

# Uniprocessor Scheduling Algorithms

- **Relevant Data:** scheduler keeps tracks of the following values regarding processes.
  - **Waiting Time:** mean/median time process waits for a resource, or in scheduler.
  - **Running Time:** time a process was permitted to run by scheduler.
    - not necessarily the CPU usage time.
  - **Turnaround Time:** wall-clock duration of process execution.
- **Uniprocessor Scheduling Algorithms:**
  - **Highest-priority:**
    - Just a priority queue.
    - Very-low priority process may starve
      - Happens if every new process has a *higher priority* than the very-low priority tasks
  - **First-code, First-serve:**
    - FIFO Queue
    - Everyone gets chance to run - no starvation
    - *Average Turnaround Time* wildly varies
      - Messes with *scheduler statistics*, and *users*.
    - No interrupting on *CPU-bound* processes
    - *I/O-bound* processes halt system excessively
  - **Round-robin:**
    - FIFO Queue with Time-slicing
      - **Time-slicing:** an interrupt generated after  $t$  clock cycles as a prompt to scheduler
      - Track average time  $r$  after which process requests a resource
      - Assigning time-slice length  $t$  slightly longer than  $r$ .
    - *I/O-bound* process spent *multiple* time-slices just waiting.
    - **Virtual Round Robin:** Prevents I/O bound process' disadvantage. Maintains *main-queue*, *auxiliary-queue*
      - Processes from *main-queue* are executed.
      - A process requesting resource is sent to corresponding queue
      - Process continues with *higher* priority after resource arrival
        - Runs for  $t-r$  time.
  - **Shortest Process Next:**
    - Predict *turn-around* times, priority-queue by shortest *turn-around* times.
    - Reduces total *turn-around* times, improves *responsiveness*
  - **Shortest Job Next:**
    - Predict *CPU-burst* lengths, priority-queue by smallest *CPU-burst* length.
    - Prediction Methods:
      - **Average:**
        - calculate expected burst-length as:.
      - **Exponential Average:**
        - calculate the expected *burst-length* as.
        - $\alpha$  is a *constant* b/w 0 and 1.
    - New processes get an initial *prediction* score of 0, making them run immediately after current-burst.
    - Long-process might starve.
  - **Smallest Remaining Time:**
    - Modification of *Shortest-Job Next*
    - *New*, or *unblocked* processes can interrupt current-burst, or be prioritized appropriately.