

1. There are other variants of LRU. Name some and describe the strategy done.

In operating systems that use paging for memory management, page replacement algorithms are needed to decide which page needed to be replaced when new page comes in. Whenever a new page is referred and not present in memory, page fault occurs and Operating System replaces one of the existing pages with newly needed page. Different page replacement algorithms suggest different ways to decide which page to replace. The target for all algorithms is to reduce number of page faults.

2. Differentiate local replacement and global replacement.

Global Replacement

In global replacement a process can select even those frames which are currently allocated to some other process. Thus, in this strategy, one process can take a frame from another process. In global replacement, the number of frames allocated to a process may increase. One problem with this method is that a process cannot control its own page fault rate. The main advantage is that it results in greater system throughput.

Local Replacement

In this algorithm, the replacement frame selected by a process can only be from the set of frames which are allocated to it. The process cannot select the frame which is currently allocated to other process. Thus, one process cannot take a frame from another process in local replacement. In local replacement, the number of frames allocated to a process does not change.

3. What is working Set Mode (WSM)?

The working set model states that a process can be in RAM if and only if all of the pages that it is currently using (often approximated by the most recently used pages) can be in RAM. The model is an all or nothing model, meaning if the pages it needs to use increases, and there is no room in RAM, the process is swapped out of memory to free the memory for other processes to use. Often a heavily loaded computer has so many processes queued up that, if all the processes were allowed to run for one scheduling time slice, they would refer to more pages than there is RAM, causing the computer to "thrash".

The main hurdle in implementing the working set model is keeping track of the working set. The working set window is a moving window. At each memory reference a new reference appears at one end and the oldest reference drops off the other end. A page is in the working set if it is referenced in the working set window. To avoid the overhead of keeping a list of the last k referenced pages, the working set is often implemented by keeping track of the time t of the last reference, and considering the working set to be all pages referenced within a certain period of time.

4. What is Least Recently Used (LRU Algorithm)? What about Not Frequently used (NFU) Algorithm. What is the difference between the two algorithms?

The LRU (Least Recently Used) algorithm is a memory management approach that replaces pages. This approach replaces the page that has been used the least lately. As a result, any page that has been unused for a longer time than the others gets replaced in memory. A counter is required by the not frequently used (NFU) page replacement mechanism, and each page has its own counter, which is initially set to 0. All pages that have been referenced within that interval will have their counters increased by one.

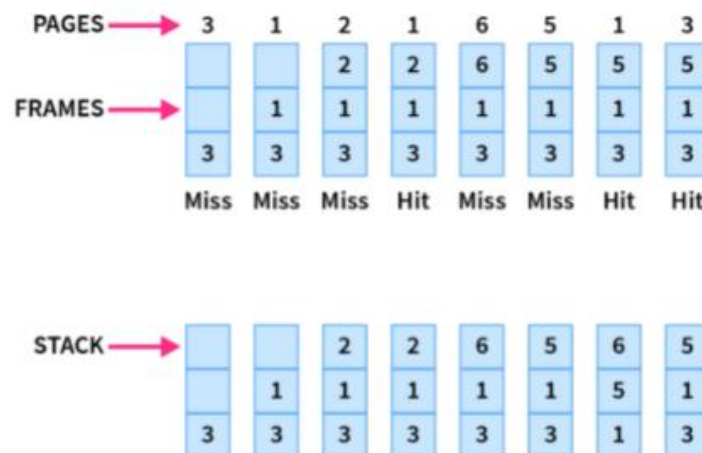
at each clock interval. The Least Recently Used page replacement algorithm is abbreviated as LRU. The Not Frequently Used page replacement algorithm is abbreviated as NFU. It deletes the page in the memory that has been inactive for the longest amount of time. It takes the place of the pages that aren't used very often.

5. Discuss other page replacement algorithm like LIFO and MFU. Give example problem and solution.

Last In First Out (LIFO) Page Replacement Algorithm

This is the Last in First Out algorithm and works on LIFO principles. In this algorithm, the newest page is replaced by the requested page. Usually, this is done through a stack, where we maintain a stack of pages currently in the memory with the newest page being at the top. Whenever a page fault occurs, the page at the top of the stack is replaced.

