Additional Coordination Constructs

Barrier, Single, and Master Directives
Parallel Sections

• Provide another way of creating a team of threads
  • In addition to construct parallel or parallel for
• From the Openmp 4.5 standard:

```c
#pragma omp sections [clause [ , ] clause] ... ] new-line
{
  [/pragma omp section new-line]
  structured-block
  [/pragma omp section new-line]
  structured-block
  ...
}
```

• Independent different pieces of code assigned to different threads
• (BTW: openmp standard is the (semi-)final arbiter
  • [http://www.openmp.org/specifications/](http://www.openmp.org/specifications/)
  • Final arbiter is of course your compiler ... hopefully it implements the latest standard ... check always
**barrier** Construct: Making Everyone Wait

- This can be thought of as an event synchronization construct

  ```
  #pragma omp barrier
  ```

- No thread can pass the barrier directive unless all threads (in the current team) have arrived at it

- The programmer must take care to ensure all threads (in the team) encounter this statement or none of them do, for every execution of the program
The **master** Construct

• In a parallel region, sometimes you want some action to be done only by the master thread
  • The parallel region may be a “parallel for” or a “parallel” construct, for example

• Syntax:  
  ```
  #pragma omp master
  structured_block
  ```

• The master thread executes the `structured_block`, while

• All the other threads pass past it
  • I.e., they do not execute the `structured_block` nor do they wait for the master thread to execute it
The **single** Construct

• Similar in spirit to the master construct

• In a parallel region, sometimes you want some action to be done only by a single thread
  • It doesn't matter which thread executes it

• Syntax: `#pragma omp single structured_block`

• The first thread to arrive at this directive executes the `structured_block`, while

• All the other threads pass past it
  • I.e., they do not execute the `structured_block` nor do they wait for execution of this `structured_block` by the first thread