

# Section 7: Cow Fork

CSE 451 18SP



# Announcements

- Lab 3 has been graded, please let us know if you have any questions
- Lab 4B deadline is May 15th
- Lab 4C deadline is May 22nd
  - Final deadline, this is the version that will be graded
- Lab X proposal Due May 18th

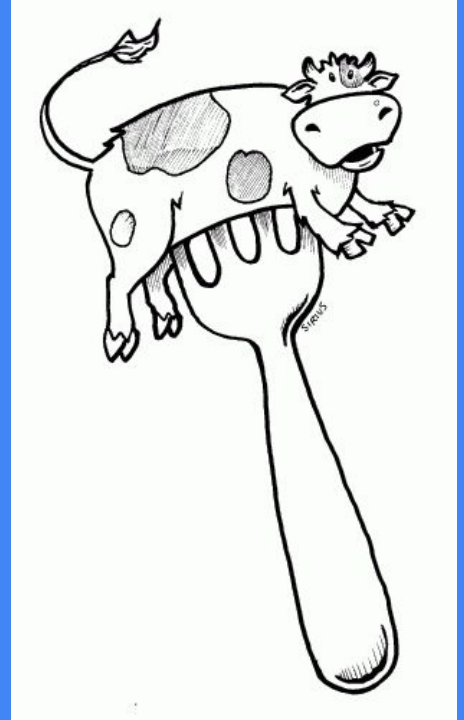
# User-Exception Stack



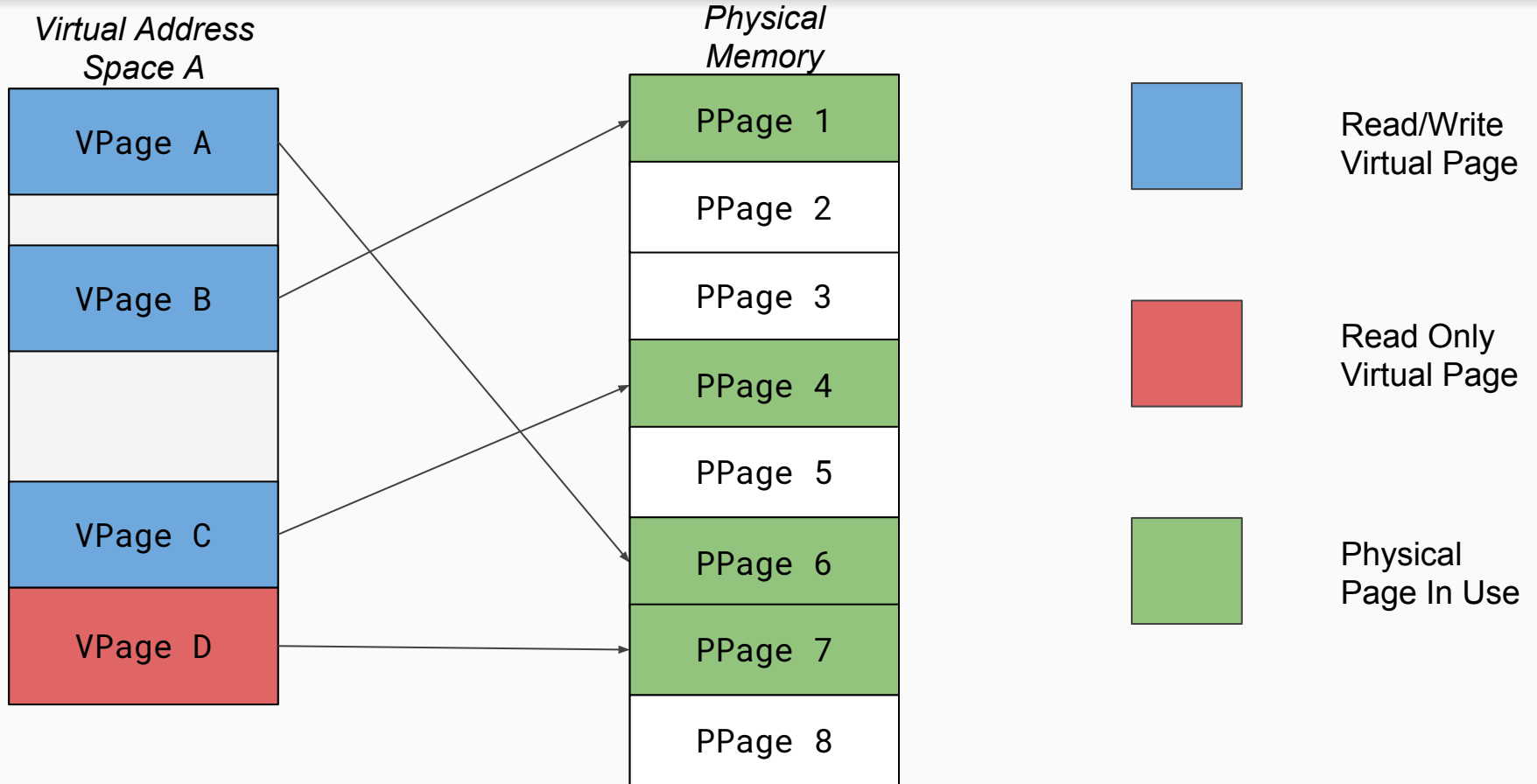
# COW Fork

(copy-on-write)

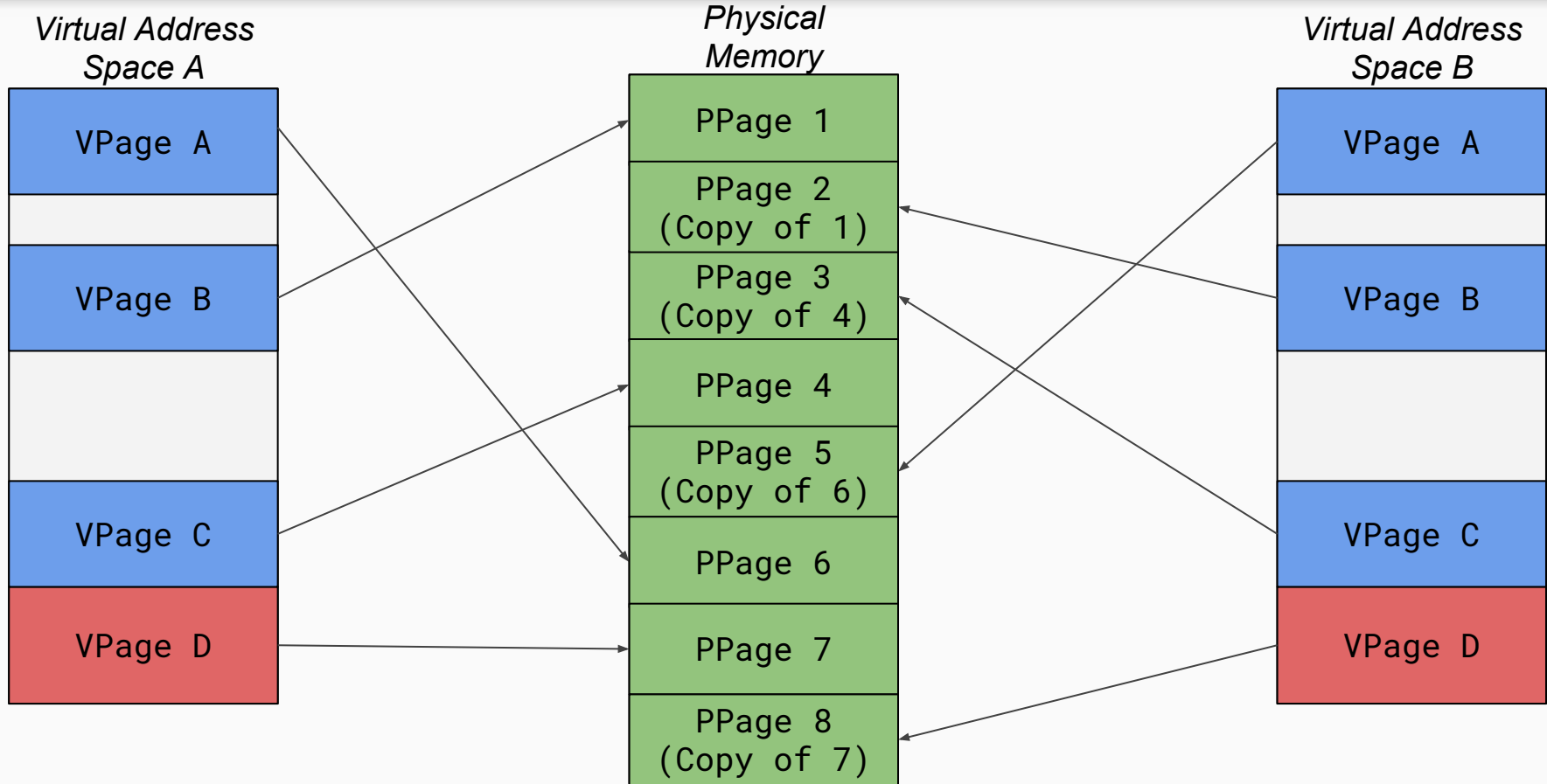
*Sometimes being lazy is the right thing to do*



