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CS:3620 Operating Systems
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Scheduling Policies

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What is a scheduling policy?

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- On context switch, which process to run next, from set of ready processes?

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- OS scheduler schedules the CPU requests (bursts) of processes
- CPU burst = the CPU time used by a process in a continuous stretch
- If a process comes back after I/O wait, it counts as a fresh CPU burst

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What are we trying to optimize?

- Maximize (utilization = fraction of time CPU is used)
- Minimize average (turnaround time = time from process arrival to completion)
- Minimize average (response time = time from process arrival to first scheduling)
- Fairness: all processes must be treated equally
- Minimize overhead: run process long enough to amortize cost of context switch (~1 microsecond)

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First-In-First-Out (FIFO)

- Example: three processes

arrive at $t=0$ in the order

A,B,C

- Problem: convoy effect
- Turnaround times tend to be high

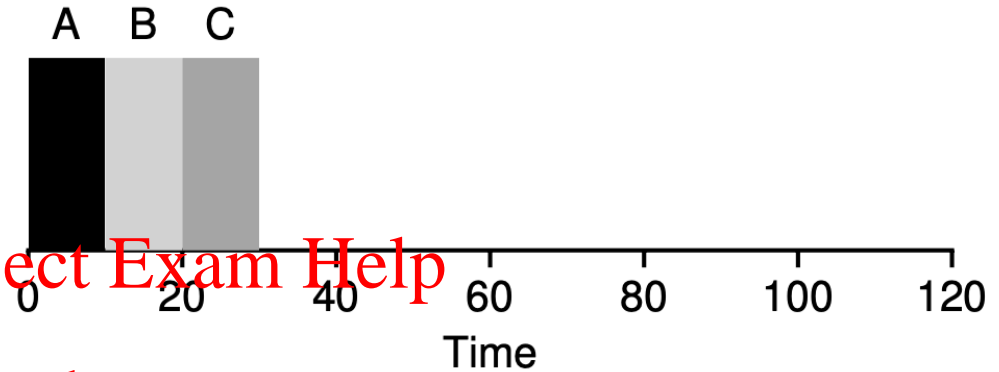


Figure 7.1: FIFO Simple Example

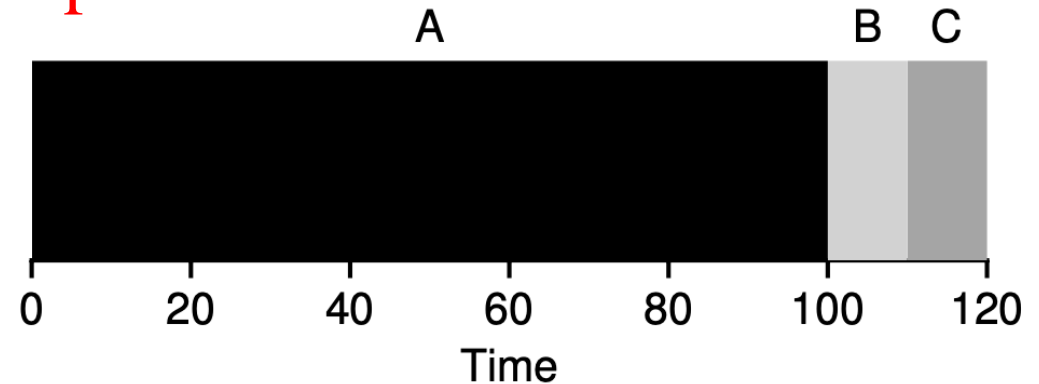


Figure 7.2: Why FIFO Is Not That Great

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Shortest Job First (SJF)

- Provably optimal when all processes arrive together.

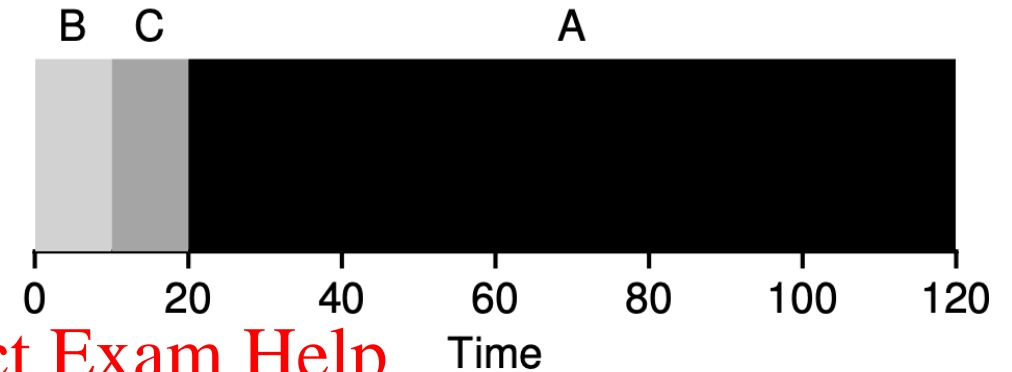


Figure 7.3: SJF Simple Example

- SJF is non-preemptive, so short jobs can still get stuck behind long ones.

