Computer Science 330
Operating Systems
Siena College
Spring 2012

Term project

Groups must be formed by: Tuesday, March 27, 2012
Proposals due: 9:20 AM, Friday, March 30, 2012
Progress reports due: 9:20 AM, Friday, April 13, 2012
Complete paper drafts due: 10:00 AM, Tuesday, April 24, 2012
Presentations: Monday, April 30, 2012
Final submission: 4:00 PM, Monday, April 30, 2012

As you know, this course requires you to complete a final project that will determine 20% of your grade. You may choose your own topic related to operating systems to study in more detail than we have as a class. Most projects will involve programming, but the amount and difficulty may vary from topic to topic. A formal research paper and brief (approximately 20 minute) presentation at a minisymposium to be held during the final exam period.

You may work individually or in groups of two or three. Groups must be formed by Tuesday, March 27, 2012.

The proposal

Please start thinking about a topic right away and come to me with your ideas. By 9:20 AM, Friday, March 30, 2012, submit a proposal, at most one page in length, that describes your topic, what specifically you plan to investigate about your topic, and how you plan to go about it. Describe the major milestones for your project, a rough schedule for achieving these milestones, and which milestones you believe are most important for your project to be considered a success. If you will need access to any special hardware or software, include that in your proposal. Your proposal should convince me that you have an interesting and worthwhile topic and that it is feasible in the time available.

The progress report

By 9:20 AM, Friday, April 13, 2012, submit a progress report. This should consist of a detailed outline (or better yet, an early draft) of your paper including sources, and a description of the design and current implementation status of your software, as well as a more specific timetable for completion of the project. You must also submit an annotated bibliography with your progress report, detailing the sources you have considered (including some you intend to use and some you do not intend to use).

The paper

This is to be a formal research paper, and should be organized as such. You should begin with a title, author list, and abstract. The main body of the paper should be organized into sections

including (i) an introduction in which you describe the general topic and the particular aspects you will be examining, (ii) one or more sections comprising your main text, where you describe what you have done, how you have done it, and what you have learned, (iii) a conclusion, which should include ideas for future investigation into your topic which were beyond the scope of your project and the paper, and (iv) a complete list of citations. Citations of web pages are acceptable in some circumstances, but books, articles in conference proceedings or journals, or technical reports are preferred.

Proper English and a good technical writing style are important. Writing well is very difficult – it is an iterative process and cannot be done all at once. Be precise and be concise. Group members should proofread and make suggestions about each other's writing. Check your spelling and grammar carefully. I expect most papers will be around 15 single-sided pages, using 1.5 spacing, one inch margins, and a 12-point Times Roman font (or similar). Please do not adjust margins and font sizes to force a certain length. You are encouraged but not required to use LaTeX to typeset your paper. The LaTeX example in my shared area is already set up with an appropriate format. Length is not important – content and quality are. Papers shorter than 10 pages or longer than 20 pages are acceptable, if the length is appropriate for the content.

Submit a complete draft by 10:00 AM, Tuesday, April 24, 2012. The more complete this draft, the better feedback I can give you to improve it and the more you can focus on programming at the end. You may also submit additional drafts for feedback, but keep in mind that it may take me a day or two to get to them. Submit your final version by 4:00 PM, Monday, April 30, 2012.

The project

You should submit your source code and instructions on how to build and run it. The software should be described in the paper. Please make arrangements to demonstrate the program. Source code should be submitted and demonstrations completed by 4:00 PM, Monday, April 30, 2012.

The presentation

Each group will present a summary of their work to the class. Include background information on your topic, the motivation for your project, a description of what you did, and a summary of what you learned. Software demonstrations may also be appropriate. Prepare slides or web pages. Rehearse your presentation, paying special attention to timing. Given how busy everyone will be at the end of the semester, our schedule will be tight, so groups will not be allowed to run over the allotted time. Presentations will take place during a class minisymposium on Monday, April 30, 2012. All group members must participate in the presentation. Attendance is required at the entire presentation session, not just when your group is speaking.

Grading

This final project accounts for 20% of the course grade. The grade will be based on all aspects of the project, including the proposal (5%), the progress report (5%) and annotated bibliography (5%), the design, documentation, style, and correctness of the software developed (10–30%), the content and writing style of the complete draft (10%) and final version (30–50%) of the paper, and quality of the presentation (15%). The breakdown between software development and the final paper will depend on the amount of programming required for each project. No credit is given for attendance at the minisymposium, but penalties will be applied for missing all or part of it.

Choosing a topic

Here are some ideas to consider when choosing your topic:

- Experimental modifications to FreeBSD or Linux kernel (such as custom schedulers, memory management, file systems, device drivers).
- A more detailed simulation (along the lines of the CPU scheduling simulator) of some aspect or aspects of operating systems.
- OS issues arising in high-end web servers or server farms (think Google, very popular news/sports/weather sites).
- Implementations of and applications of semaphores or other synchronization techniques.
- Experiments with how (insert OS here) handles (insert important OS issues here), possibly trying other possibilities.
- Mass storage systems, high performance file systems, file system safety and repair.
- OS issues in autonomous systems, embedded systems, or real time systems.
- Emulators or virtual machines – build your own or enhance an existing one. This could include things like the Java virtual machine, emulators for older hardware, or operating system virtualization with tools such as Xen or VMWare.
- Operating system issues arising in current and near-future hardware (e.g., chips with many CPU cores).
- Operating system issues arising in mobile computing.
- Protection and security issues, encryption.
- Distributed operating systems.
- File sharing over wide-area networks.
- OS issues in Grid computing, internet computing.
- Theoretical issues in OS, such as queueing theory.

These are just ideas, and you should not restrict yourself to this list. I hope everyone can find an appropriate topic that they find interesting. You might also find it useful to browse recent journals and conferences proceedings to get a feel for some current research projects in operating systems.

We may be able to provide a dedicated lab computer to each of a few groups who wish to pursue a project that requires administrative access. If you think you may be interested in this, be sure to stake your claim right away.

Academic Honesty Guidelines

Collaboration within a group is unrestricted. Since each group is working on a different project, you are free to discuss your projects with each other. If you wish to use or refer to any software libraries or outside source code beyond the standard language (C, C++, Java) libraries, check with me first. All sources must be cited properly. If in doubt about anything related to Academic Honesty, ask now and avoid problems later!

Final Thoughts

You have several weeks, so the expectation is for several weeks of work. You will not be able to do a good job if you put it off. I don't expect a Ph.D. thesis, but I do expect much more than your average lab assignment.