Chapel: Hands-on

Morning Hands-on Session

Goals:

- Get everyone up and running with Chapel
- Try out base language and data parallel features

What can I do?

- Work through prepared Monte Carlo exercises
- Read and execute sample programs ($CHPL_HOME/examples)
- Write your own Chapel program of interest

Please feel free to:

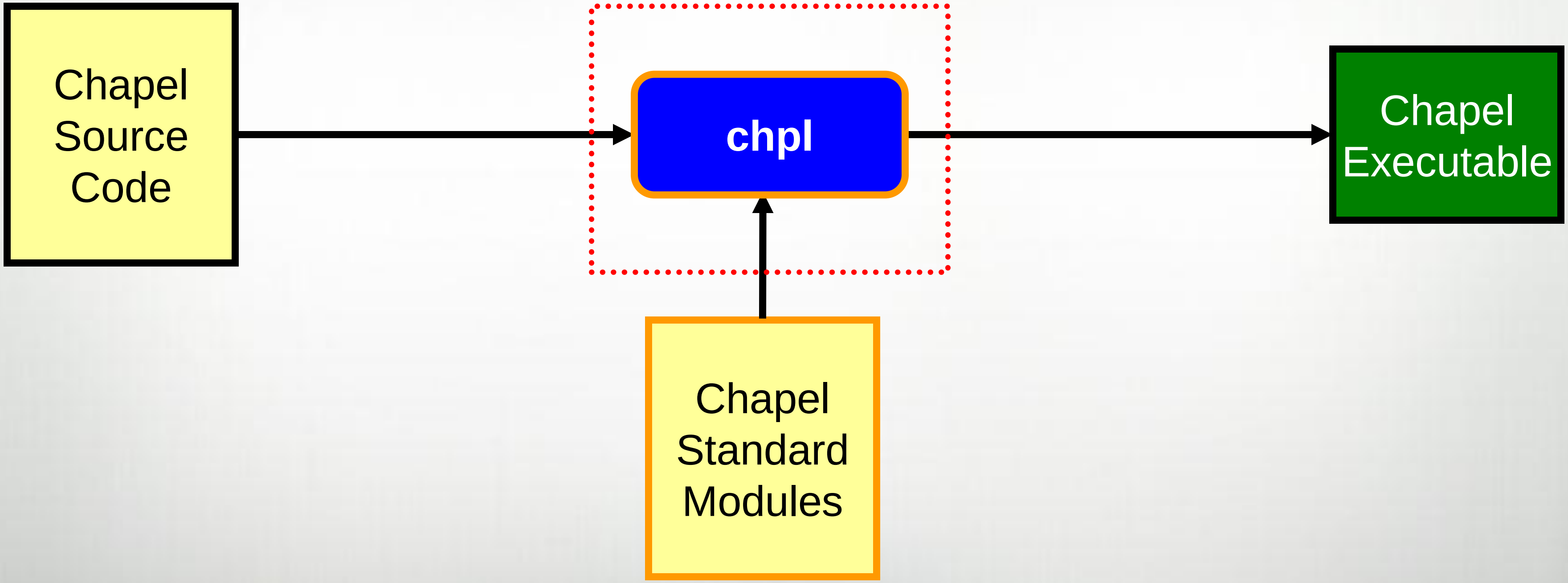
- Work with a partner
- Ask questions/talk with the team

Handouts For the Hands-On Sessions

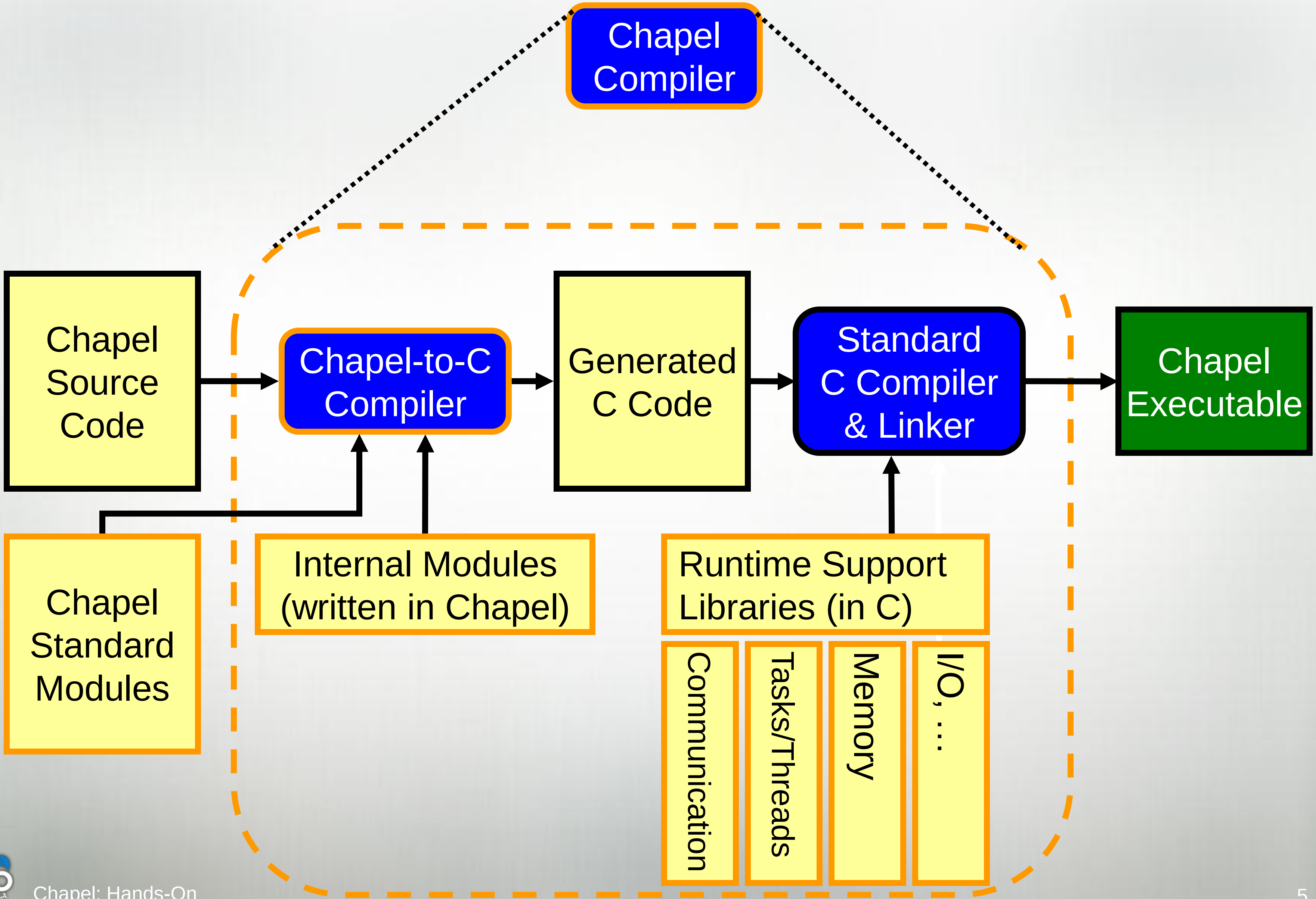
1. A Chapel Quick Reference Sheet
    - Provides a succinct overview of the language

