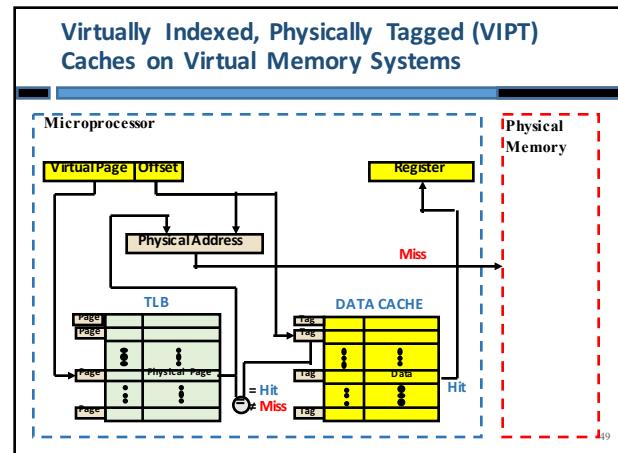
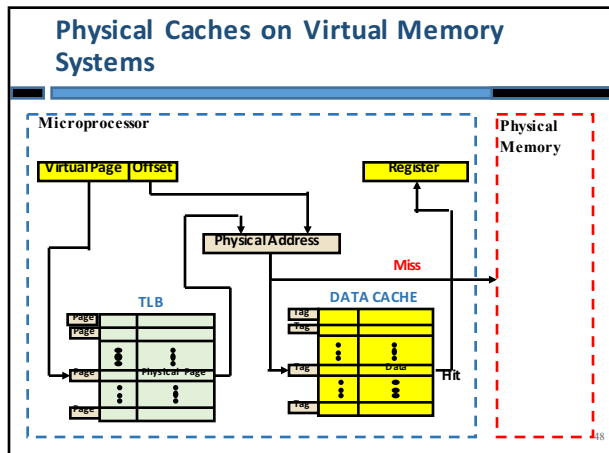


Caches on Virtual Memory Systems

- Physical Cache
 - Use physical addresses
 - Total memory access can be a minimum of two cycles if a TLB produces the physical address
- Virtually Indexed, Physically Tagged (VIPT) Cache
 - Uses offset of virtual address as index
 - Uses physical address tags (physical pages)
 - Needs TLB to validate physical page
 - Total memory access can be a minimum of one cycle

47



Lesson Outcomes

- Understand the organization of virtual memory systems.
- Understand the process of virtual to physical address translation.
- Know how the operating system intervenes in a virtual memory system, in particular on a page fault.
- Know how multi-level page tables accomplish address translation.
- Know how address translation is accomplished on virtual memory systems that use segmentation.
- Understand how caches are integrated on a virtual memory system.

50