

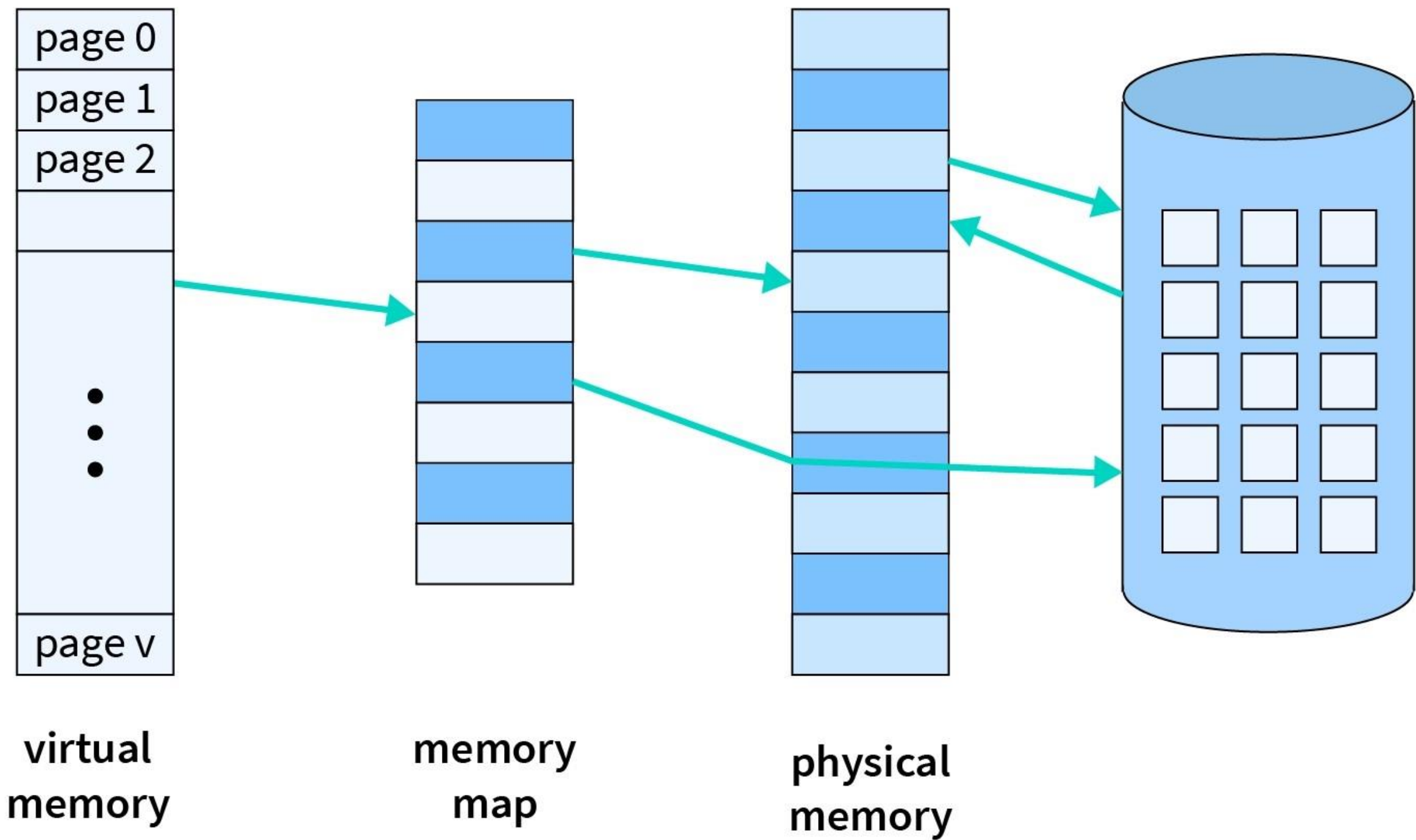
What is Virtual Memory in OS?

Virtual memory in OS is a memory management technique that enables or allows the computer to execute larger programs or multiple programs together that would not be possible by using only the available physical memory.

In simple words, we can also say that virtual memory in os makes an illusion of extra memory than available physical memory.

Virtual Memory in OS organizes the physical memory in various parts and keeps note of all the available and used memory and it is also known as the page table.

A computer can run the software by combining physical memory and hard disk space with virtual memory.



Physical memory is loaded when a program is run, but if there is not enough space, the operating system will move some program components to the hard drive. This process is known as swapping.

The user is unaware of the swapping procedure because it takes place in the background.

The operating system will swap the necessary portion of the program back into physical memory when the user tries to access a portion of it that has been moved to the hard drive.

How does Virtual Memory Work?

Virtual memory works by dividing a program into small sections called pages. Each page is typically 4 kilobytes in size.

When a program is executed, the operating system loads some of the pages into physical memory.

The pages that are not loaded into physical memory are stored on the hard disk.

The operating system uses a page table to keep track of which pages are in physical memory and which are on the hard disk.

When a program attempts to access a page that is not in physical memory, the operating system generates a page fault.

The page fault interrupts the program and transfers control to the operating system.

The operating system then reads the required page from the hard disk and stores it in physical memory.

