Administrivia
• Project 2 is due on September 30
• Project 2 is due on September 30
• Ground Truth
First Hint
First Hint

Fix Project 1 Bugs!!!
Purpose
Purpose

• Made a major assumption in Project 1…
Purpose

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• Threads behave nicely and give up the CPU
Purpose

• Made a major assumption in Project 1…
  • Threads behave nicely and give up the CPU
  • Issues?
Purpose

• Made a major assumption in Project 1…
  • Threads behave nicely and give up the CPU
  • Issues?
    • Selfish Threads
Purpose

• Made a major assumption in Project 1…
  • Threads behave nicely and give up the CPU
  • Issues?
    • Selfish Threads
    • Potential Security risks
The Three Parts
The Three Parts

• Specs say 5…
The Three Parts

• Specs say 5…

• Start Receiving Clock Interrupts
The Three Parts

• Specs say 5…
  • Start Receiving Clock Interrupts
  • Add Alarms
The Three Parts

• Specs say 5…
  • Start Receiving Clock Interrupts
  • Add Alarms
    • Makes Thread Sleeping Possible
The Three Parts

- Specs say 5…
  - Start Receiving Clock Interrupts
  - Add Alarms
    - Makes Thread Sleeping Possible
  - Why do we care?
The Three Parts

• Specs say 5…
  • Start Receiving Clock Interrupts
  • Add Alarms
    • Makes Thread Sleeping Possible
    • Why do we care?
  • Multilevel feedback queue scheduler
Receiving Clock Interrupts
Receiving Clock Interrupts

• KISS: Keep It Simple Student!
Receiving Clock Interrupts

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• Difference between:
Receiving Clock Interrupts

• KISS: Keep It Simple Student!

• Difference between:
  • Testing/Coding
Receiving Clock Interrupts

• KISS: Keep It Simple Student!

• Difference between:
  • Testing/Coding
  • Final Product
Receiving Clock Interrupts

- KISS: Keep It Simple Student!

- Difference between:
  - Testing/Coding
  - Final Product
  - Changing Clock Period, Print Statements, etc.
Alarms
Alarms

• Performance matters!
• Performance matters!

• How long does it take to find an element in your Project 1 queue?
Alarms

• Performance matters!

• How long does it take to find an element in your Project 1 queue?

• Is that good enough?
Scheduling

• Let’s take stock of where we are…
Scheduling

• Let’s take stock of where we are...
  • You have an OS
Scheduling

• Let’s take stock of where we are…
  • You have an OS
  • Many Threads are Running
Scheduling

• Let’s take stock of where we are…
  • You have an OS
  • Many Threads are Running
  • Now forcing them to give up the CPU
Scheduling

• Let’s take stock of where we are…
  • You have an OS
  • Many Threads are Running
  • Now forcing them to give up the CPU
  • How do we pick who’s next?
Round Robin
Round Robin
Round Robin

1 2
Round Robin
Round Robin

1  2  3  4
Round Robin
Round Robin
Round Robin
Round Robin
Round Robin
Round Robin
Round Robin
Round Robin
Multilevel Queue

Highest

Lowest
Multilevel Queue

Round Robin

Highest

Lowest
Multilevel Queue

- Round Robin
- Round Robin

Highest

Lowest
Multilevel Queue

- Round Robin
- Round Robin
- Round Robin

Highest

Lowest
Multilevel Queue

Round Robin

Round Robin

Round Robin

Round Robin

Highest

Lowest
Multilevel Queue

1. Round Robin
2. Round Robin
3. Round Robin

Highest
Lowest
Multilevel Queue

Round Robin

Round Robin

Round Robin

Round Robin

Highest

Lowest
Multilevel Queue

Round Robin

Round Robin

Round Robin

Round Robin

Highest

Lowest
Multilevel Queue

- Round Robin
- Round Robin
- Round Robin
- Round Robin

Highest
Lowest
GDB (Gnu DeBugger)

Demo
GDB (Gnu DeBugger)
GDB (Gnu DeBugger)

• Many good guides out there for GDB!
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• Here’s a good one that’s pretty short:
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