CPU schedule
Algorithms & metrics

• What are important metrics in CPU scheduling?

• What scheduling algorithms do you know?
Fair Share Schedule
Another metric: fair share

• How to make sure P1 gets exactly K-times the execution time of P2

• How to enforce the fair share in a dynamic and modular way
  • Adjustable at run time
  • Alice’s decision shouldn’t affect Bob’s processes’ behavior
Naïve solutions

• Adjust the time slice length
  • Problem: can lead to unreasonable slice length

• Adjust the number of process instances in the ready queue
  • Problem: ...
Lottery schedule

• Every process gets x lottery tickets
  • X is determined by the “fair share”
• Scheduler runs lottery; the process holding the winning number runs
• Example
Lottery schedule – ticket exchange rate

• Base tickets
• Regional tickets
• ➔ ensure dynamic and modular management
• Example
Is lottery schedule perfect?

• No!
  • ...
  • ...
Before we move on ...
Stride schedule

• Motivation
  • How to make lottery schedule deterministic?

• Algorithm
  • Every process has a stride and a start time
  • Every time a process is scheduled, it progresses its stride
  • The scheduler picks the least-progressed process to run

• Example
Linux Complete Fair Scheduler

• Which process to run?
  • Similar with stride scheduling
  • “Nice” level decides the stride length

• What is the time slice?
  • Vary based on the number of ready processes, etc.

• An efficient scheduler is VERY important these days
Resource Containers
Background

• .com bubble
• Web!
• Dynamic web content
Goal

• How to do accurate resource accounting
The evolution of web server systems

Fig. 2: A single-process event-driven server.

Fig. 3: A single-process multi-threaded server.
What should be the accounting unit?