Lecture 6

CPU Scheduling

16 September, 2011
batch
vs.
interactive
vs.
real-time
CPU-bound vs. I/O-bound
pre-emptive vs. non pre-emptive
(process states)
(CPU states)
CPU Utilization
Throughput
Response Time
Turnaround Time
Fairness
Balance

C  B  C  B  C  A  B  A  B  A
Scheduling Algorithms
FCFS (non-preemptive)
Round Robin
(preemptive)
Long Time Quantum

VS.

Short Time Quantum
Time Quantum
20 - 50ms
Shortest Job First
(non-preemptive)
Shortest Remaining Time First
(preemptive)
Estimating Remaining Time
Priority Scheduling (preemptive)
Static vs. Dynamic Priority
Guidelines
for
Good Schedulers
1. interactive jobs should have higher priority than CPU bound jobs
2. CPU intensive jobs should be given larger time quantum
3.
round robin is good for response time but bad for turnaround time
4. shortest job first reduces the turnaround time
(how to know if a job is interactive? remaining time on the job?)
Multilevel Feedback Queue
new

ready
join highest level queue

join lower level but higher quanta

running

stay at same/higher level

new

blocked

exit
interactive jobs remains on top

CPU intensive jobs sink to bottom
1. interactive jobs should have higher priority than CPU bound jobs
2. CPU intensive jobs should have be given larger time quantum
3. round robin is good for response time but bad for turnaround time
4. shortest job first reduces the turnaround time
Linux Scheduler

Active

Expired

139

1

0

1

139

139
move to expired list and recompute priority

join active list at default priority

stay in active list at same priority

move to expired list and recompute priority

join active list at default priority

stay in active list at same priority
Linux Static Priority

"real time" jobs

default priority 120

user jobs
Linux Static Priority

“real time” jobs

user jobs

nice

time quantum

800ms

5ms

0

99

139

-20

+19
Linux Dynamic Priority

sleep time - run time

-5

+5
Swap Active <-> Expired

Active

\[
\begin{array}{c}
0 \\
1 \\
\vdots \\
139 \\
\end{array}
\]

Expired

\[
\begin{array}{c}
0 \\
1 \\
\vdots \\
139 \\
\end{array}
\]