Outline

• MP5
• Mutexes, Semaphores, and Conditional Variables!
MP5
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- This MP is simple:
  - Create a ‘make’ utility.
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• This MP is simple:
  – Create a ‘make’ utility.

• What does ‘make’ do?
  – Reads a ‘makefile’
  – Determines the tasks that available to run based on dependency rules
  – Run until all tasks are finished
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job1: job2 job3
  commandtoberun withargs
  commandtoberun2 withargs

job2:
  othercommand

job3:
  finalcommand
key

job1: job2 job3
commandtoberun withargs
commandtoberun2 withargs

job2:
othercommand

job3:
finalcommand
job1: job2 job3
command to be run with args
command to be run 2 with args

job2:
other command

job3:
final command
MP5

job1: job2 job3

command to be run with args
command to be run 2 with args

job2:

other command

job3:

final command

commands
• We can show this graphically:

...job1 depends on job2 and job3 being done.
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• In MP5, you will specify (with the –j# option) how many worker threads should run.
  – “-j1”: Only one worker thread
  – “-j2”: Two worker threads
  – “-j100”: One hundred worker threads
If the makefile is ran with –j2, then:

[thread a]: job2 runs
[thread b]: job3 runs
[thread b]: job3 finishes
[thread b]: idle, job1 not ready
[thread a]: job2 finishes
[thread a OR b]: job1 runs
[thread a OR b]: job1 finishes
[thread a AND b]: exit, all jobs done
[main thread]: join threads, exit
We provide you some tools you can use, if you’d like:

– **queue.c**: A queue data structure

– **parser.c**: A parser for makefiles
  
  • `parser_parse_makefile(...)` takes function pointers as arguments that will be called when it reaches a key, dependency, or command.
MP5 Parser Callbacks

parsed_new_key(key=job1)
parsed_dependency(key=job1, dep=job2)
parsed_dependency(key=job1, dep=job3)
parsed_command(key=job1, command=...)
parsed_command(key=job1, command=...)
parsed_command(key=job1, command=...)
parsed_new_key(key=job2)
parsed_command(key=job2, command=...)
parsed_new_key(key=job3)
parsed_command(key=job3, command=...)


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• Some useful functions:
  – pthread_create(), pthread_join()
  – sem_init(), sem_wait(), sem_post(), sem_destroy()
  – system()
    • Does fork(), exec(), and wait() for you in one command!

• Remember to check return values! You may find some weird things going on with semaphores if you don’t... Good luck!
Coding Examples

• This week:
  ds/ds7/