

Speedup and Scheduling

CS 241

Oct. 4, 2013

Speedup

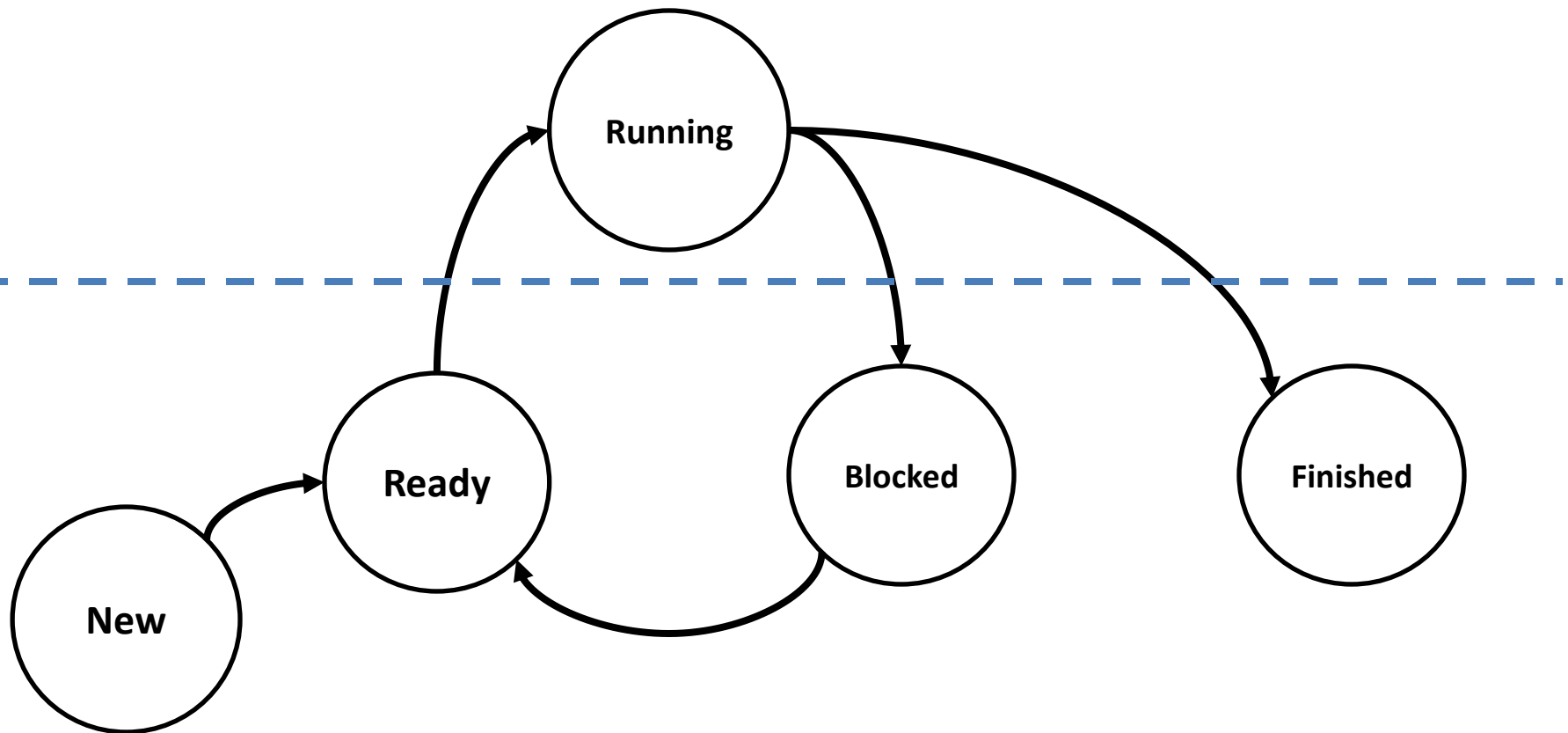
- One of the greatest advantages of parallelism is to speed up computation. We formally define this speedup as:
$$S_P = \frac{T_1}{T_P}$$

- **P**: The number of processors
- **S_p**: The speedup for a given number of processors
- **T₁**: The execution time of a sequential algorithm
- **T_p**: The execution time of a parallel algorithm on P processors

- **Ideal Speedup:**

Scheduling

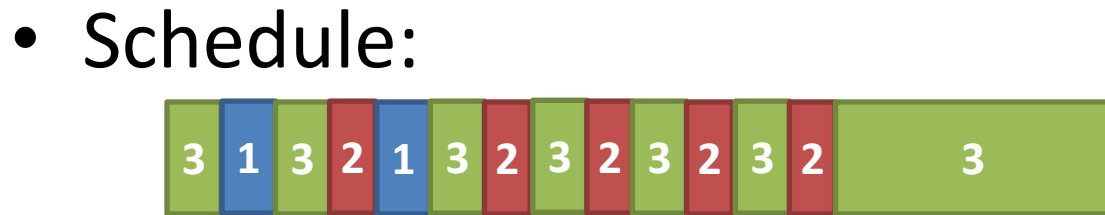
- When do we need scheduling?



Scheduling

- Basic scheduling decision:

High-Level Scheduling Example



Scheduling Goals

- Throughput:
- Latency:
- Fairness:

Quantitative Metrics

- Waiting Time:
- Turnaround Time:
- Response Time:


FCFS: First Come First Serve

- FCFS: Schedule tasks in the order they arrived at the scheduler.

Process	Duration	Priority	Arrival Time
P1	24	2	3
P2	3	6	0
P3	4	3	7

Schedule:

Time: 0



Process	Waiting Time	Turnaround	Response
P1			
P2			
P3			
Average:			

SJF: Shortest Job First

- SJF: Scheduling the job with the shortest running time first (non-preemptive).

Process	Duration	Priority	Arrival	Waiting Time	Turnaround Time	Response Time
P1	6	2	0			
P2	8	6	0			
P3	7	3	0			
P4	3	5	0			

Schedule:

Time: 0



PRI: Fixed Priority Scheduling

- PRI: Schedule the job with the highest priority first. (*Low number → Higher priority*)

Process	Duration	Priority	Arrival	Waiting Time	Turnaround Time	Response Time
P1	6	2	0			
P2	8	6	0			
P3	7	3	0			
P4	3	5	0			

Schedule:

Time: 0



Scheduling Example

- Initially, two processes in the scheduler:
 - **P1**(duration = **4**, priority = **1**, arrival = **0**)
 - **P2**(duration = **100**, priority = **100**, arrival = **0**)
- Every three seconds, a new process arrives:
 - **P_x**(duration = **4**, priority = **1**, arrival = **0**)
- **FCFS:**
- **SJF:**
- **PRI:**

Starvation

- A scheduling algorithm may cause **starvation** if, for any job, it cannot guarantee that the job will run within a finite amount of time.
 - This is not **deadlock**!

Advantages / Disadvantages

- FCFS:

- SJF:

- PRI: