Graduate Operating Systems

Fall 2019

Working Set Model

- How much memory does a process need?
- Virtual memory & memory management
- Paging-in, paging-out
- Page replacement strategies
  - Metric: page traffic
  - Optimal
  - Random
  - FIFO
  - LRU
  - ATLAS Loop Detection
  - Belady: simple + “some” historical data
Working Set Model

- Reference string: 7,0,1,2,0,3,0,4,2,3,0,3,0,3,2,1,2,0,1,7,0,1

- Optimal
- FIFO
- LRU
Working Set Model

- Working set of information $W(t, \tau)$
- Working set size $\omega(t, \tau)$
- Properties of working set:
  - Size (Figure 3)
  - Prediction
  - Reentry rate
  - $\tau$-sensitivity
- $\tau$ too small/large

Working Set Model

- In-core & use bits (Figure 5)
- if $D > m \Rightarrow$ Thrashing
- Policy if $D > m$, then suspend or swap out one of the processes
Working Set Model

Paper “WSCLOCK”

- Local vs. global replacement policies
- Dirty bit
- CLOCK algorithm
- Task isolation: WS vs. CLOCK
Paper “WSCLOCK”