

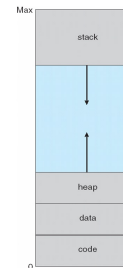
Graduate Operating Systems

Spring 2023

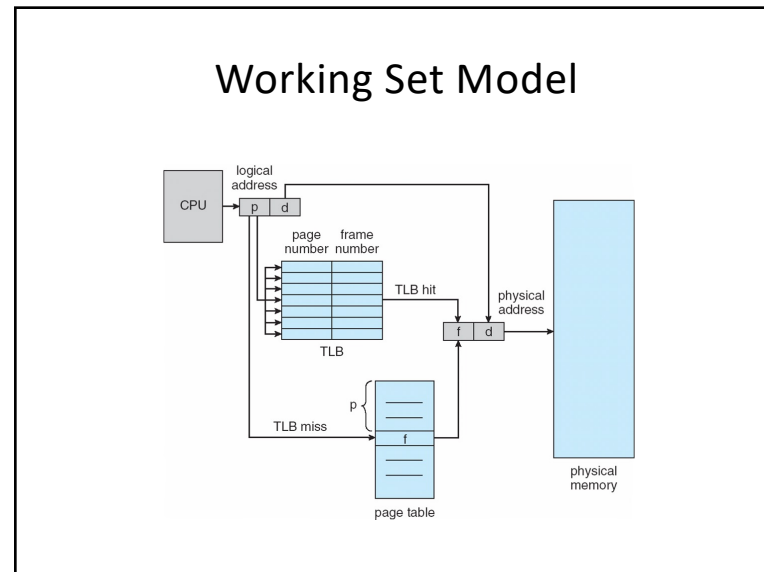
1

Working Set Model

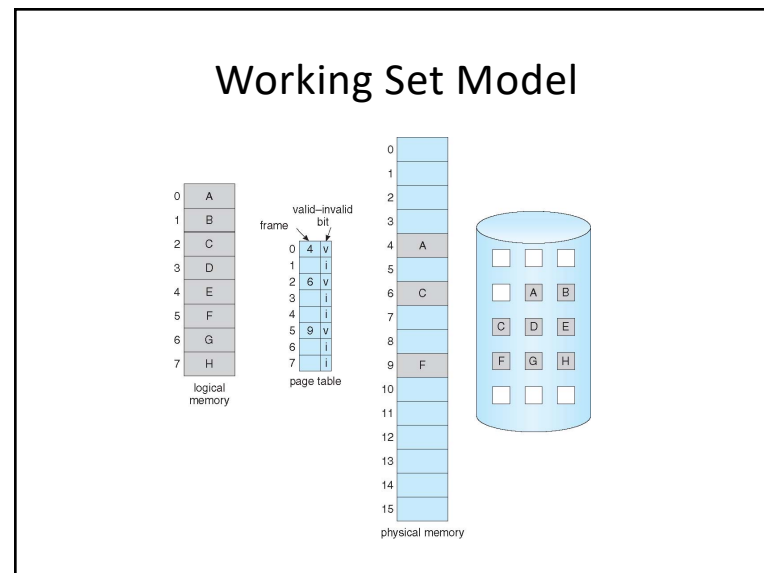
- How much memory does a process need?
- Virtual memory & memory management
- Paging-in, paging-out
- Page replacement strategies
 - Metric: page traffic
 - Optimal
 - Random
 - FIFO
 - LRU
 - ATLAS Loop Detection
 - Belady: simple + “some” historical data