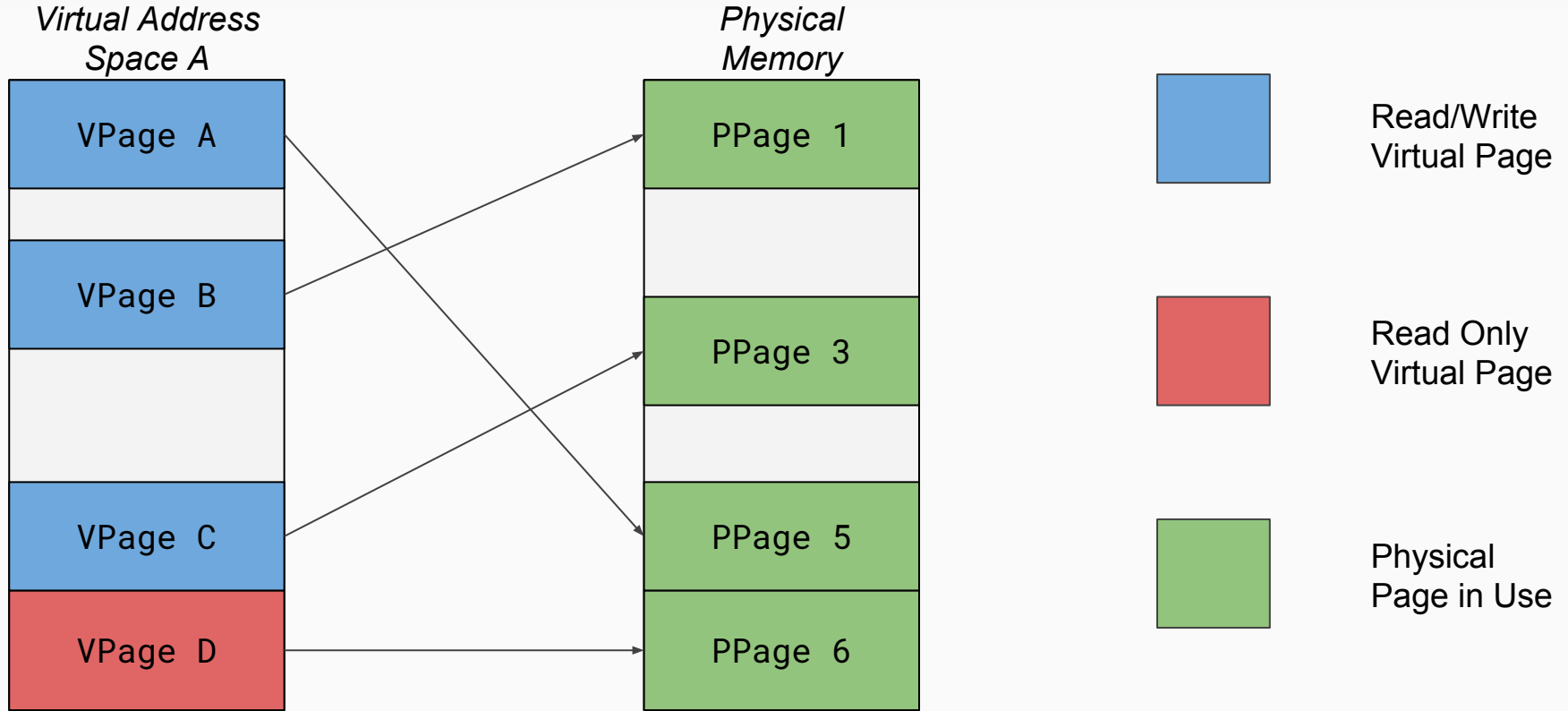
# Lab 4: Before dumbfork



# Lab 4: After dumbfork

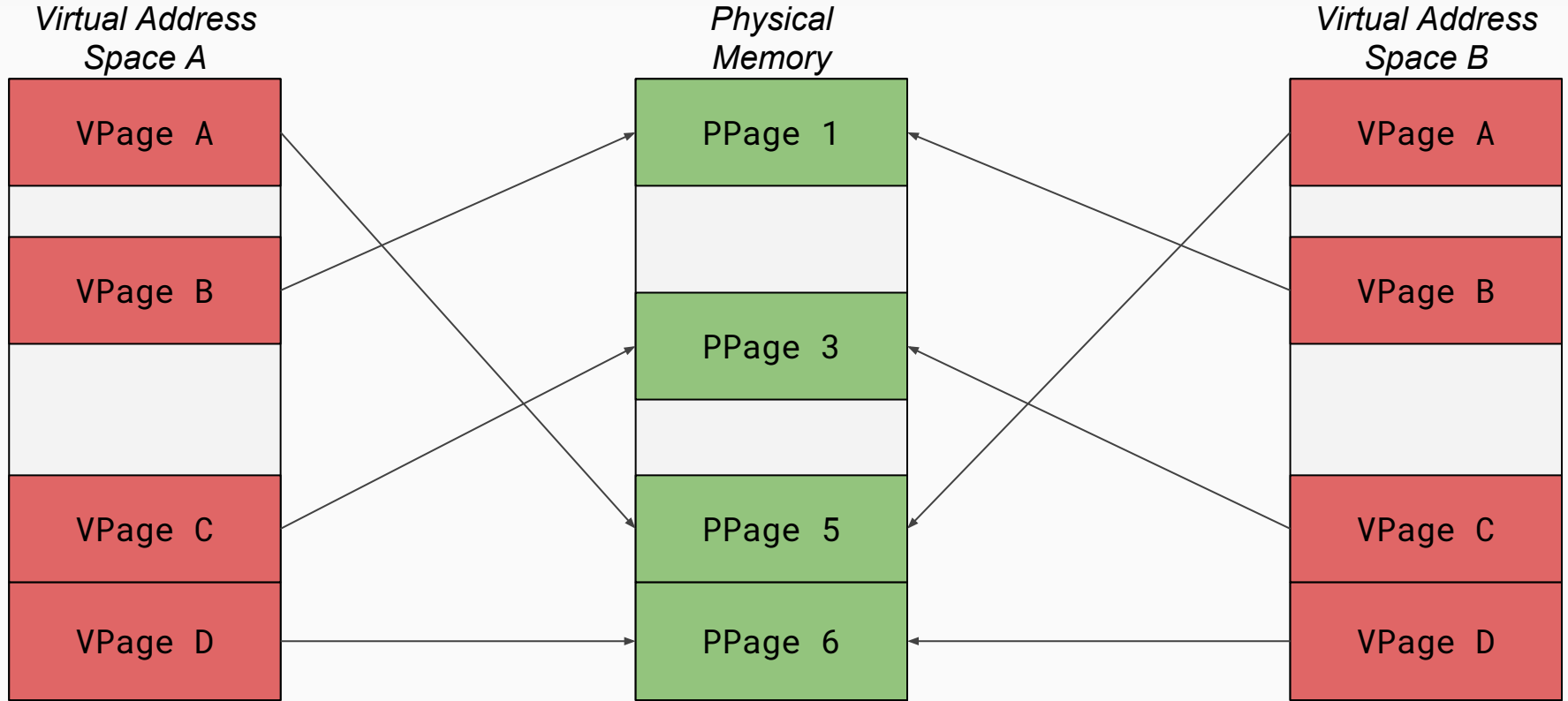


# COW Fork: before a copy-on-write fork()

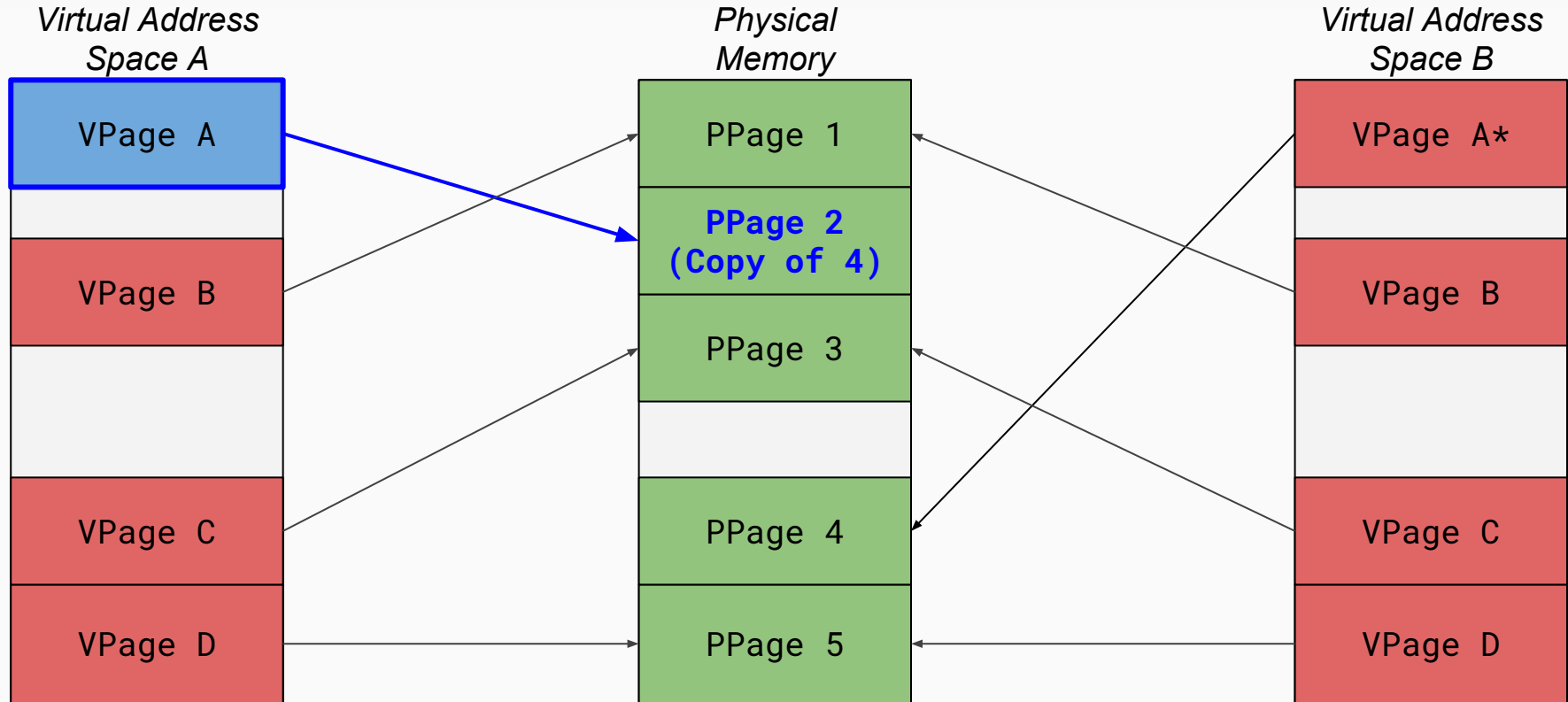




# COW Fork: after a copy-on-write fork()



# COW Fork: After Environment A writes to Virtual Page A



# COW Fork

- Use PTE\_COW to mark a page as a copy on write page (these pages must also be read only, no PTE\_W)
- Can/should we use COW semantics for all parts of the environment's address space?
  - User stack?
  - User exception stack?
  - User heap?
  - Kernel's space (above UTOP)?