CPRE 416: Software Evolution and Maintenance   Homework 7 (50 points)
Assigned: November 2, 2005
Due: November 14, 2005 at the beginning of the class; <u>Up to 10 bonus points</u> if submitted on
November 9.
Name: Fill in on your answer sheet

The objective of this homework is to check if there are memory leaks in the given Xinu operating system
code. Use the XinuVax code; the tool in the lab has another project set for a different Xinu code that is
meant for future use.

The **getbuf ()** call is used to get memory and the **freebuf ()** call is used to free memory. We need to check
that every **getbuf ()** call is followed by a call to **freebuf ()** in order to ensure that there are no memory
leaks.

Each one in the class is given a set of **getbuf ()** calls to check. You have to analyze the given Xinu code
and check if each **getbuf ()** call assigned to you is followed by a call to **freebuf ().** As we have discussed in
the class you have to follow a sequence of calls, observe the context under which the calls are being made,
check the paths along which pointers to the allocated memory are being passed etc. You need to do a
thorough investigation, note down your results, and communicate your observations and reasoning to
conclude if there is a memory leak or not.

This assignment is quite hard to do manually because of size and complexity of the code. We have installed
a tool in the Software Engineering Lab on the second floor of Coover. The tool was demonstrated a few
times in the class and by now you probably know how to use it. You should try it in the lab right away and
any questions on using the tool should be brought to the next class. I will go over your difficulties in the
class. I expect you to be adept at using the tool by the end of the next class.

With an appropriate use of the tool, you should be able to finish your assignment in a couple of hours. You
may able to finish all your observations within an hour too; it depends on the strategy you follow and how
effectively you use the tool.

I have noted all the callers of **getbuf ()** in Xinu and assigned each one three callers to check. In effect, we
will be using the entire class as a team to check if Xinu has memory leaks. With the teamwork and the tool,
we can do something within a couple of hours that would otherwise take a lot more time to finish. I would
like you to note the amount of time you spend using the tool as exactly as possible with the actual time
periods you logged on and logged off the tool. I would also like you to estimate the amount of time it
would have taken you to do the work without the tool and the possible difficulties you may have faced.
Report this part of the work in a separate section.

You can discuss strategies and help each other in the mechanics of using the tool, but you should make all
your observations with the tool, reasoning, and writing individually; do not share that part of the work with
anyone else. I have purposely assigned the same set of calls for checking to two or more individuals for
following reasons: (a) we will have redundancy in checking and I will be able to do cross-verifications, (b)
I want to observe who is being more thorough and creative in designing the strategies and using the tool,
(c) I am curious about the time it takes to do the work with or without the tool.

Submit a report that is well written and well formatted using appropriate sections and section headings.
Write it like a technical paper. You may want to take a look at some technical papers and follow a pattern
you like.

Your report should have a section where you record your conclusions about all the calls assigned to you.
Create a subsection for each call and record the following: (a) your conclusion - if there is a memory a leak
or not, (b) all the important observations relevant to your conclusions; present these nicely and in an easy to
read format along with code snippets if necessary, (c) your reasoning based on the given observation that
led to your conclusion; again, present these nicely and in an easy to read format. Note that we have

discussed that you may reach a dead-end following the control flow and you may have to use other strategies to go beyond. We have discussed such strategies in the class and you should use them and bring those out in your report.

Your report should have another section where you give the timing and your estimates for time for performing the work without the tool. Tell us how you arrived at your estimates.

You can have additional sections. There is room for creativity. For example, you can have a section for interesting observations that go beyond our discussions in the class. This homework may be very different from anything else you have done in other courses because we are working with a real-world problem and using a tool to solve the problem. Thus, you can also have a section on your learning experience as a result of doing this homework assignment.

Have fun and show your creativity and passion for learning. My grading is usually partly relative and I try to reward students who have done something that shows the motivation to do hard work and learn.