The operating system updates the page table to indicate that the page is now in physical memory, and then returns control to the program.

The program can now access the required page, and the execution of the program continues.

Demand Paging

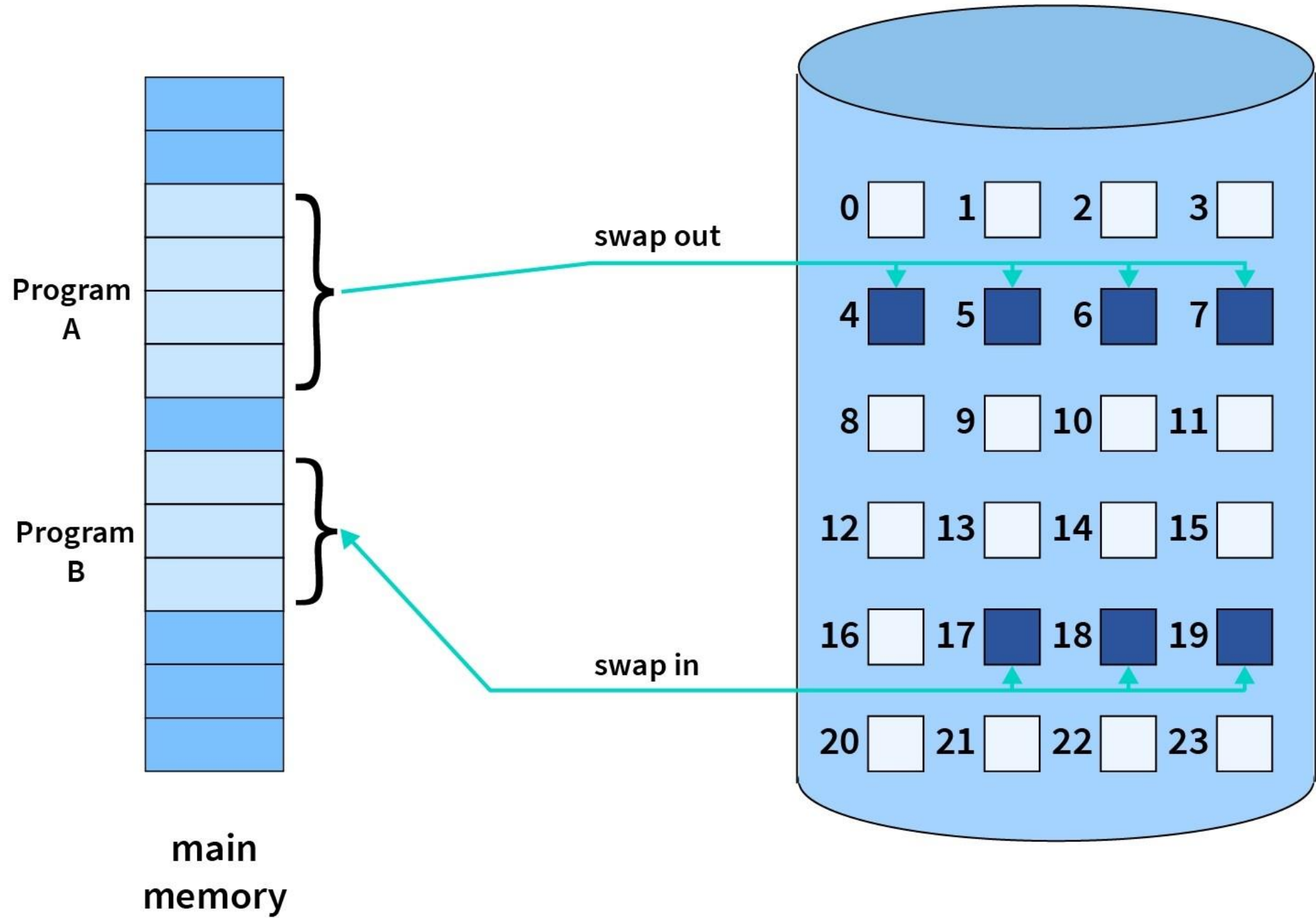
It is one of the memory management techniques that is used by operating systems.

In this technique, only the pages that are required are loaded into the memory, rather than loading all the pages at the start of the program.

This approach saves memory resources and allows the programs to run even if they require more memory than is available.

It reduces the startup time of the programs and also makes the I/O faster.

Because of this many programs can also run at the same time when one program gets the required page the other can get its required pages.



What is Page Replacement in Operating Systems?

Page replacement is needed in the operating systems that use virtual memory using Demand Paging.

As we know in Demand paging, only a set of pages of a process is loaded into the memory.

This is done so that we can have more processes in the memory at the same time.

Why Need Page Replacement Algorithms?

Page Faults: As the program runs and attempts to access data or code that is not currently in memory, a page fault occurs. A page fault is an exception that the operating system catches, indicating that the requested page is not in the current set of pages in RAM.

Since the actual RAM is much less than the virtual memory the page faults occur.

So whenever a page fault occurs, the Operating system has to replace an existing page in RAM with the newly requested page.

In this scenario, page replacement algorithms help the Operating System in deciding which page to replace.

First In First Out (FIFO)