CS 241 Section (03/15/2012)

MP6

- 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 are 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
```

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target

```
job1: job2 job3
      commandtoberun withargs
      commandtoberun2 withargs
job2:
      othercommand
job3:
      finalcommand
```

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dependencies

```
job1: job2 job3
      commandtoberun withargs
      commandtoberun2 withargs
job2:
      othercommand
job3:
      finalcommand
```

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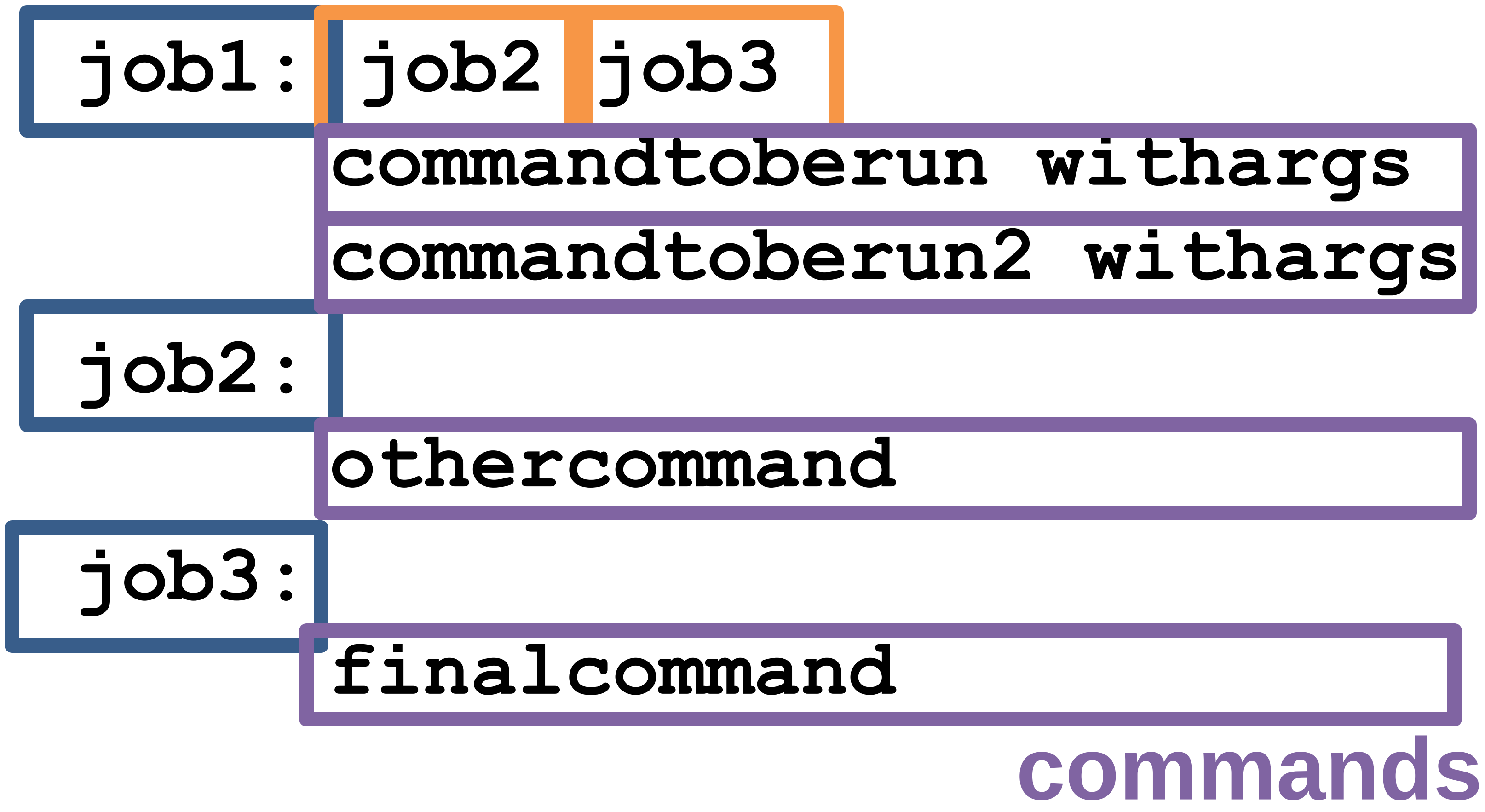

```
job1: job2 job3
commandtoberun withargs
commandtoberun2 withargs
job2:
othercommand
job3:
finalcommand
```

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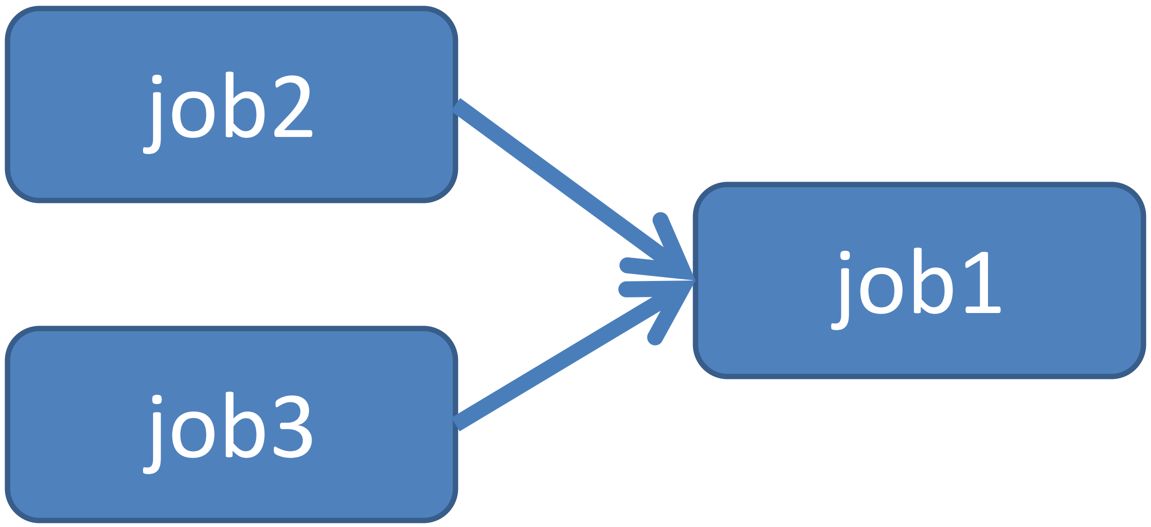
- We can show this graphically:



…job1 depends on job2 and job3 being done.

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- In MP6, you will specify (with the –j # option) how many worker threads should run.
  - “-j 1”: Only one worker thread
  - “-j 2”: Two worker threads
  - “-j 100”: One hundred worker threads

- Use getopt() to handle command-line options

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- If the makefile is ran with –j 2, 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

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- 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.

MP6 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_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!

MP6

- Run a rule only if any dependency has a modification time more recent than the target.

- You can get the modification time of a file using stat()

Coding Examples

- This week:
  ds/ds6/