Tools

Chapel Team, Cray Inc.
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Outline

- **chplvis Improvements**
- **chpldoc Improvements**
chplvis Improvements
chplvis: Background

- chplvis first available with Chapel 1.12.0
- chplvis is a tool to visualize tasks and inter-locale communication in a graphical user interface
- Instrumentation done by programmer by adding calls to procedures in the VisualDebug module.
  - At runtime, each locale writes a data file with events
  - Task events are: task creation, task begin and end execution
  - Communication events: gets, puts, “on calls”
- chplvis reads data files written at run time and provides a post run view of the Chapel program run
  - Shows CPU time, clock time, number of tasks and concurrency, and size or volume of communication events
chplvis: Original Example Display

- **Simple coforall and on-clause display, 6 locales**
  - Boxes are locales
  - Lines are communication
  - Color shows data value
    - Segment adjacent to box indicates number of communications *into* locale

- **Interactive display**
  - Click on boxes
  - Click on lines
  - Data menu changes display
chplvis: VisualDebug Module / Runtime

● **Original version:** VisualDebug module always “on”
  ● User added calls to VisualDebug module in their code
  ● VisualDebug always ran unless commented out by user

● **Added VisualDebugOn**
  ● Config const: VisualDebugOn – allows user to disable data collection

● **Completed callback mechanisms in runtime**
  ● Task Events: Creation, Start execution, End execution
  ● Communication Events: gets, puts, on Clause calls

● **Internal function names, filenames**
  ● Source file name table
  ● Internal function name table
  ● Used by VisualDebug module for source view
chplvis: New Default Display

- Original view now called graph view
- One window design
  - Locale clicks bring up information box instead of a window
  - Communication clicks bring up comm (gets, puts, on calls) box
- View zooms and scrolls
- View selection on left bar
chplvis: Grid View

- Alternate view of same data
- Locales left and top
- Comm from left locale to top locale
- Red column is comm into locale 0
- Blue row is comm from locale 0 to others
chplvis: More Than 32 Locales

- Grid view easily shows >32 locales
- Box size varies based on number of locales, window size
- View zooms and scrolls
chplvis: Concurrency View

- View instead of a window
- Tasks with communication now identified with '*' (*OC 16, *OC 17, ...)
- Menus allow selection of locales and tags
- Click on task brings up task communication view
chplvis: Task Communication

- Lists comm events for single task
- Click on comm brings up file at line number listed

![chplvis Communication](image)

```plaintext
Communications for task 16 on locale 0.
[0.000012] Get from 4, total size 8, file modules/standard/IO.chpl:4508
[0.000201] Get from 4, total size 4, file modules/standard/IO.chpl:2836
[0.000395] Get from 4, total size 4, file modules/standard/IO.chpl:4510
[0.000542] Get from 4, total size 4, file modules/standard/IO.chpl:4511
[0.000631] Get from 4, total size 28, file modules/standard/IO.chpl:4511
[0.000689] Get from 4, total size 20, file modules/standard/IO.chpl:95
[0.000747] Put to 4, total size 4, file modules/standard/IO.chpl:4511
[0.000801] Get from 4, total size 4, file modules/standard/IO.chpl:4510
[0.000851] Get from 4, total size 4, file modules/standard/IO.chpl:4511
[0.000907] Put to 4, total size 4, file modules/standard/IO.chpl:4511
[0.000957] Get from 4, total size 8, file modules/standard/IO.chpl:4514
[0.001011] Get from 4, total size 4, file modules/standard/IO.chpl:2856
```
chplvis: File View

- Line highlighted for communication location or task definition
- Back arrow to get to view that led to file view
chplvis: Profile View

- Profile view of internal functions
- Clicking on line brings up file view
- Profile data: clock, tasks, communication, on calls, gets, puts
- Selection via menu
chplvis: Settings

- Heat colors selectable
- Restore window size on next run selectable
chplvis: Next Steps

- **Runtime / chplvis improvements**
  - Map more events back to user code in non-developer mode
  - Improve profile data
  - Find ways to gather and display more data
  - Look for ways to add animation to displays

- **More UI improvements**
  - Improve zooming
  - Add more settings for users, possible choices
    - background color
    - default view
    - set `CHPL_HOME` and compile directory for copied data files
  - Add a way to export a .png or .pdf of current view
  - Many more tweaks to UI possible
chpldoc Improvements
chpldoc: Background

- **Tool to generate documentation for .chpl files**
  - Originally added in Chapel 1.6.0
  - text output only
  - Improved significantly in 1.11.0 and onwards
    - HTML output revamped
    - Used to generate our online documentation for our library modules

- **Considered stable and reliable**
  - Handful of known bugs
  - Some feature requests
Bug fixes:

- Stop generating documentation for symbols within:
  - Loops
  - Inner block statements

```javascript
module M {
    var x = 10; // Should be documented
    while x > 3 {
        var inner = x / 2; // Shouldn't be documented
        ...
    }
}
```

- These symbols can’t be accessed through a ‘use’ of the module
  - So they aren’t part of the program’s API and shouldn’t be documented
Bug fixes:
- Fix output of:
  - Dmapped variables
  - Expressions with the ‘new’ keyword

```c
const rcDom = rcDomainBase dmapped new dmap(rcDomainMap);
// Turned into this instead:
const rcDom = appendExpr.Call09chpl__distributedrcDomainBase
```
chpldoc: This Effort

● Bug fixes:
  ● HTML source highlighting for:
    ● Functions with ‘const ref’ return intents
    ● Type and param methods on types
  ● Clean up leftover documentation of removed symbols in library docs
    ● Built-ins had script to remove certain symbols, e.g. those named “chpl_*”
    ● But accidentally left any documentation comments behind

1.13 release

```
proc type R.foo()
proc bar() const ref
```

1.14 release

```
proc type R.foo()
proc bar() const ref
```
chpldoc: Next Steps

● Change testing of chpldoc to validate .rst output
  ● Currently uses distinct text-oriented mode which could then be retired

● Add class/record view, including inheritance
  ● Plus, class and record index

● Support testing Chapel code used in chpldoc comments
  ● Similar to Python doctests

● Link module documentation to source code
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