

## Memory Paging (Intel Core2)

- The **memory paging mechanism** is located within the 80386 and up.
- Allows a **linear address** (virtual address) of a program to be located in any portion of physical memory.
- The **linear address** is defined as the address generated by a program.
- The **physical address** is the actual memory location accessed by a program.
- **Paging** is a storage mechanism that allows **OS** to retrieve processes from the secondary storage into the main memory in the form of pages.
- In the paging method, the main memory is divided into **small fixed-size blocks of physical memory**, which is called **frames**.
- The **size of frames** should be kept the same as that of a **page** to have *maximum utilization of the main memory* and to avoid external fragmentation.
- **Paging** is used for faster access to data, and it is a logical concept.
- With the memory paging unit, the *linear address* is **invisible translated to any physical address**, which allows any application written to function at a specific address to be relocated through the paging mechanism.

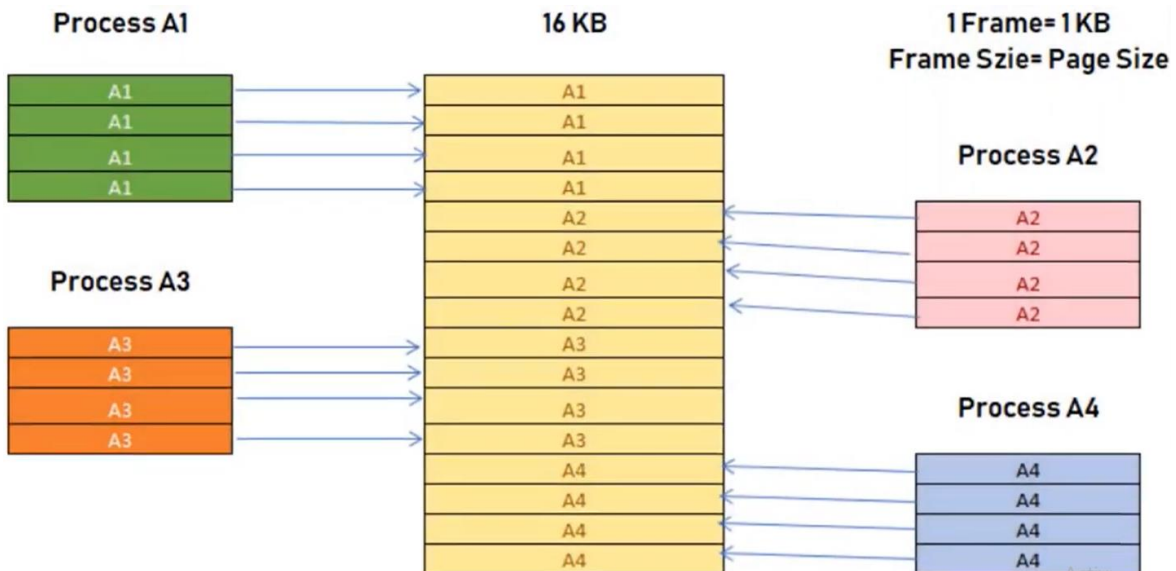
-----  
**Example:** if the main memory size is **16 KB** and frame size is **1 KB**. Here, the main memory will be divided into the collection of **16 KB** frames of **1 KB** each.

And there are **4 separate processes** in the system that is **A1, A2, A3, and A4** of **4 KB** each.

