Lecture 9

CprE 308

January 31, 2013

Intro

Today's Topics

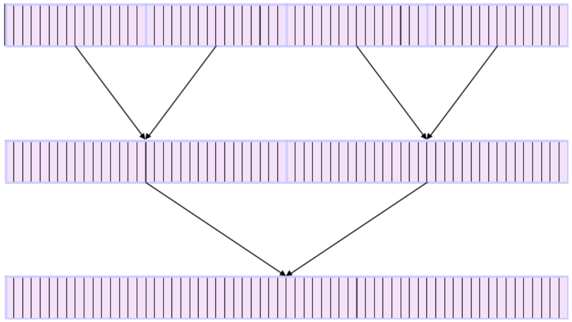
- Threads
  - Why?
  - How?

Threads

The need for Threads

- Think Performance
  - High performance web server
  - Web Browser
- Not able to (easily) overlap I/O and computation in a single process

Parallel Merge Sort



Threads

- Multiple “threads” of control within a single process
- Threads share process address space

Why not multiple processes?

- Process creation expensive

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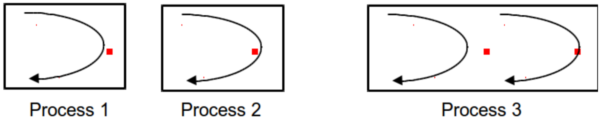
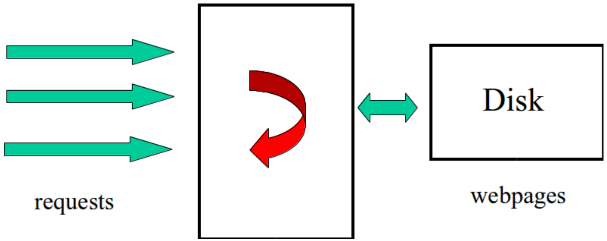
- Process creation expensive
- Each process needs memory, lots of state
- We don’t need all that. . .

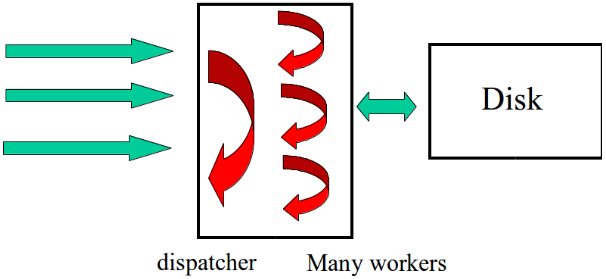
Process vs. Threads



Single Threaded Web Server



Multi Threaded Web Server



Pseudocode with Threads

Dispatcher

```
while(1) {
  get_request(&req);
  start_new_worker(req);
}
```

Worker

```
Worker_thread(req) {
  fetch_webpage(req,&page);
  return_page(req,page);
}
```

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- Multiple threads in the same address space
- Each thread has its own stack, registers, program counter
- All threads within a process share the same text (code) and data segment

Process vs Threads

- Creating a new thread 100 times cheaper than creating a new process
- Switching between two threads also chaper
- Thread = “Lightweight process”

The Thread Model

Per process Items	Per thread items
Address space	Program counter
Global variables	Registers
Open files	Stack
Child processes	State
Pending alarms	
Signals and signal handlers	
Accounting information	