen. Pressing a mouse button produces a 'mouse click'. You might have heard the expressions 'double click', 'click and drag' and 'drag and drop'.

Most mice use a small ball located underneath them to calculate the direction that you are moving the mouse in. The movement of the ball causes two rollers to rotate inside the mouse; one records the movement in a north-south direction and the other records the east-west movement. The mouse monitors how far the ball turns and in what direction and sends this information to the computer to move the pointer.

Advantages:

- Ideal for use with desktop computers.
- Usually supplied with a computer so no additional cost.
- All computer users tend to be familiar with using them.

Disadvantages:

- They need a flat space close to the computer.
- The mouse cannot easily be used with laptop, notebook or palmtop computers. (These need a tracker ball or a touch sensitive pad called a touch pad).

Trackball

A tracker ball is like an upside-down mouse with the ball on top. Turning the ball with your hand moves the pointer on the screen. It has buttons like a standard mouse, but requires very little space to operate and is often used in conjunction with computer aided design. You will often find a small tracker ball built into laptop computers in place of the conventional mouse.

Advantages:

- Ideal for use where flat space close to the computer is limited.
- Can be useful with laptops as they can be built into the computer keyboard or clipped on.

Disadvantages:

- Not supplied as standard so an additional cost and users have to learn how to use them.

Joystick

A Joystick is similar to a tracker ball in operation except you have a stick which is moved rather than a rolling ball. Joysticks are used to play computer games. You can move a standard joystick in any one of eight directions. The joystick tells the computer in which direction it is being pulled and the computer uses this information to (for example) move a racing car on screen. A joystick may also have several buttons which can be pressed to trigger actions such as firing a missile.

Advantages:

- There is an immediate feel of direction due to the movement of the stick

Disadvantages:

- Some people find the joystick difficult to control rather than other point and click devices. This is probably because more arm and wrist movement is required to control the pointer than with a mouse or tracker ball.
- Joysticks are not particularly strong and can break easily when used with games software.

Touch Screen

These screens do a similar job to concept keyboards. A grid of light beams or fine wires

criss-cross the computer screen. When you touch the screen with your finger, the rays are blocked and the computer 'senses' where you have pressed. Touch screens can be used to choose options which are displayed on the screen.

Touch screens are easy to use and are often found as input devices in public places such as museums, building societies (ATMs), airports or travel agents. However, they are not commonly used elsewhere since they are not very accurate, tiring to use for a long period and are more expensive than alternatives such as a mouse.

Advantages:

- Easy to use
- Software can alter the screen while it is running, making it more flexible such that a concept keyboard with a permanent overlay
- No extra peripherals are needed apart from the touch screen monitor itself.
- No experience or competence with computer systems are needed to be able to use it.

Disadvantages:

- Not suitable for inputting large amounts of data
- Not very accurate, selecting detailed objects can be difficult with fingers
- Tiring to use for a long period of time
- More expensive than alternatives such as a mouse.
- Touch screens are not robust and can soon become faulty.

Digital Camera

A digital camera looks very similar to a traditional camera. However, unlike photographic cameras, digital cameras do not use film. Inside a digital camera is an array of light sensors. When a picture is taken, the different colors that make up the picture are converted into digital signals (binary) by sensors placed behind the lens.

Most digital cameras let you view the image as soon as you have taken the picture and, if you don't like what you see, it can be deleted. The image can then be stored in the camera's RAM or on a floppy disk. Later, the pictures can be transferred onto a computer for editing using photo imaging software. The amount of memory taken up by each picture depends on its resolution.

The resolution is determined by the number of dots which make up the picture: the greater the number of dots which make up the picture, the clearer the image. However, higher resolution pictures take up more memory (and are more expensive).

Resolution ranges from about 3 million (or Mega) pixels up to 12 Mega pixels. Digital cameras are extremely useful for tasks such as producing newsletters. There is often a digital camera built into mobile phones that operates in exactly the same way as a standard one.

Advantages:

- No film is needed and there are no film developing costs
- Unwanted images can be deleted straight away
- You can edit, enlarge or enhance the images
- Images can be incorporated easily into documents, sent by e-mail or added to a website.

Disadvantages:

- Digital cameras are generally more expensive than ordinary cameras.
- Images often have to be compressed to avoid using up too much expensive memory
- When they are full, the images must be downloaded to a computer or deleted before any more can be taken.

