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Virtual Memory Benefits and Uses

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Abstract: ***This paper will give brief outline of virtual memory benefits &uses. Virtual memory concept is implemented by demand paging concept. Programs require memory to start and run on computers. When several processes are being processed at the same time, the operating system must keep track of the computer's memory and make sure there is enough. Computers have limited amount of random access memory which is known as RAM. RAM is the main memory on a computer. If multiple applications are running at the same time, the RAM on it will not be enough to execute the processes. This is when virtual memory comes in and balances the process. Virtual memory is a memory management technique. Virtual memory gives programmer an illusion that he is having very large memory at its disposal but in reality user has very small memory. Virtual memory serves two purposes. First, it allows us to extend the use of physical memory by using disk. Second, it allows us to have memory protection, because each virtual address is translated to a physical address.***

Keywords: virtual memory, benefits, virtual memory management, memory protection, demands paging.

I. INTRODUCTION

Virtual memory is secondary memory that can act like part of the main memory. When the RAM is used up, virtual memory is used like RAM. The hard disk is much slower then RAM so the more virtual memory used, the slower your computer will run. The computer will look for areas on the RAM that are not in use and copy it to the hard disk to free up space on the RAM. Virtual memory keeps 'active' process in the RAM and keeps the 'inactive' processes on the address space on the disk. When an 'inactive' process is needed, it will bring that process back to the RAM from the disk. This process is running in the background without the user being aware. The disk runs much slower so the more RAM a computer has, the fast it will run. When using multiple or large applications, it is best to have as much physical memory if possible. Due to the limited physical memory, it is tough to store Multiple processes in memory for multiprogramming. Virtual memory can solve this problem. In this we can execute a process without bringing it completely in the main memory Virtual memory separates both logical memory and physical memory. Due to this separation the amount of available physical memory is no longer an issue and less physical memory is needed for each program, which increases CPU utilization and throughput. Each process is given a virtual address, which is used to map the process into main memory. The process can access its data with the virtual address. The range of actual memory is known as the physical address space, the addresses available in main memory are called physical addresses. When we want to execute a process, the virtual address space is mapped into a physical address space.

II. IMPLEMENTATIONS OF VIRTUAL MEMORY: DEMAND PAGING

Virtual memory concept is implemented using demand paging concept. In demand paging a process is divided into various pages & every page is given a unique address and at a time all the pages of a process are not brought in the main memory only some of the pages related to the pages are brought in because it is assumed that during given time we don't need all the pages in the memory for execution of program only some of the pages are needed, remaining pages can be brought on the demand. CPU can also need those pages which are not available in the main memory; this need is indicated by page fault by the CPU. When

there is page fault that means page referenced by CPU is not available in the main memory and that page is to be searched in the secondary memory. Once the required page is found in the secondary memory, we have to bring that page into the main memory but main memory is already full so we have to make room for the page for this we have to replace one of the existing page .In order to replace existing page we have to use some of the page replacement algorithm. There are various page replacement algorithms available; every algorithm has its own functionality we have to select that algorithm which best suits to our requirement .of the commonly used algorithms are FIFO (first in first out), LRU(Least Recently used) , OPT(Optimal Page Replacement).Page replacement algorithms are also divided into local & global page replacement algorithms. In Local page replacement algorithm only page related to same process is replaced, in global replacement page related to any process can be replaced. Global page replacement algorithm is more complex to implement.

A. ADVANTAGES:

- Virtual memory allocation is easy and cheap
- Eliminates external fragmentation
- Data (page frames) can be scattered all over PM
- Pages are mapped appropriately anyway
- Allows demand paging and preparing.
- Allows jobs to be allocated in non-contiguous memory locations.
- Very efficient swapping
- Fragmentation problem is solved.
- We can run more applications at once.
- We can run larger applications with less real RAM.
- Applications may be launched faster because of File Mapping.
- We don't have to get more memory (RAM).
- We can swap out page which least likely to be used.

B. DISADVANTAGES:

- Longer memory access times.
- Applications run slower.
- Reduced system stability.
- High Complexity.
- It takes more time to switch between applications
- Less hard drive space for use.
- Table handling overhead.

III. FINDING

Virtual memory concept is very useful in improving the memory utilization but sometime this feature is obtained at cost of loss of some important data. We can use this concept in improving the performance of computer system in more meaning full

manner by using this concept as hybrid virtual memory concept. We can also use dynamic demand paging concept for improving the implementation part of virtual memory. We can have real time virtual memory in future for exploiting parallelism.

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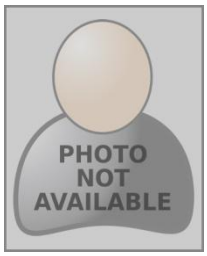

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