Project 3: Pick Four

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Overview

Your task is to read four recent, related, operating systems papers of your choosing, and to write a short survey paper describing the area. The rest of this handout describes: (a) the criteria for choosing the four, though you may alter your choices as needed up until the final deadline; (b) the expected structure of the report; and (c) my intended grading plan. As in previous assignments, you are expected to work in new pairs.

This exercise is intended to allow you to apply your skill in reading research papers toward the task of developing a proposal for novel research of your own. This ability is what I want you to develop as computer scientists who happen to be taking an operating systems class.

Paper Selection

You may choose three papers from the following venues; they may be from the same or different venues. Other current venues may be appropriate as well (HotOS or other SIGOPS-sponsored activities, for example). The links should be clickable in PDF.

- SOSP'11 `http://sigops.org/sosp/sosp11/current/abstracts.html`
- OSDI'10 `http://www.usenix.org/event/osdi10/tech/`
- USENIX ATC 2011 `http://www.usenix.org/events/atc11/tech/`
- USENIX ATC 2010 `http://www.usenix.org/events/atc10/tech/`
- ASPLOS 2011 `http://asplos11.cs.ucr.edu/program.html` or `http://dl.acm.org/citation.cfm?id=1950365` (table of contents tab)
- ASPLOS 2010 `http://dl.acm.org/citation.cfm?id=1736020` (table of contents tab)

The fourth paper may come from any venue, at any time. (For example, a paper commonly cited by your three current papers would be fair.) You may need to at least skim a few more papers than these for context, and you will be welcome to cite them in your report.

I suggest biasing toward paper award winners, toward choosing all papers in a session (already thought to be related by the PC chairs), choosing papers with a common author (likely related), and choosing papers from academic authors (more likely to employ techniques and solve problems available to mortals with limited resources).

What to do

The main task is to classify the papers by their solution method or problem, in an attempt to expose future directions. For example, thinking about the collection should expose blank spaces: unsolved problems, untried solutions to existing problems, or perhaps other problem domains with similarity. Sorry this is so generic, but what you can do really does depend on the papers you choose and the problem domain you're most interested in.

For example, one could classify Opal, Spin, Nooks, and Mach from our reading list in terms of how they protect against faulty operating system components. Nooks and Opal use VM tricks to mark sharable memory read only while isolating aspects; Spin and Nooks add protection to a monolithic kernel; Opal and Mach adopts a Microkernel-based approach to isolating operating system services. A straightforward (if naive) question would be, could Nooks protection be made more efficient if shadow drivers and actual drivers were written in modula-3? (I'm not a big fan of "hybrid" approaches in research because they lack independent insight and can require a lot of effort to implement both schemes well, though they often can get good results by approaching the best of both worlds.) A broader question might be whether the technology trend of 64-bit address space might be put to better use, e.g., by using address space in a sparse way within processes: interleaving allocated (mapped) and unallocated (unmapped) pages to expose memory faults sooner. (Such may be redundant with memcheck/valgrind or electric fence.)

The Report

Your survey report shall have (at least) the following sections.

Introduction What is this problem, why is it important, why is it hard, and what can be done about it?

Background Tutorial for a general computer scientist about the concepts involved. There are likely to be terms as in our readings that would benefit from definition, such as leases, control plane, or byzantine faults, that a general audience might not be familiar with.

Paper overview Summarize each paper, likely in chronological order. (I know, I ask to avoid this in comments on the blog; now is your chance.) Avoid recapping the paper ("The paper starts by x, then y, then z."), and instead present the highlights ("The paper solves problem x using insight y, showing a z-fold improvement....")

Paper relationships What binds these papers together, and what aspects of the problem or solution space remain un- or under-explored? This is the key section for the exercise, in that I want you to develop a picture of the area bigger than any individual paper.

Conclusion Is this a promising, interesting, rich area? Or a waste of time?

I suspect eight pages of single column 11 point times will be enough to complete this task with reasonable detail, but length is not a requirement. As you may know, many words can be written to express very few ideas. Your task is to express interesting, novel, thought-provoking ideas, like those in your comments except matured a bit through discussion with your partner.

Milestones and Deadlines

Please email me the list of four papers (three plus one) by November 30. This is a hard deadline, so please make a soft deadline you're comfortable with earlier, in case chosing papers is harder than you think. You may change a paper or maybe two after this deadline if you discover something better; the intermediate deadline here is to make sure you're making progress and give me an idea of what to expect.

Please email me your report (pdf only, please) by the end of the day December 13.

If you find particularly useful scholar.google.com or academic.research.microsoft.com search queries (to understand the citation and coauthorship relationships), feel free to share.