Scanner

A scanner is another way in which we can capture still images or text to be stored and used on a computer. Images are stored as 'pixels'.

A scanner works by shining a beam of light on to the surface of the object you are scanning. This light is reflected back on to a sensor that detects the color of the light. The reflected light is then digitized to build up a digital image. Scanner software usually allows you to choose between a high resolution (very high-quality images taking up a lot of memory) and lower resolutions.

Special software can also be used to convert images of text into actual text data which can be edited by a word processor. This software is called an "Optical Character Reader" or OCR.

There are two types of scanner:

- Flatbed Scanner
- Handheld Scanner

The most popular type of scanner is the flatbed. It works in a similar way to a photocopier. Flatbed scanners can scan larger images and are more accurate than handheld scanners.

Handheld scanners are usually only a few inches wide and are rolled across the document to be scanned. They perform the same job but the amount of information that can be scanned is limited by the width of the scanner and the images produced are not of the same quality as those produced by flatbed scanners.

Advantages:

- Flat-bed scanners are very accurate and can produce images with a far higher resolution than a digital camera
- Any image can be converted from paper into digital format and later enhanced and used in other computer documents.

Disadvantages:

- Images can take up a lot of memory space.
- The quality of the final image depends greatly upon the quality of the original document.

Graphics Tablets

Graphics tablets are often used by graphics designers and illustrators. Using a graphics tablet a designer can produce much more accurate drawings on the screen than they could with a mouse or other pointing device. A graphics tablet consists of a flat pad (the tablet) on which you draw with a special pen. As you draw on the pad the image is created on the screen. By

using a graphics tablet a designer can produce very accurate on-screen drawings.

Drawings created using a graphics tablet can be accurate to within hundredths of an inch. The 'stylus' or pen that you use may have buttons on it that act like a set of mouse buttons. Sometimes, instead of a stylus a highly accurate mouse-like device called a puck is used to draw on the tablet.

Advantages:

- In a design environment where it is more natural to draw diagrams with pencil and paper, it is an effective method of inputting the data into the computer.

Disadvantages:

- Not as good as a mouse for clicking on menu items.

OTHER OUTPUT DEVICES

Printers

Printers are output devices. They are dedicated to creating paper copies from the computer.

Printers can produce text and images on paper. Paper can be either separate sheets such as A4 A5 A3 etc. or they may be able to print on continuous (fanfold) paper that feed through the machine. A ream of A4 paper continuous paper with holes on the edges, used by dot matrix printers. After you print on fanfold paper, you have to separate the pages and tear off the edge strips. Very specialist printers can also print on plastic or even textiles such as T shirts.

Some printers are dedicated to only producing black and white output. Their advantage is that they are often faster than a color printer because effectively there is only one color to print (Black). Color Printers are

dedicated to creating text and images in full color. Some types can even produce photographs when special paper is used.

There are three main types of printer that you need to know about. You will be expected to understand the main differences i.e. purchase costs, running costs, quality and speed

The three types are Laser, Dot Matrix and Inkjet.

Plotter

These are output devices that can produce high quality line diagrams on paper. They are often used by engineering, architects and scientific organizations to draw plans, diagrams of machines and printed circuit boards.

A plotter differs from a printer in that it draws images using a pen that can be lowered, raised and moved across the page to form continuous lines. The electronically controlled pen is moved by two computer controlled motors. The pen is lifted on and off the page by switching an electromagnet on and off.

The paper is handled in different ways depending on the type of plotter.

Flatbed plotters hold the paper still while the pens move.

Drum plotters roll the paper over a cylinder

Pinch-roller plotters are a mixture of the

two.

Advantages:

- Drawings are of the same quality as if an expert drew them
- Larger sizes of paper can be used than would be found on most printers

Disadvantages:

- Plotters are slower than printers, drawing each line separately.
- They are often more expensive to buy than printers
- Although drawings are completed to the highest quality they are not suitable for text (although text can be produced)
- There is a limit to the amount of detail these plotters can produce, although there are plotters which are "pen-less" the set are used for high-density drawings as may be used for printed circuit board layout.
- In recent years, cheaper printers that can handle A3 and A2 sized paper have resulted in a decline in the need for smaller plotters.

