Overview

- We are conducting a study during this class:
  - Done in conjunction with the larger HPC community
  - Similar studies occurring at different universities around the country

- Goals of the study
  - Understanding how people solve HPC problems and where they spend their time
  - Understanding tradeoffs among different variables (language, development approach, performance, etc.)
  - Allowing the next generation of high performance computers to take development effort into account

Independent Research Team
- Dr. Carver from MSU
- Dr. Basili, Dr. Zelkowitz, Dr. Asgari, Dr. Shull, L. Hochstein from University of Maryland

Different types of data will be collected for this project
- Background Survey
- Effort/Activities during development
- Defect logs
- Questionnaire/Interview after assignments

Example defect log

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Reason</th>
<th>Symptom</th>
<th>Time to fix (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/25</td>
<td>Used “i” instead of “j” in nested for-loop</td>
<td>Simple typo</td>
<td>Incorrect output</td>
<td>75</td>
</tr>
<tr>
<td>10/26</td>
<td>Divide-by-zero error</td>
<td>Didn’t think variable would ever be zero</td>
<td>Program crashed</td>
<td>15</td>
</tr>
<tr>
<td>10/26</td>
<td>Used wrong variable in a calculation</td>
<td>Copied-pasted code from another section, didn’t modify pasted code properly</td>
<td>Incorrect output</td>
<td>45</td>
</tr>
<tr>
<td>10/27</td>
<td>Incorrectly put statement inside loop</td>
<td>Carelessness</td>
<td>Program hung</td>
<td>60</td>
</tr>
</tbody>
</table>

This example and a blank log file will be available on the class web page.

Defect log

- As you work on the problem, keep a log of your defects (bugs)
- We will provide a standard form
- Each time you fix a bug, please record:
  - Description: What was wrong in the code
  - Reason: Why you think you made the bug
  - Symptom: What happened that led you to believe there was a problem with your code
  - Time to fix: How long it took from the time you realized there was a bug until the time you fixed it

- Please DO NOT record compile-time errors on this log

Effort collection

- Instrumented compiler
- Instrumented job scheduler
- Instrumented editor
- Instrumented shell

Dr. Luke will not see this data until after the semester and it will not affect your grade.
Editors on titan will have plugins that track the amount of time you spend editing files

Supported editors:
- Emacs (preferred)
- Vim

To improve quality of data collection:
- Please try to do as much development as possible on the remote machine (titan), including serial development if possible
- Please use one of the supported editors

Your shell will be instrumented as well

These mechanisms are automatic: hopefully, you won’t even notice them.

In order for the data collection procedures to work properly you must perform the following steps:
- Execute a script to set up the instrumentation:
  - If you are using a class account run:
    /home/lorin/inst/sensors/setup_tcsh.sh
  - If you are using a non-class account run:
    /home/lorin/inst/sensors/setup_bash.sh
  - Logout and log back in before starting work
  - NOTE: You only have to run the script one time – not each time you log in

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Help advance the field of software engineering for high performance computing

Learn how much time you really spend debugging

Raffle for USB memory stick!

Consent form
- Allows the research team to use the data collected during this study (anonymously)

Background Survey
- Allows the research team to better understand the types of experience and knowledge you have at the beginning of the class
- Please be as honest and accurate as possible

Tribal lore survey
- Survey of opinions about parallel computing

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Questions?
Please email me with any questions or problems

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