

CSC369 Week 5 Notes

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1 Memory Management

- Physical Memory vs Virtual Memory ^[1]
 - Physical Memory
 - * Is RAM :)!!
 - * Is the first memory used when computer requires memory such as loading application or OS
 - Virtual Memory
 - * Is stored on hard drive
 - * Is used when RAM is filled
 - * Is slower than RAM

References:

- 1) Tech Walla: What Is the Difference Between Virtual Memory & Physical Memory?, [link](#)

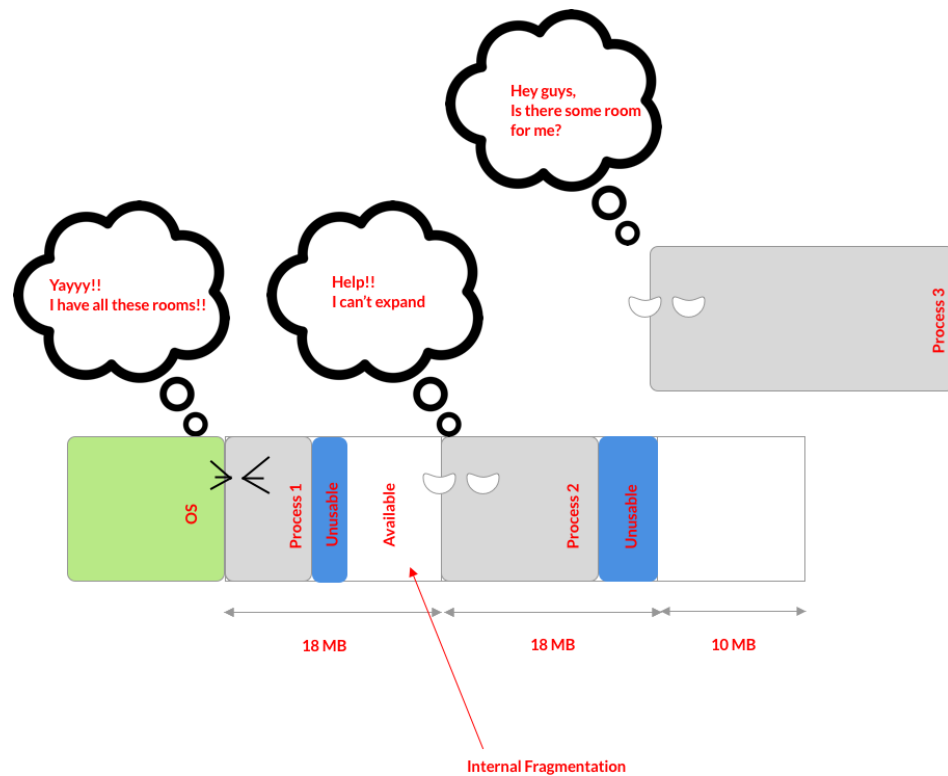
- Memory Management
 - Is the process of controlling and coordinating computer memory
 - Assigns portions known as **blocks** to various programs ^[1]

References:

- 1) Guru 99: Memory Management in OS: Contiguous, Swapping, Fragmentation & Physical Memory?, [link](#)

- Fixed Partitioning

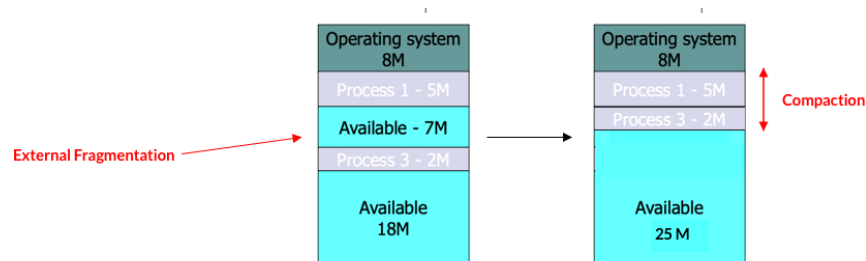
- Is the oldest and simplest technique to put more than one processes in the main memory. ^[1]
- Divides memory into regions with fixed boundaries.
 - * Can be of equal size
 - * Or unequal size
- Advantages: ^[1]
 - * Is easy to implement
 - * Requires lesser indirect computational power
- Disadvantages: ^[1]
 - * Creates a gap if process is smaller than partition (**Internal Fragmentation**)
 - * Programmer must deal with programs larger than partition



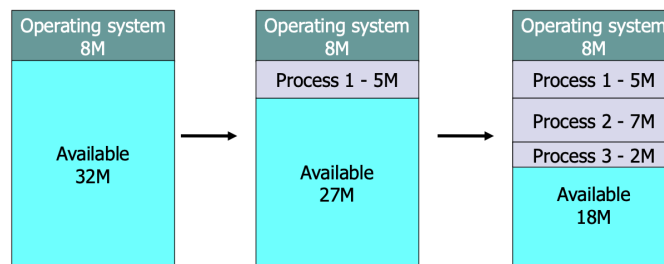
References:

- 1) Chegg Study: Fixed Partitions, link
- Dynamic Partitioning
 - Allevates problems caused by fixed partitioning ^[1]
 - A partition of exact the right size is created for a process

- OS may move processes around to create larger chunks of space
 - * I.e. moving process 3 right beneath process 1
 - * Is called **compaction**
 - * Processes must be **relocatable**



- Advantages ^[1]
 - * No **internal fragmentation**
 - There will be no unused space left in the partition

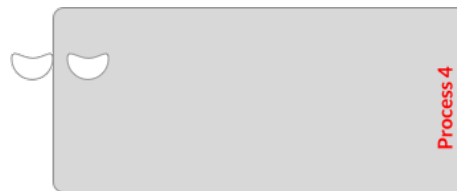


- * No restriction on degree of multiprogramming ^[1]
 - More processes in memory due to absence of internal fragmentation
 - Processes can be loaded until RAM is empty
- * No limitation on the size of process
 - Process size not limited to the size of partition
- Disadvantages
 - * As processes come and go ‘holes’ are created
 - Is called **external fragmentation**

1



2



External Fragmentation

 A red arrow points from the text "External Fragmentation" to the large white gap in the memory layout diagram above.

Refernces:

1) GeeksForGeeks: Variable (or dynamic) Partitioning in Operating System, link

- Paging

- Solves **internal fragmentation** and **external fragmentation**
- Stores and retrieves data from **secondary storage** for use in **main memory** ^[1]
 - * Secondary storage → Hard Drive

- * Main memory → RAM
- Is an important part of **virtual memory** management in modern OS ^[1]
- Partitions memory into equal, fixed-size chunks
 - * Are called **page frames** or **frames**
- Divide processes' memory into chunks of the same size
 - * These are called **pages**

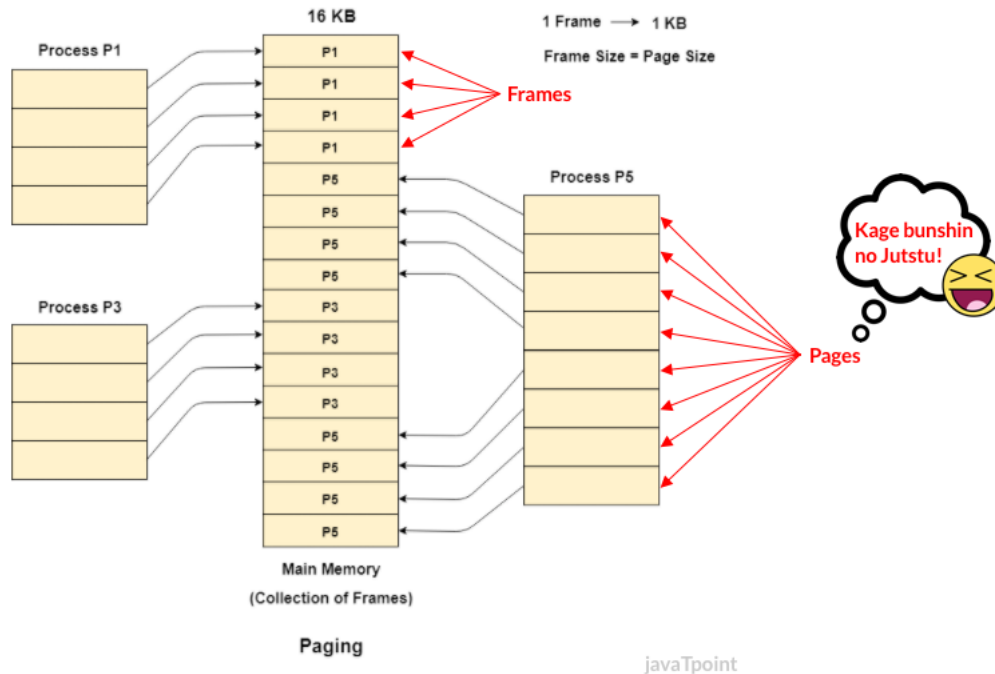


Figure 1: Oh moe.. :)

References:

- 1) Wikipedia: Paging, [link](#)
 - 2) JavaTPoint: Paging with Example, [link](#)
- Translation Lookaside Buffer (TLBS)
 - Is a memory cache that is used to reduce the time taken to access a user memory location ^[1]
 - Stores the recent translations of virtual memory to physical memory ^[1]
 - Resides in between the different levels of multi-level cache, i.e. L1, L2, L3 cache ^[1]

References:

- 1) Wikipedia: Translation Lookaside Buffer, [link](#)