WEEK5 UNIT 4 SOFTWARE ELEMENTS IN DATA PROCESSING

Definition and Types of Software

Software is suite programs that make the hardware components of computers to function. It is a collection of programs. Programs are computer instructions which control the works of computers. These are computer languages which guides and directs how computers are put into use. Software are categorized into two broad ways: System software and Application software.

Operating System (OS)

Operating systems are computer-oriented software which controls the internal operation of computer system. An operating system consists of suites of programs, one of which the master, kernel or executive program, remains resident in the main store of the computer. This program controls the other operating system programs in the suite and between them they control the application programs. Example of current operating system that are commonly used today is Windows coming up in various versions.

Functions of operating system:

1. Priority assignment: Operating system manipulates jobs awaiting execution are scheduled according to either a predetermined or dynamic assignment plan.
2. Control of multi-programming in which programs are executed in order to achieve their purposes.
3. Spooling: The control of input/output peripheral in order to achieve their utilization.
4. Communication: It controls data transmission between terminals and computer, and computerto-computer.
5. Dynamic allocation of main and backing storage, including virtual storage
6. Database: It also controls database management system.

7. Software control: Software such as assemblers, compilers, utility software and subroutines are controlled so that they available immediately when required.
8. Application package control especially with minicomputers.
9. Operations log: This involves maintenance of details of all jobs carried out by the computer

APPLICATION SOFTWARE

Description of Application Software

Application software comprises the programs that are written specifically to achieve results appertaining to the company's activities. In other words application software is user-oriented as opposed to systems software which computer-oriented. Application software comes from two sources, i.e. the company's own DP staff or from external agencies. In the early years of DP, purchased software was often found to be too restrictive and badly documented so that apart from payroll was not accepted. Existing application packages are available for use. A business application package is a complete suite of programs together with associated documentation. It covers a business routine, is supplied by a computer manufacturer or software house, on lease or purchase. A package is normally intended to meet the needs of a number of different user companies. It also contains a number of options; these are selected by user by the insertion of parameters before use.

Advantages of Application Packages

The following benefits should be accrued from the adoption of an application package:

- Implementation of an application is quicker and possibly cheaper.

- System designs, programming and system testing are maximised.
- System documentation is provided with the package.
- Portability from the existing computer system to any new computer adopted by the user.
- Efficiency in terms of speed, storage requirements and accuracy.

Considerations Regarding Application Packages.

Before any organization considers the use of application package, it is necessary to give consideration to:

i. Definition of Requirements

The user company cannot abandon the study of company objectives, systems investigation and consequent definition of DP requirements. In these respects the approach is the same as when designing a DP systems for in-house programming.

ii. Study of Range

A range of packages should be examined in depth before a choice is made, and existing users of the packages should be consulted for their practical experiences and opinions. It should be remembered that the more commonly used packages result in pressure on the suppliers to keep them up-to-date.

iii. Interfacing

Consideration should be given to how a package interface with the user's own routines, both existing and future especially in the area of database.

iv. Performance

How efficient is the package in terms of its average and maximum run times on the computer? What resources does it demand such as peripherals and of main and backing storage.

v. Contract Terms

The terms of contract should embrace factors such as the terms of payment, suppliers' assistance with implementation, extent of documentation and future maintenance.

Types of Application Software

Spreadsheet Software

A spreadsheet also known as a worksheet, is a multipurpose method that is usable for variety of planning, modelling and forecasting purposes, e.g. budgeting, sales analysis, payroll and break-even analysis. The principle of a spreadsheet is that it stimulates a large matrix of cells within each of which a data item or formula can be held. A display of cells, i.e. a window, is scrolled up or down and right or left so that any cell may be inspected at will. Each are located using the row and column identifier. All vertical cells are referred to as columns while the horizontal cells are rows. Among the better known spreadsheet programs are Microsoft Excel, Supercalc, Lotus Works and Visicalc.

Word processing Software

Word processing is an enhanced method of typing which converts text into form the typewritten documents but also stores it in computer storing devices like hard disks, floppy drives, flash drives, CD-ROM and tapes (Opatye, 1999). It involves the composition, recording, transcription, editing and communication of text. A feature of Word processing is its ability to interface with other text that automatically incorporates the relevant names, descriptions and numerical data. Word processing used in offices can be categorized into the following groups:

One-off texts, such as individualized letters and memoranda

Replicated texts, such as standard letters and certain legal documents, perhaps with some degree of individuality.

