Virtual Memory

Bùi Đức Hiếu - 7140231

Outline

Virtual Memory

Paged Virtual Memory

Segment Virtual Memory

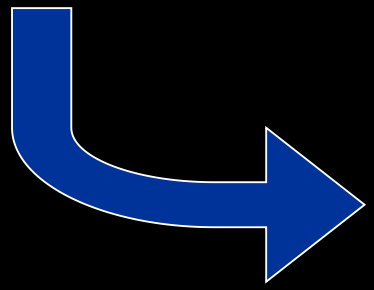
Differences

Preface

Computers are running multiple processes with its own address space.

It's too expensive to create full address space for all process.

And each process use only small part of its address space.



Virtual Memory

Virtual Memory

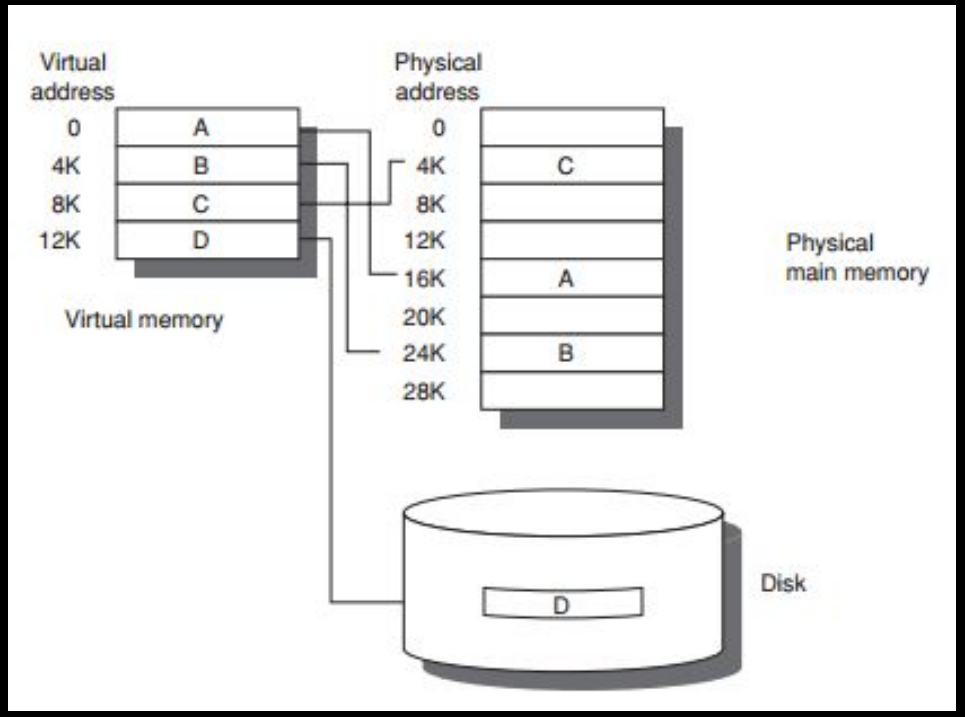
Virtual Memory

Divides physical memory into blocks and allocates them to different processes.

Memory management technique is implemented using both hardware and software.

Virtual Memory

It maps memory addresses used by virtual addresses into physical addresses.



Benefit

- Freeing applications from having to manage a shared memory space.
- Increasing security due to memory isolation.
- Being able to conceptually use more memory than might be physically available.

Category

Page (fixed-size blocks): 4096 to 8192 bytes

Segment (variable-size blocks): varies

- Min: 1byte
- Max: 2^16 - 2^32 byte.

Paged virtual memory

Paged virtual memory

Divide a virtual address space into pages, blocks of contiguous virtual memory addresses.

Systems with large virtual address ranges or amounts of real memory generally use larger page sizes.

Page table

Used to translate the virtual addresses seen by the application into physical addresses like MMU.

Each page table entry holds indexes whether the corresponding page is in real memory or not.

Page table

Yes, page table entry contain the real memory address at which the page is stored.

No, page fault exception.

Page supervisor

Creates and manages page tables.

If page fault exception, paging supervisor

- Accesses secondary storage
- Returns page has virtual address that resulted in the page fault
- Updates the page tables to reflect the physical location of the virtual address
- Tells the translation mechanism to restart the request.

Page supervisor

If physical memory is full, paging supervisor must free a page page.

Use one of page replacement algorithms to determine which page to free.

Segmented virtual memory

Segmented virtual memory

Dividing virtual address spaces into variable-length segments.

Consisting of a segment number and an offset within the segment.

Segmentation and paging can be used together by dividing each segment into pages.

Segmented virtual memory

Segment is not a page with variable length or a simple way to lengthen the address space.

Segmentation that can provide a single-level memory model in which there is no differentiation between process memory and file system consists of only a list of segments..

Differences between page and segment

Differences

About memory division.

Segmentation is visible to user processes.

Q & A

Thank you for attention