Example: Let's see how the LIFO performs for our example string of 3, 1, 2, 1, 6, 5, 1, 3 with 3-page frames:



Most Frequently Used Page Replacement Algorithm

Typically, I've seen an MFU cache used as the primary, backed by a secondary cache that uses an LRU replacement algorithm (an MRU cache). The idea is that the most recently used things will remain in the primary cache, giving very quick access. This reduces the "churn" that you see in an MRU cache when a small number of items are used very frequently. It also prevents those commonly used items from being evicted from the cache just because they haven't been used for a while.

MFU works well if you have a small number of items that are referenced very frequently, and a large number of items that are referenced infrequently. A typical desktop user, for example, might have three or four programs that he uses many times a day, and hundreds of programs that he uses very infrequently. If you wanted to improve his experience by caching in memory programs so that they will start quickly, you're better off caching those things that he uses very frequently.

6. What are the functions of a file manager?

File management tools are utility software that manages files of the computer system. Since files are an important part of the system as all the data is stored in the files. Therefore, this utility software help to browse, search, arrange, find information, and quickly preview the files of the system.

Functions of a file management system are as follows:

- Store, arrange, or accessing files on a disk or other storage locations.
- Creating new files.
- Displaying the old files.
- Adding and editing the data in files.
- Moving files from one location to another.
- Sorting files according to the given criteria. For example, file size, file location, modified date, creation date, etc.

7. Discuss in your own words the file organization techniques.

- Know What You Need to File

Sorting through documents will give you an idea of what types of organization techniques to institute, based on what kind of information you have to file away. Create sub-piles according to categories that you determine, such as “client files,” “finance files” or “marketing files.” While sorting through your documents, be sure to get rid of the files you no longer need, or put them in your company’s archives.

- Alphabetical Order

Once you have all your sub-piles completed and you know what you need to file, you can figure out how to keep the documents organized in a way that will let you access the information easily.

- Chronological Order

You can use a chronological organization technique for filing, which arranges files according to the date, or sequence of dates. The Entrepreneur Network (an online resource for entrepreneurs) recommends using a chronological organization technique because it makes filing and accessing records more convenient. This type of organization system may be especially handy when putting away files from meetings.

- Maintaining the Process

It’s easy to let those papers pile up and up, but establishing a filing process will be beneficial. When new documents land on your desk, try filing them away as promptly as you can. This will save you time down the road from having a massive filing project.

8. Where can you find the details (elements) of a specific file? What details are commonly presented? How do you access other details? Provide an example of at least 5 files and describe the given details?

To view information about a file or folder, right-click it and select Properties. You can also select the file and press Alt + Enter. The file properties window shows you information like the type of file, the size of the file, and when you last modified it.

- **Name** - You can rename the file by changing this field. You can also rename a file outside the properties window. See Rename a file or folder.
- **Type** - This helps you identify the type of the file, such as PDF document, OpenDocument Text, or JPEG image. The file type determines which applications can open the file, among other things. For example, you can't open a picture with a music player. See Open files with other applications for more information on this.
- **Contents** - This field is displayed if you are looking at the properties of a folder rather than a file. It helps you see the number of items in the folder. If the folder includes other folders, each inner folder is counted as one item, even if it contains further items. Each file is also counted as one item. If the folder is empty, the contents will display nothing.
- **Size** - This field is displayed if you are looking at a file (not a folder). The size of a file tells you how much disk space it takes up. This is also an indicator of how long it will take to download a file or send it in an email (big files take longer to send/receive).
- **Parent Folder** - The location of each file on your computer is given by its absolute path. This is a unique "address" of the file on your computer, made up of a list of the folders that you would need to go into to find the file. For example, if Jim had a file called Resume.pdf in his Home folder, its parent folder would be /home/jim and its location would be /home/jim/Resume.pdf.
- **Free Space** - This is only displayed for folders. It gives the amount of disk space which is available on the disk that the folder is on. This is useful for checking if the hard disk is full.
- **Accessed** - The date and time when the file was last opened.
- **Modified** - The date and time when the file was last changed and saved.