Updatable texts, such as reports and manufacturers' manuals that may need amending at regular and frequent intervals.

Examples of Wordprocessing packages are Windows Microsoft Word, Windows Wordperfect and Page maker.

Database Management Software (DBMS)

A database is a collection of data supporting the operations of the organization. More specifically, a database entails creating and maintaining data in computer storage in such a way that it is usable for many purposes. In order to have an efficient database there are certain characteristics that must be met, i.e. it must:

- Be substantially non-redundant
- Be program independent
- Be usable by all the programs
- Include all the necessary structural interrelationships of data
- Have common approach to the retrieval, insertion and amendment of data

Database management system therefore could be defined as a system that organizes the storage of data in such a way to facilitate its retrieval for many different applications. The characteristics of logical data are decided by the user's need for flexibility in processing data. In many business situations there is an unlimited range of demands for data; new problems and consequent new arrangements of data occur frequently. Examples of facilities of DBMS are

- Screen formatting for ease of data entry
- Record and file locking to make multi-user systems secure
- Sorting records into any sequence

- Creation of an audit trail
- Logging of transactions
- Control of Passwords
- Acceptance of written programs for enhancing DBMS
- Acceptance of high-level languages as a means of making changes to the contents of the database
- Validation of data
- Dynamic creation and maintenance of data dictionary

DBMS application packages available for use today are Oracles, Foxpro, Microsoft Access etc.

Accounting Software

This involves a wide range of selection of software that is available for business applications such as payroll, sales, purchases and nominal ledgers, stock control, financial modelling, survey and so on.

Statistical Analyses Software

Statistical analysis software is an application package that helps in processing research-based data in order to answer research questions and test hypotheses. Such software helps in entering and processing data collected during the course of study. Data analyses packages include Statistical Package for Social Scientist (SPSS), Statistical Analysis for Scientists (SAS) among others.

Week 6 UNIT 5: DATA PROCESSING FILE MANAGEMENT AND ORGANISATION

INTRODUCTION

A computer file is a piece of arbitrary information, or resource for storing information, that is available to a computer program and is usually based on some kind of durable storage. A file is *durable* in the sense that it remains available for programs to use after the current program has finished. Computer files can be considered as the modern counterpart of the files of printed documents that traditionally existed in offices and libraries.

Concept and Contents of Files

As far as the operating system is concerned, a file is in most cases just a sequence of binary digits. At a higher level, where the content of the file is being considered, these binary digits may represent integer values or text characters. It is up to the program using the file to understand the meaning and internal layout of information in the file and present it to a user as a document, image, song, or program.

At any instant in time, a file might have a size, normally expressed in bytes, that indicates how much storage is associated with the file. Information in a computer file can consist of smaller packets of information (often called *records* or *lines*) that are individually different but share some trait in common. For example, a payroll file might contain information concerning all the employees in a company and their payroll details; each record in the payroll file concerns just one employee, and all the records have the common trait of being related to payroll—this is very similar to placing all payroll information into a specific filing cabinet in an office that does not have a computer. A text file may contain lines of text, corresponding to printed lines on a piece of paper.

The way information is grouped into a file is entirely up to the person designing the file. This has led to a plethora of more or less standardized file structures for all imaginable purposes, from the simplest to the most complex. Most computer files are used by computer programs. These programs create, modify and delete files for their own use on an as-needed basis. The programmers who create the programs decide what files are needed, how they are to be used and (often) their names.

In some cases, computer programs manipulate files that are made visible to the computer user. For example, in a word-processing program, the user manipulates document files that she names herself. The content of the document file is arranged in a way that the word-processing program understands, but the user chooses the name and location of the file, and she provides the bulk of the information (such as words and text) that will be stored in the file.

Files on a computer can be created, moved, modified, grown, shrunk and deleted. In most cases, computer programs that are executed on the computer handle these operations, but the user of a computer can also manipulate files if necessary. For instance, Microsoft Word files are normally created and modified by the Microsoft Word program in response to user commands, but the user can also move, rename, or delete these files directly by using a *file manager program* such as Windows Explorer (on Windows computers).