2. A prepared set of programming exercises

Compiling Chapel



Chapel Compiler Architecture



Chapel Directory Structure (Partial)

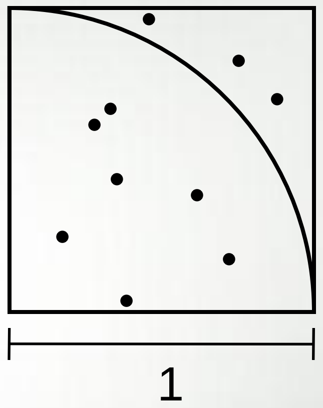
```
chapel-1.2.0/
  chapel/      – $CHPL_HOME refers to this directory
    README     – quick-start instructions for building & using chpl
               – also contains pointers to key documentation
    doc/       – language spec, READMEs, quick reference
    examples/ – sample codes written in Chapel
    man/       – man page for chpl
    README.files  – complete directory structure description
    bin/       – location of the Chapel compiler
    lib/       – location of the Chapel runtime libraries
    modules/– location of the Chapel standard/internal modules
```

Monte Carlo Exercise

Goal: Estimate π using a Monte Carlo method

Technique:

- Generate *n* random points in unit square
- Count how many fall in quadrant of unit circle
- Use ratio of *count*/*n* to estimate ratio of areas



$$count\ /\ n \approx (\pi \cdot r^2/4)\ /\ r^2$$

$$7/10 \approx \pi/4$$

$$\Rightarrow \quad \pi \approx 2.8$$

Five variations:

1. serial
2. data parallel

morning hands-on

3. task parallel
4. multi-locale task parallel
5. multi-locale data parallel

afternoon hands-on

Using Chapel Today

1. Install your own version of Chapel…

   …on a laptop

   - Linux/UNIX
   - Mac OS X
   - Windows if you have Cygwin installed (but it tends to be slow)

   …or by ssh-ing to a remote Linux/UNIX-based system

2. Or use a pre-installed version on a CX-1000™

   - we have ten accounts with Chapel pre-installed
   - requires ability to **ssh** to an external machine
   - also requires comfort with **vim** or **gedit** (no **emacs** support)

Again, feel free to partner with someone if desired

Q&A

Q: Where do I get the Chapel release?

A: From your Cray USB stick or http://sourceforge.net/projects/chapel/; after unpacking, start with the top-level README

Q: Where do I get the Monte Carlo exercise?

A: From the handout, your USB stick, or http://chapel.cray.com/tutorials/SC10

Q: Where can I get the final tutorial slides?

A: On your Cray USB stick -- the version from SC10 is an earlier draft

Q: Where can I get more documentation on the language?

A1: $CHPL_HOME/doc/chapelLanguageSpec.pdf or http://chapel.cray.com/spec/spec-0.796.pdf

A2: See also the quick reference handout (also in $CHPL_HOME/doc/)

Q: Where can I get more documentation on the compiler itself?

A: (1) chpl –help; (2) man chpl; (3) $CHPL_HOME/doc/README.compiling

Executing Multi-Locale Programs

- By default, Chapel compiles for a single locale
  - environment variable CHPL_COMM defaults to ‘none’
  - Effect: no communication inserted by compiler
  - Locales array exists, but has just one element

- To execute using multiple locales…
  - With your own installation:
    - Requires making some additional settings and building a second version of the runtime
    - See $CHPL_HOME/doc/README.multilocale for instructions
  - With the provided CX1000 accounts:
    - See the instructions on your handout