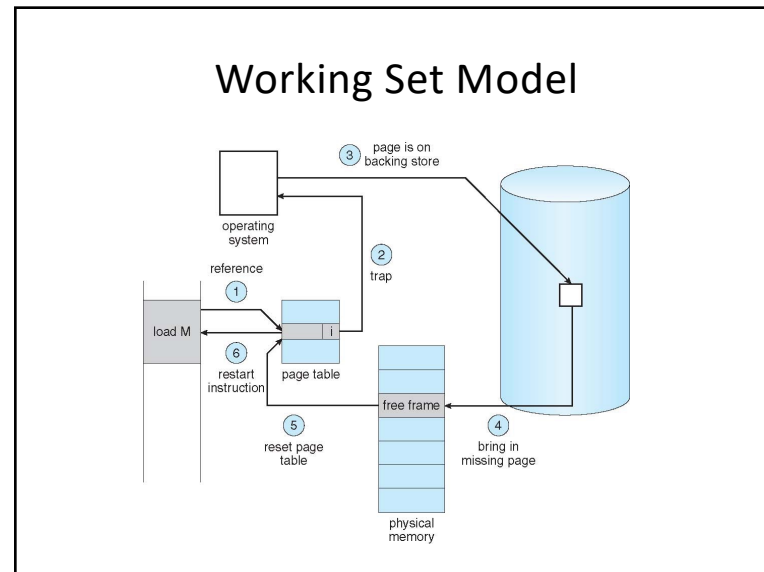
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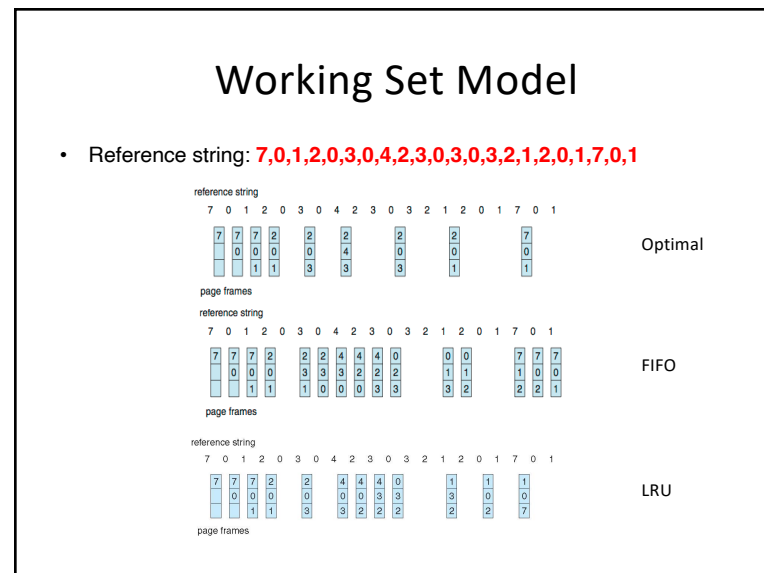
3



4



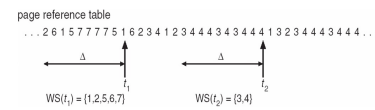
5



6

Working Set Model

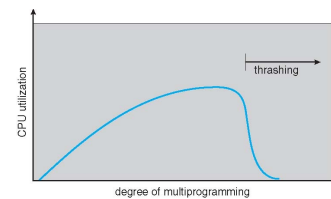
- Working set of information $W(t, \tau)$
- Working set size $\omega(t, \tau)$
- Properties of working set:
 - Size (Figure 3)
 - Prediction
 - Reentry rate
 - τ -sensitivity
- τ too small/large



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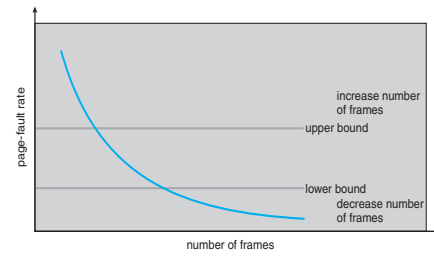
Working Set Model

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



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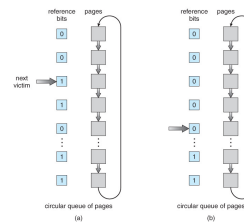
Working Set Model



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Paper "WSCLOCK"

- Local vs. global replacement policies
- Dirty bit
- CLOCK algorithm
- Task isolation: WS vs. CLOCK



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Paper "WSCLOCK"