File Operations and Organisation

Operations on the file

1. *Opening* a file to use its contents
2. *Reading* or *updating* the contents
3. *Committing* updated contents to durable storage
4. *Closing* the file, thereby losing access until it is opened again

File Organization

a Sequential file

Access to records in a Sequential file is serial. To reach a particular record, all the preceding records must be read. As we observed when the topic was introduced earlier in the course, the organization of an unordered Sequential file means it is only practical to read records from the file and add records to the end of the file (OPEN.EXTEND).

It is not practical to delete or update records. While it is possible to delete, update and insert records in an ordered Sequential file, these operations have some drawbacks.

Problems accessing ordered Sequential files

Records in an ordered Sequential file are arranged, in order, on some key field or fields. When we want to insert, delete or amend a record we must preserve the ordering. The only way to do this is to create a new file. In the case of an insertion or update, the new file will contain the inserted or updated record. In the case of a deletion, the deleted record will be missing from the new file.

The main drawback to inserting, deleting or amending records in an ordered Sequential file is that the entire file must be read and then the records written to a new file. Since disk access is one of the slowest things we can do in computing this is very wasteful of computer time when only a few records are involved.

For instance, if 10 records are to be inserted into a 10,000 record file, then 10,000 records will have to be read from the old file and 10,010 written to the new file. The average time to insert a new record will thus be very great.

Inserting records in an ordered Sequential file

To insert a record in an ordered Sequential file:

1. All the records with a key value less than the record to be inserted must be read and then written to the new file.
2. Then the record to be inserted must be written to the new file.
3. Finally, the remaining records must be written to the new file.

Deleting records from an ordered Sequential file

To delete a record in an ordered Sequential file:

1. All the records with a key value less than the record to be deleted must be written to the new file.
2. When the record to be deleted is encountered it is not written to the new file.
3. Finally, all the remaining records must be written to the new file.

Amending records in an ordered Sequential file

To amend a record in an ordered Sequential file:

1. All the records with a key value less than the record to be amended must be read and then written to the new file.
2. Then the record to be amended must be read the amendments applied to it and the amended record must then be written to the new file.
3. Finally, all the remaining records must be written to the new file.

Relative File

As we have already noted, the problem with Sequential files is that access to the records is serial. To reach a particular record, all the proceeding records must be read. Direct access files allow direct access to a particular

record in the file using a key and this greatly facilitates the operations of reading, deleting, updating and inserting records.

Organization of Relative files

Records in relative files are organized on ascending Relative Record Number.

A Relative file may be visualized as a one-dimension table stored on disk, where the Relative Record Number is the index into the table. Relative files support sequential access by allowing the active records to be read one after another. Relative files support only one key. The key must be numeric and must take a value between 1 and the current highest Relative Record Number. Enough room is allocated to the file to contain records with Relative Record Numbers between 1 and the highest record number. For instance, if the highest relative record number used is 10,000 then room for 10,000 records is allocated to the file. In this example, enough room has been allocated on disk for 328 records. But although there is room for 328 records in the current allocation, not all the record locations contain records. The record areas labeled "free", have not yet had record values written to them.

Accessing records in a Relative file

To access a record in a Relative file a Relative Record Number must be provided. Supplying this number allows the record to be accessed directly because the system can use the start position of the file on disk, the size of the record, and the Relative Record Number to calculate the position of the record. Because the file management system only has to make a few calculations to find the record position the Relative file organization is the fastest of the two direct access file organizations available in COBOL. It is also the most storage efficient.

Indexed Files

While the usefulness of a Relative file is constrained by its restrictive key, Indexed files suffer from no such limitation. Indexed files may have up to 255 keys, the keys can be alphanumeric and only the primary key must be unique. In addition, it is possible to read an Indexed file sequentially on any of its keys.

Organization of Indexed files

An Indexed file may have multiple keys. The key upon which the data records are ordered is called the primary key. The other keys are called alternate keys. Records in the Indexed file are sequenced on ascending primary key. Over the actual data records, the file system builds an index. When direct access is required, the file system uses this index to find, read, insert, update or delete, the required record. For each of the alternate keys specified in an Indexed file, an alternate index is built. However, the lowest level of an alternate index does not contain actual data records. Instead, this level made up of base records which contain only the alternate key value and a pointer to where the actual record is. These base records are organized in ascending alternate key order.

