L41 - Advanced Operating Systems:
Lab 1 – Getting Started with Kernel Tracing / I/O

Dr Robert N. M. Watson

2020-2021

This is L41 Lab 1. If you are a Part II student, please see the other lab variant.

Your lab report will compare several configurations of the benchmark, exploring (and explaining) performance differences between them. Do ensure that your experimental setup quiesces other activity on the system, and also uses a suitable number of benchmark runs.

0.1 Submitting your completed assignment

Please submit your solution in the form of a single PDF interleaving written answers, plots, tabular data, and source-code excerpts, generated from your JupyterLab notebook. The lab report should use the L41 lab-report LaTeX template provided. All submissions are via the course's Moodle page.

1 Notes

Quiescing system state Ensure that your experimental setup quiesces other activity on the system, and use a suitable number of benchmark runs. Drop the first run of each set, which may experience one-type startup expenses, such as loading pages of the benchmark from disk.

Presenting plots Carefully label all axes, lines, etc., in plots, and take care to ensure legibility. Use logarithmic scaling of X axes representing buffer size; do ensure that all plots have the same X axis so that they can be visually compared more easily. When describing plots, consider partitioning them based on key inflection points, and explaining what each region (and transition) represents.

Experiments to run Although the benchmark contains a number of modes and further options, use only the modes specifically identified in the assignment for your work. For example, please do not evaluate `write()` behaviour or disable the buffer cache.

Benchmark execution time The benchmark can run for a considerable period of time – especially if we are scanning a parameter space, and using multiple runs. You may wish to initially experiment using a smaller number (e.g., 3) and get tea. For the final measurement, a larger number is desirable (e.g., 11). For short runs, plan on a cup of tea. For long runs, plan on having dinner.

2 Experimental questions

Please answer the following questions in your report:

- Holding the total I/O size constant (16MB), how does varying I/O buffer size affect IO-loop performance?

- Using DTrace, explore and describe potential causes for those performance behaviours.

- Identify and explain any unexpected performance anomalies that might disprove the implied hypothesis that increasing buffer size improves performance.

- Explore the impact of the probe effect on your causal investigation; how has DTrace changed the behaviour of the benchmark, and does it invalidate your analysis above?