Section 7: Lab 3 contd.

CSE 451 20wi

section 7: 2/20/2020

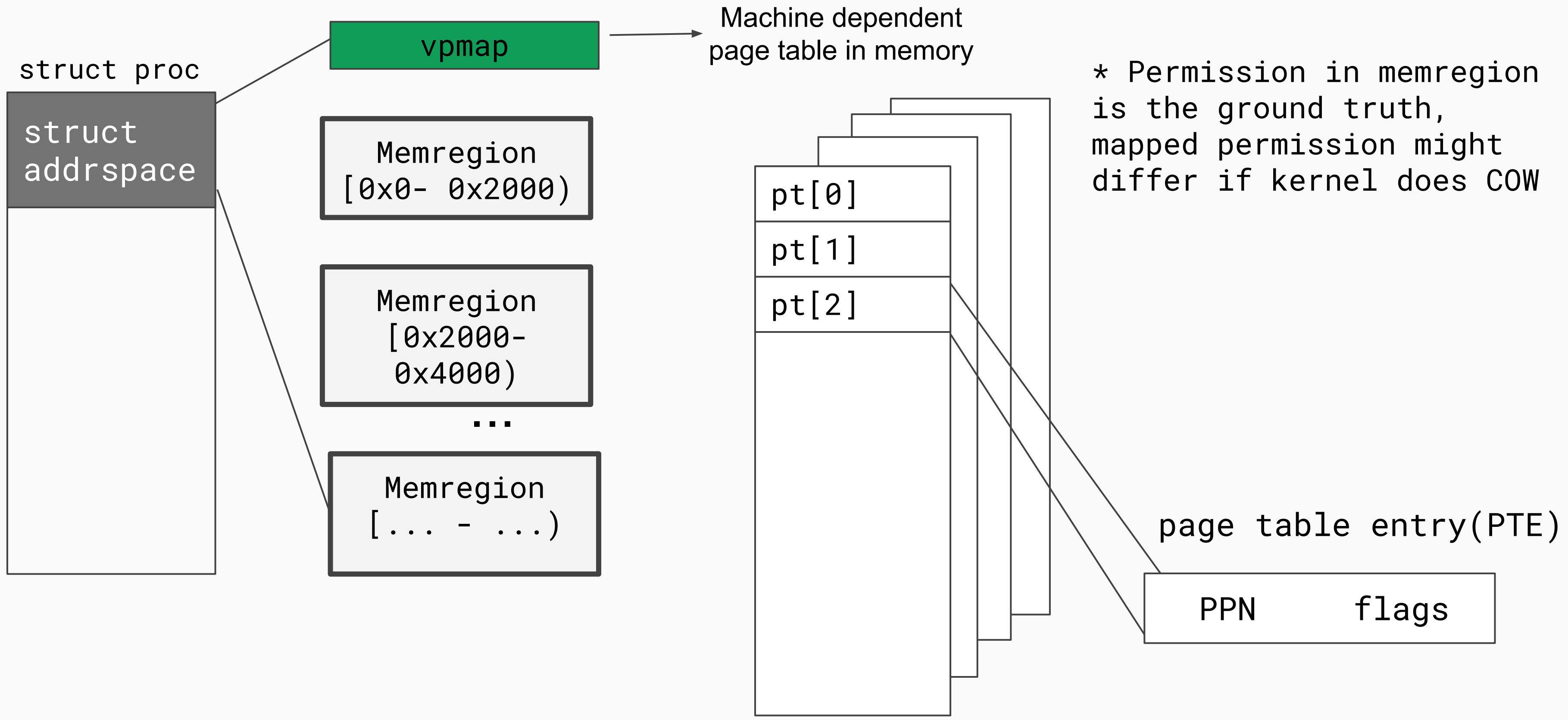
Announcements

- Lab 3 due tomorrow (no late days for lab4)

Copy-on-write Fork Tips

- How is a page different from a memory region?
  - A memory region is a contiguous region of memory, can contain multiple pages
  - A page is a 4096 byte virtual address range inside a memory region
- Anything else?

Virtual Memory System Visual Diagram



* Permission in memregion is the ground truth, mapped permission might differ if kernel does COW

TLB Flush

- vpmap_flush_tlb
- when you map a virtual to a different physical page
  - flush to get rid of cached old translation
- when you change permission of a mapped page
  - flush to get rid of cached permission
- memregion_invalidate flushes TLB only if modified region belongs to current process (tries to reduce unnecessary flush)

When should you flush TLB in Lab 3?

Copy-on-write Fork Tips

- when copying over parent's page table entry, make sure to only copy mapped parent's pages
    - if (*parent_pte & PTE_P) { … }
    - if parent's page is not mapped to a physical page, there is nothing to share
- Do we need to lock around pmem_*?
    - No :) pmem is synchronized internally
- How is a physical page freed?
    - when pmem_dec_ref is decrementing the last reference, pmem_free is invoked
    - no need to explicitly free it, just make sure reference count is updated correctly

Copy-on-write Fork Tips

- What are present, user, write bit used for in page fault handler?
  - **present** indicates if the page exists
  - **user** indicates if the fault occured in user or kernel mode
    - doesn't really matter for stack/heap growth since kernel can trigger stack or heap growth
  - **write** indicates if the memory access is a write
- Do I need to call handle_page_fault myself?
  - Nope. Page fault handler is a trap handler that is invoke on exception, you should never call this yourself

Office Hour