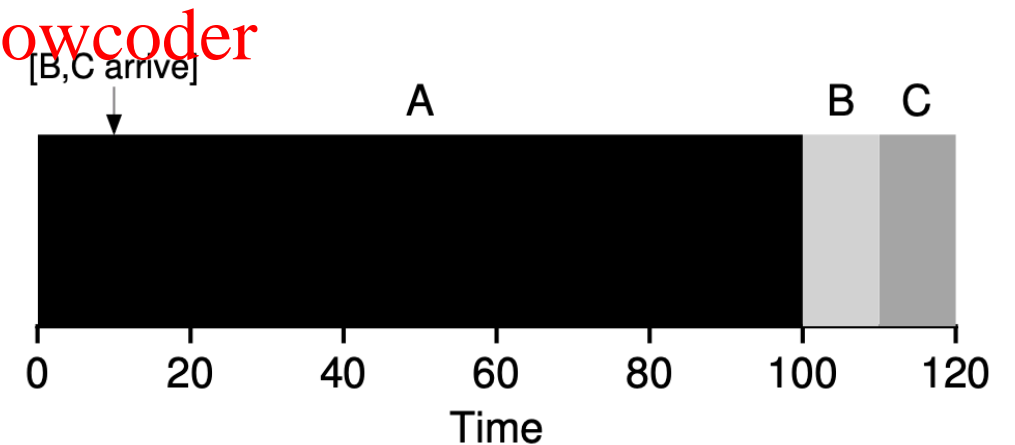


Figure 7.4: SJF With Late Arrivals From B and C

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Shortest Time-to-Completion First (STCF)

- Also called Shortest Remaining

Time First (SRTF)

- Preemptive scheduler
- Preempts running task if time

left is more than that of new
arrival

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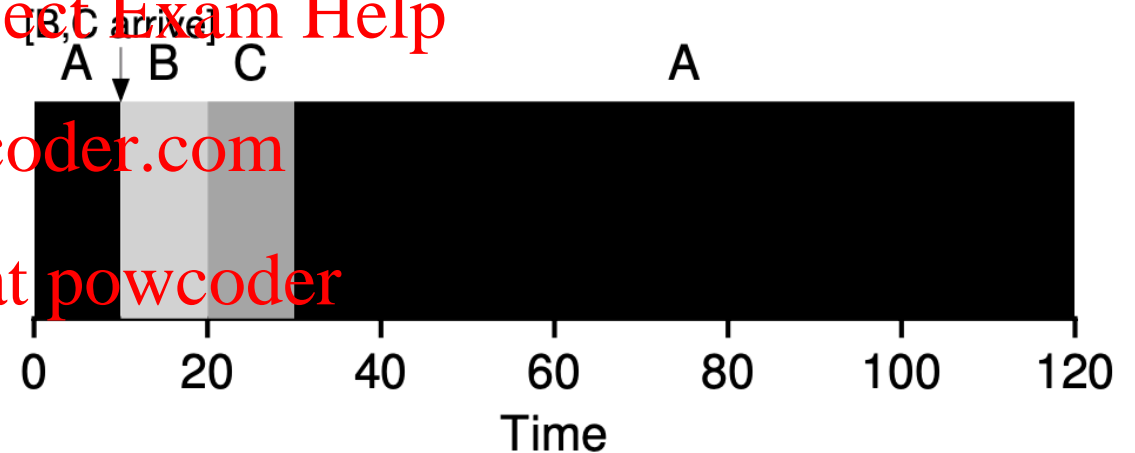


Figure 7.5: STCF Simple Example

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Round Robin (RR)

- Every process executes for a fixed quantum slice
- Slice big enough to amortize cost of context switch
- Preemptive
- Good for response time and fairness
- Bad for turnaround time