9. Create a table showing the description of access method using the format given.

Access Method	Key points	How is search done	Type of applications where it is effective (give concrete examples)	How is a new record added?
File	Data collected in the order of arrival	Use space well when the stored data vary in size and structure	Unsuitable for most applications	No structure, hence record access use exhaustive search

Sequential	Contains a key field which uniquely identifies a record	Fixed length with fixed set of fields in a fixed order	Appropriate in processing applications involving the whole file example is payroll	Addition of data to existing file may cause a problem
Indexed Sequential	Greater performance than sequential access	Index file contains a key field and a pointer to a main file	Overflow file used to record any addition or update to an existing file	Records are organized in sequence
Indexed	Multiple indexes are used to achieve flexibility in searching for fields other than the key field	Indexed is organized as sequential file for easy search	Used mostly in real time applications	Records are accessed through indexes
Hashed or Direct	Direct access to any block or known address	Key field is required but may not be in sequential order	Often used for application with the following characteristics: <ul style="list-style-type: none">- Requires immediate access- Uses fixed length records- Access is done one record at a time	Used hashing on key value

10. Research on the common schemes used in defining the logical structure of a directory. These schemes are:

a. Single level directory

The single-level directory is the simplest directory structure. In it, all files are contained in the same directory which makes it easy to support and understand. A single level directory has a significant limitation, however, when the number of files increases or when the system has more than one user.

b. Two level directory

In the two-level directory structure, each user has their own user files directory (UFD). The UFDs have similar structures, but each lists only the files of a single user. system's master file directory (MFD) is searched whenever a new user id=s logged in.

c. Tree structured directory

The directory is structured in the form of a tree. It also has a root directory, and every file in the system has a unique path. A directory within a tree-structured directory may contain files or subdirectories. Special system calls are used to create or remove directories.

d. Acyclic graph directories

An acyclic graph is a graph with no cycle and allows us to share subdirectories and files. The same file or subdirectories may be in two different directories. It is a natural generalization of the tree-structured directory.

e. General graph directories

In general graph directory structure, cycles are allowed within a directory structure where multiple directories can be derived from more than one parent directory. The main problem with this kind of directory structure is to calculate the total size or space that has been taken by the files and directories.

11. Pick one operating system and discuss its file management

Windows Operating System

Windows File Management is designed to teach management of files and changing settings effectively in the Windows operating system. The learner will be able to use the Windows File Explorer to create a hierarchical folder structure as well as how to move, copy, rename and delete files. Also, information on keeping the Windows desktop organized with useful shortcuts and controlling various Windows settings will be shared. As time permits, additional tips and shortcuts will be shared about certain Microsoft Office software programs as well.

File Explorer

You can view and organize files and folders using a built-in application known as File Explorer (called Windows Explorer in Windows 7 and earlier versions).

To open File Explorer, click the File Explorer icon on the taskbar, or double-click any folder on your desktop. A new File Explorer window will appear. Now you're ready to start working with your files and folders.

12. Research on the issues involved in file allocation

- ✓ Contiguous allocation method suffers internal as well as external fragmentation.
- ✓ In terms of memory utilization, this method is inefficient.
- ✓ It is difficult to increase the file size because it depends on the availability of contiguous memory.

- ✓ In this scheme, there is large no of seeks because the file blocks are randomly distributed on disk.
- ✓ Linked allocation is comparatively slower than contiguous allocation.
- ✓ Random or direct access is not supported by this scheme we cannot access the blocks directly.
- ✓ The pointer is extra overhead on the system due to the linked list.
- ✓ The pointer head is relatively greater than the linked allocation of the file.
- ✓ Indexed allocation suffers from the wasted space.
- ✓ For the large size file, it is very difficult for single index block to hold all the pointers.
- ✓ For very small files say files that expend only 2-3 blocks the indexed allocation would keep on the entire block for the pointers which is insufficient in terms of memory utilization.