Critical Regions

CS 447

Monday 3:30-5:00

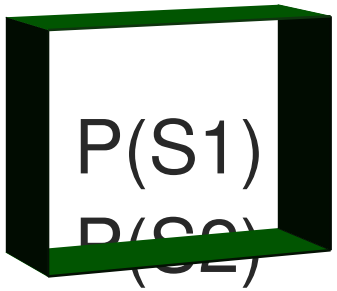
Tuesday 2:00-3:30

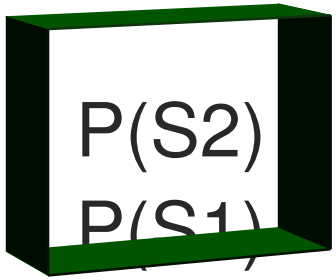
What are the drawbacks of the algorithmic solutions?

- i.e. solutions with shared variables and atomic read and write?
  - Scalability: No of processes is to be known statically
  - Busy wait
  - Responsibility of implementation is with user
- Pointers to OS-supported solution?

Care to be taken with Semaphores (drawbacks)

- User programs must still use P and V correctly
- A for
- gotten P, or a misplaced V
- Possibility of deadlocks-



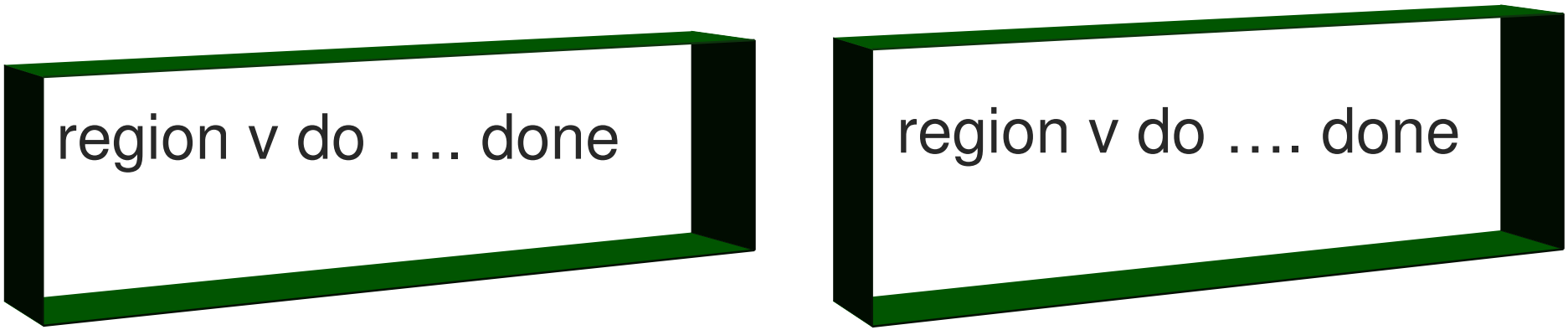


Better Higher level synchronization primitives?

- Critical Regions
- Conditional Critical Regions
- Monitors
  - These were supported in concurrent programming languages
  - Today's semaphore system calls allow monitor type synchronization as well

Critical Regions

Shared variable v

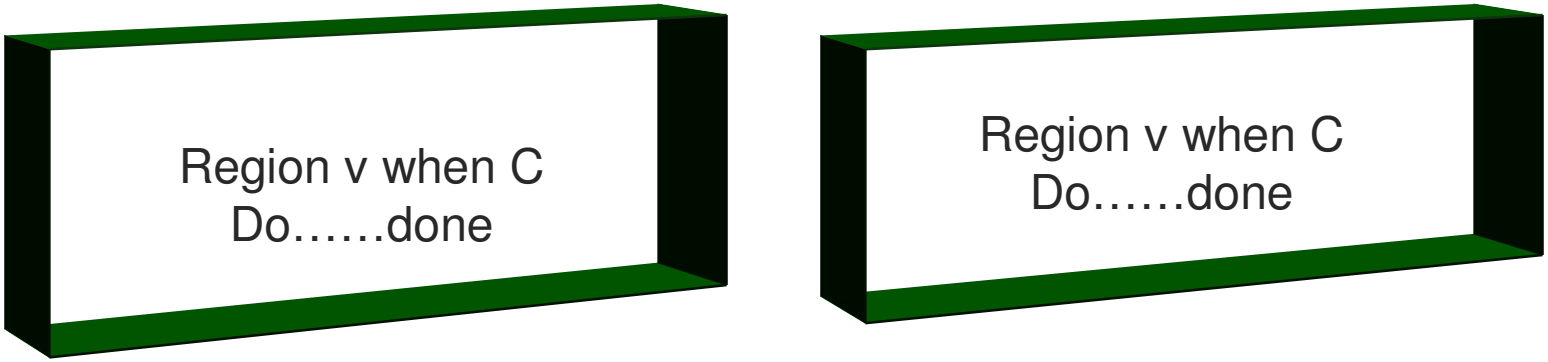


Producer-consumer code with CRs

- Producer:
  - While (true) region buff if (!full) produce done
- Consumer
  - While (true) region buff if (!empty) consume done

busy wait

Conditional Critical Regions



ability to block

Try the Producers and Consumers problem
With conditional critical regions

Producer-consumer code with CCRs

- Producer:
  - While (true) region buff when (!full) do produce done
- Consumer
  - While (true) region buff when (!empty) do consume done

Readings

- Hoare: Towards a theory of parallel programming, 1971
- Hansen: Structured multiprogramming, 1993