EECS 3221 E F20 Ch-10 1 Virtual Memory Material

Virtual Memory

Demand Paging, Page Fault, and Page Replacement

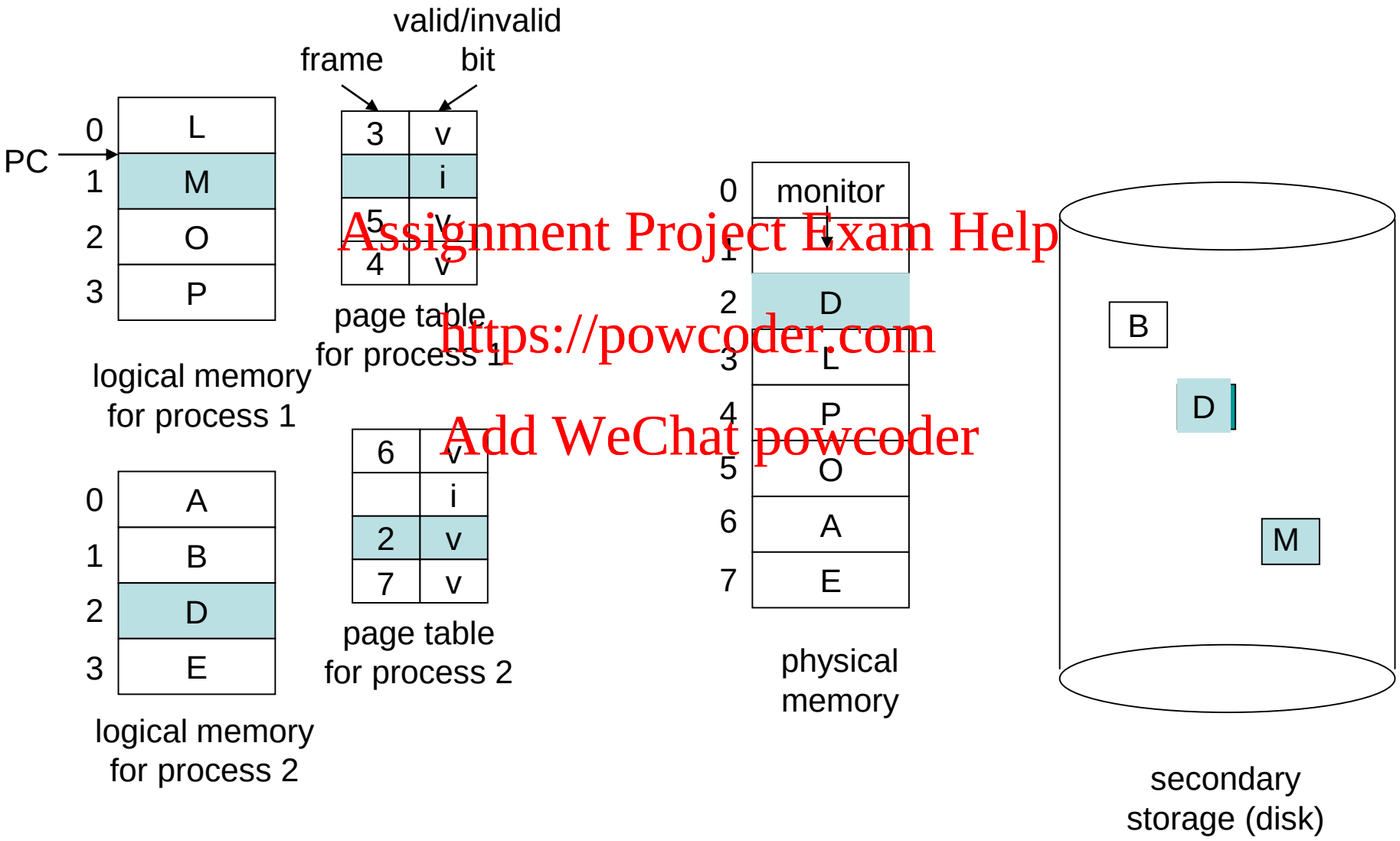
(See OS-ch10.pdf, slides 10.1 – 10.21; Textbook p.389-404.)

1. Here is an example that illustrates how page replacement works.

1.1. The first diagram titled “Before Page Replacement” below, illustrates the state of a system at the time when process 1 attempts to access page M which is not in memory – this generates a page fault.
The page table for process 1 indicates that page M is not in memory, because the valid-invalid bit in the page table entry associated with page M is set to “i” which means “invalid”.
The page fault causes a trap to the operating system, which:

(a) Finds the location of the desired page M on disk
(b) Tries to find a free frame:
(c) Since there is no free frame, a page replacement algorithm is used to select a **victim** page. It is assumed that page D in frame 2, which belongs to process 2, is selected as the victim page.
(d) Writes out page D to disk if D has been modified; brings the desired page M from disk into the (newly) free frame 2; updates the page and frame tables.
(e) Restarts process 1 where the page fault occurred, so process 1 is able to access page M as if page M had always been present in physical memory.

Before Page Replacement



1.2. The second diagram titled “After Page Replacement” below, illustrates the state of the system after all the actions described above have been performed.

After Page Replacement