

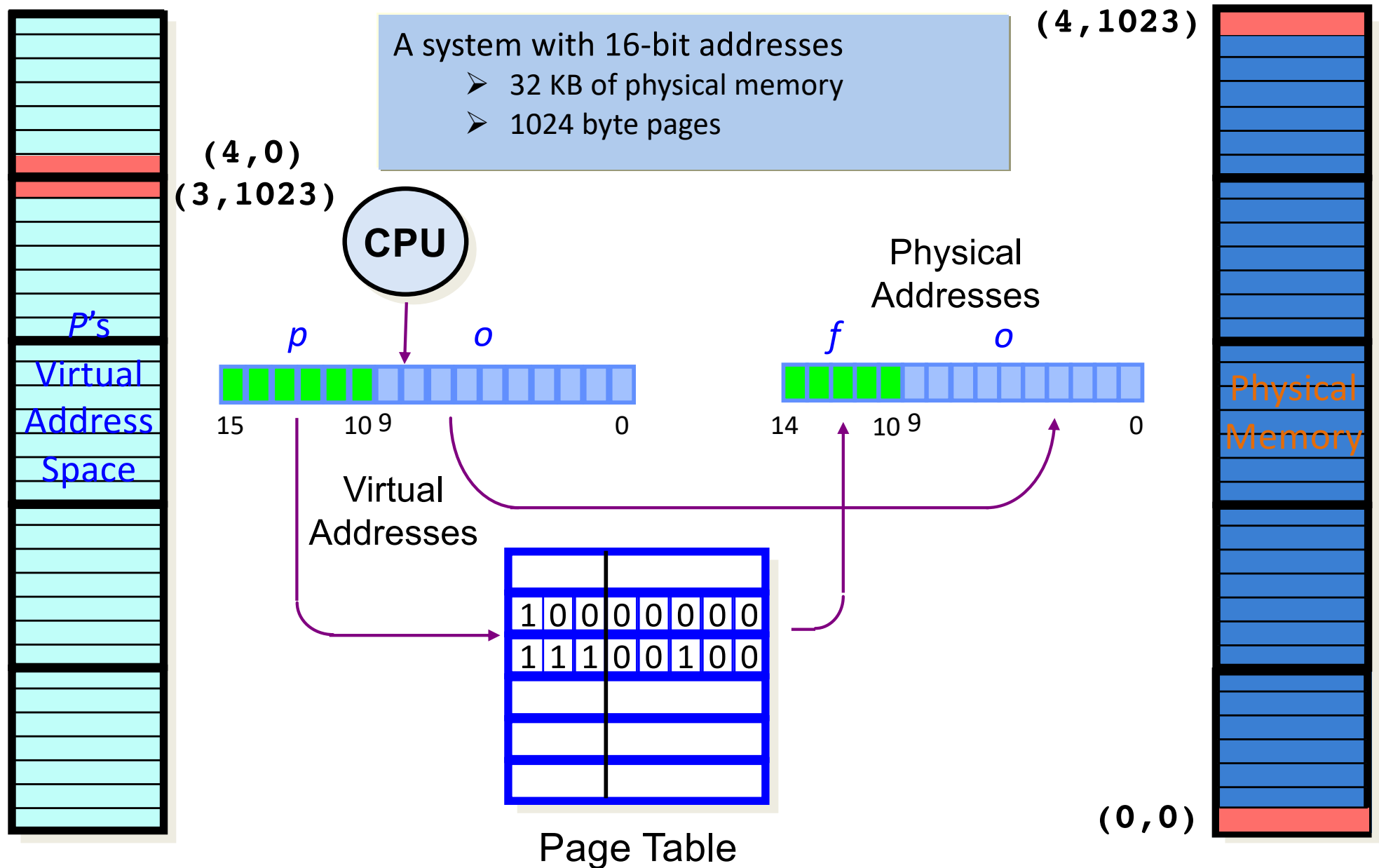
Virtual Memory: Policies

CS439: Principles of Computer Systems

Bringing It Together

- Processes are the OS's main abstraction for protection
- A process defines an address space---but this is a virtual/logical address space
- Virtual address spaces are mapped onto physical address spaces in physical memory
- All virtual addresses range from 0->max for that process
- *Paging* describes how the OS provides the illusion of infinite memory

Address Translation: Current Picture



Vocabulary

swap partition

multi-level page table

eviction

optimal page replacement

page fault

n-level page table

LRU page replacement

resident page

page replacement algorithm

inverted page table

second-level page table

first-level page table

demand paging

lazy loading

forward-mapped page table

hashed inverted page table

TLB

pre-paging

Page Replacement Algorithms: LRU

Least Recently Used

- Works well when the recent past is a good predictor of the future
- Throw out the page that has not been used in the longest time

Implementing LRU

Option 1: keep a time stamp for each page representing the last access

Problem: OS must record time stamp for each memory access and search all pages to find one to toss

Option 2: keep a list of pages, where the front of the list is the most recently used and the end is the least recently used. Move page to front on access. Doubly link the list.

Problem: Still too expensive, since OS must modify up to 6 pointers on memory access