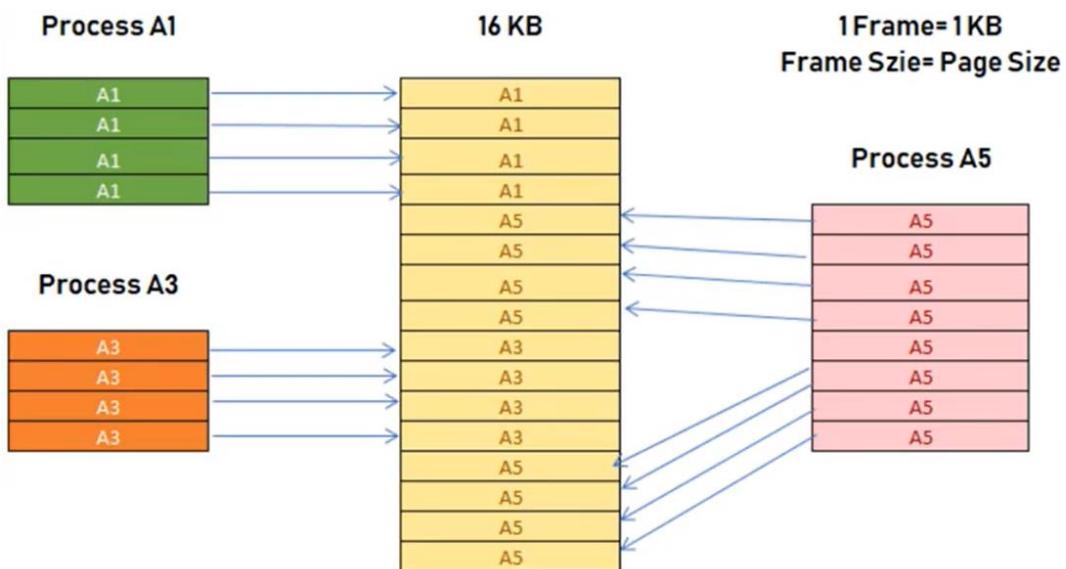
- Here, all processes are divided into pages of 1 KB each, so the operating system can

store one page in one frame.

- At the beginning of the process, all frames will remain empty so that all pages of processes will get stored in a contiguous way.

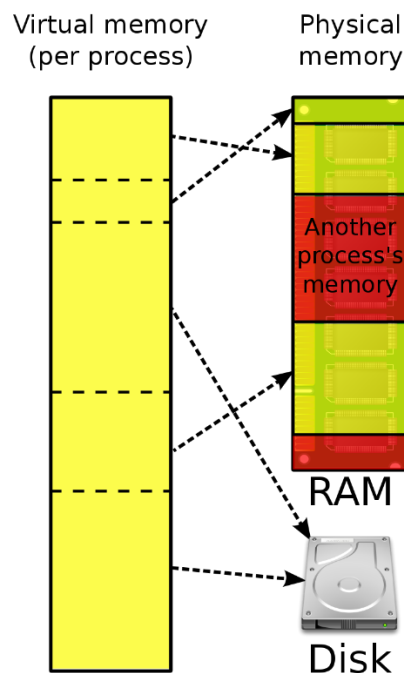


- A2 and A4 are moved to the waiting state after some time.
- Therefore, eight frames become empty, so other pages can be loaded in that empty blocks.
- The process A5 of size 8 pages (8 KB) are waiting in the ready queue.



# Virtual Memory

- **Virtual memory** is a familiar part in most operating systems. Most computers these days contain 1GB, 2GB, and possibly 4GB RAM, and this amount of memory is not enough to run a group of programs at one time, such as an editing program, images, writing editor, Internet browser, and e-mail program. If you do not have virtual memory, these programs will not work, and you will get a message asking you to close some applications to free part of the memory.
- With virtual memory, the computer will search for unused parts of the RAM constantly and copy them to the hard disk and this frees up a portion of the RAM to be used to run additional applications. This happens automatically to the extent that you do not feel it and makes your device feel that it has more memory than it is.



- But of course, the speed of reading and writing on the hard disk will be much slower than in memory. If the applications you run need a lot of memory and what you have little, you will notice a clear slowdown when you run these applications using virtual memory, and the best solution would be to add RAM to your device.

- The area on the hard disk in which the virtual memory is stored is called the **page file**, and it is the one that saves pages from the RAM on the hard disk. In the Windows system, this type of file is stored in portions of memory and has the extension **SWP**.
- **Some tips**: Controlling virtual memory in Windows 98 and later is done automatically, but if you want to control it manually then you have to do the following:
  - go to **Control Panel**, then to **System**, there go to **Performance** and click on: **RAM** and there choose:

*Let me define my virtual memory settings*

- Here you can choose the disk on which you want to store the memory and specify the least and largest amount of virtual memory measured in megabytes, which is usually the least 2 megabytes and the most is equal to RAM + 12, but it is preferable to make it equal to twice the RAM.