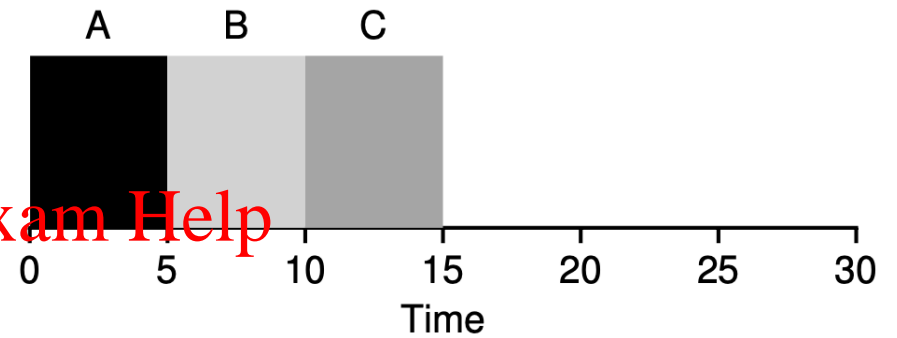


Figure 7.6: SJF Again (Bad for Response Time)

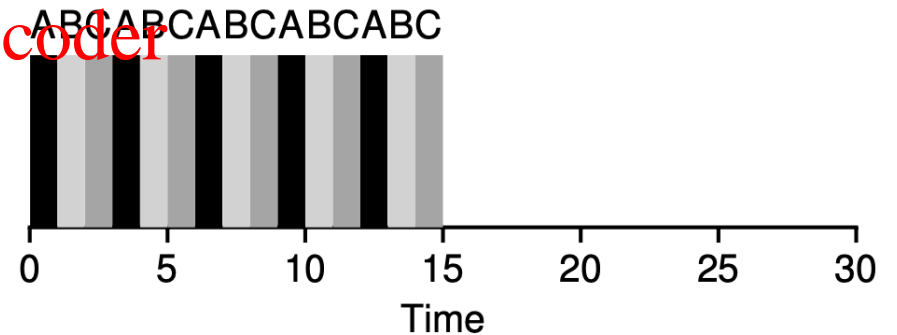
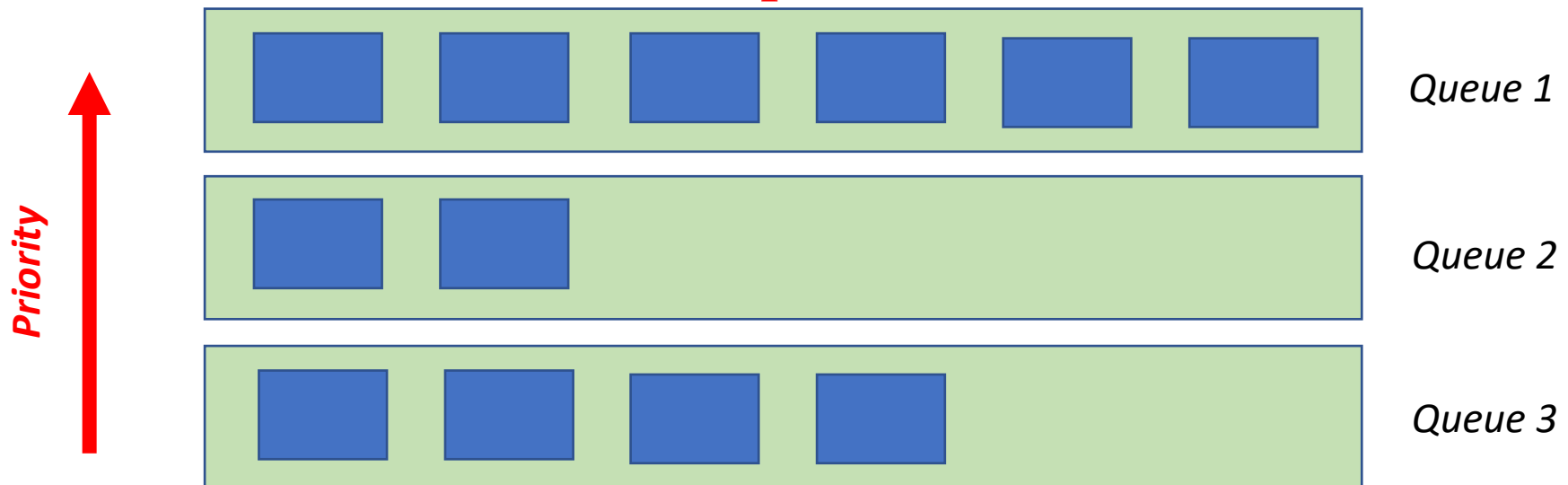


Figure 7.7: Round Robin (Good for Response Time)

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Schedulers in real systems

- Real schedulers are more complex
- For example, Linux uses a Multi Level Feedback Queue (MLFQ)
 - Many queues, in order of priority
 - Process from highest priority queue scheduled first
 - Within same priority, any algorithm like RR
 - Priority of process decays with its age



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Disclaimer

- *These lecture slides are based on a slide set by Youjip Won (Hanyang University) and Mythili Vutukuru (IIT Bombay)*

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