As well as allowing direct access to records on the primary key or any of the 254 alternate keys, indexed files may also be processed sequentially. When processed sequentially, the records may be read in ascending order on the primary key or on any of the alternate keys. Since the data records are in held in ascending primary key sequence it is easy to see how the file may be accessed sequentially on the primary key. It is not quite so obvious how sequential on the alternate keys is achieved. This is covered in the unit on Indexed files.

Organizing files and folders

Files and folders arranged in a hierarchy. In modern computer systems, files are typically accessed using names. In some operating systems, the name is associated with the file itself. In others, the file is anonymous, and is

pointed to by links that have names. In the latter case, a user can identify the name of the link with the file itself, but this is a false analogue, especially where there exists more than one link to the same file.

Files (or links to files) can be located in *directories*. However, more generally, a directory can contain either a list of files, or a list of links to files. Within this definition, it is of paramount importance that the term "file" includes directories. This permits the existence of directory hierarchies. A name that refers to a file within a directory must be unique. In other words, there must be no identical names in a directory. However, in some operating systems, a name may include a specification of type that means a directory can contain an identical name to more than one type of object such as a directory and a file.

In environments in which a *file* is named, a file's name and the path to the file's directory must uniquely identify it among all other files in the computer system—no two files can have the same name and path. Where a file is anonymous, named references to it will exist within a namespace. In most cases, any name within the namespace will refer to exactly zero or one file. However, any file may be represented within any namespace by zero, one or more names. Any string of characters may or may not be a well-formed name for a file or a link depending upon the context of application. Whether or not a name is well formed depends on the type of computer system being used. Early computers permitted only a few letters or digits in the name of a file, but modern computers allow long names (some up to 255) containing almost any combination of unicode letters or unicode digits, making it easier to understand the purpose of a file at a glance. Some computer systems allow file names to contain spaces; others do not. Such characters such as / or \ are forbidden. Case-sensitivity of file names is determined by the file system.

Most computers organize files into hierarchies using *folders*, *directories*, or *catalogs*. Each folder can contain an arbitrary number of files, and it can also contain other folders. These other folders are referred to as *subfolders*. Subfolders can contain still more files and folders and so on, thus building a tree-like structure in which one "master folder" (or "root folder" — the name varies from one operating system to another) can contain any number of levels of other folders and files. Folders can be named just as files can (except for the root folder, which often does not have a name). The use of folders makes it easier to organize files in a logical way.

Protecting files

Many modern computer systems provide methods for protecting files against accidental and deliberate damage. Computers that allow for multiple users implement file permissions to control who may or may not modify, delete, or create files and folders. A given user may be granted only permission to modify a file or folder, but not to delete it; or a user may be given permission to create files or folders, but not to delete them. Permissions may also be used to allow only certain users to see the contents of a file or folder. Permissions protect against unauthorized tampering or destruction of information in files, and keep private information confidential by preventing unauthorized users from seeing certain files. Another protection mechanism implemented in many computers is a *read-only flag*. When this flag is turned on for a file (which can be accomplished by a computer program or by a human user), the file can be examined, but it cannot be modified. This flag is useful for critical information that must not be modified or erased, such as special files that are used only by internal parts of the computer system. Some systems also include a *hidden flag* to make certain files invisible; this flag is used by the computer system to hide essential system files that users must never modify

Storing files

In physical terms, most computer files are stored on *hard disks*—spinning magnetic disks inside a computer that can record information indefinitely. Hard disks allow almost instant access to computer files. On large computers, some computer files may be stored on magnetic tape. Files can also be stored on other media in some cases, such as writeable compact *discs*, *Zip drives*, etc.

Backing up files

When computer files contain information that is extremely important, a *backup* process is used to protect against disasters that might destroy the files. Backing up files simply means making copies of the files in a separate location so that they can be restored if something happens to the computer, or if they are deleted accidentally. There are many ways to back up files. Most computer systems provide utility programs to assist in the back-up process, which can become very time consuming if there are many files to safeguard. Files are often copied to removable media such as writeable CDs or cartridge tapes. Copying files to another hard disk in the same computer protects against failure of one disk, but if it is necessary to protect against failure or destruction of the entire computer, then copies of the files must be made on other media that can be taken away from the computer and stored in a safe, distant location.

