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Lab 3 Design Document & Report

Report:

Files Changed:

1. proc.h: add stackPages variable to keep track of # of pages
2. exec.c: move stack to top of user space, change stack pointer to reference new stack location
3. vm.c: add new loop in copyuvm that maps pages in the new stack location
4. syscall.c: change bound checking for user space retrieval functions to reference new stack location
5. defs.h: changed function signature for copuvm to pass in stackPages
6. proc.c: add new parameter stackPages to copuvm call
7. trap.c: update trap handler for page faults. If page faults occur will allocate new pages
8. memlayout.h: add TOPUSERSTACK definition to keep track of the top of the stack (similar to KERNBASE)
9. Makefile: add tests to userland
10. lab3test.c: test harness with deep recursive function

Design Document:

The current memory layout has the stack in a fixed location such that it cannot grow. For this lab, we moved the memory layout in xv6 to match the memory layout in the linux kernel, and we added a page fault handler such that if the current stack is exceeded, then it is able to be grow as new pages are allocated. If the stack grows too far we prevent the stack from growing into the heap region.

Bonus: There is a picture below that shows an example of this. We attempted to grow the stack into the the heap by calling a very deep recursive function (fibonacci(2000000000)). When the stack grew to where the heap was, the whole address space was allocated, since the stack started at the top. So, instead of growing into the heap, allocuvm returned with an error (shown below) that memory had run out.

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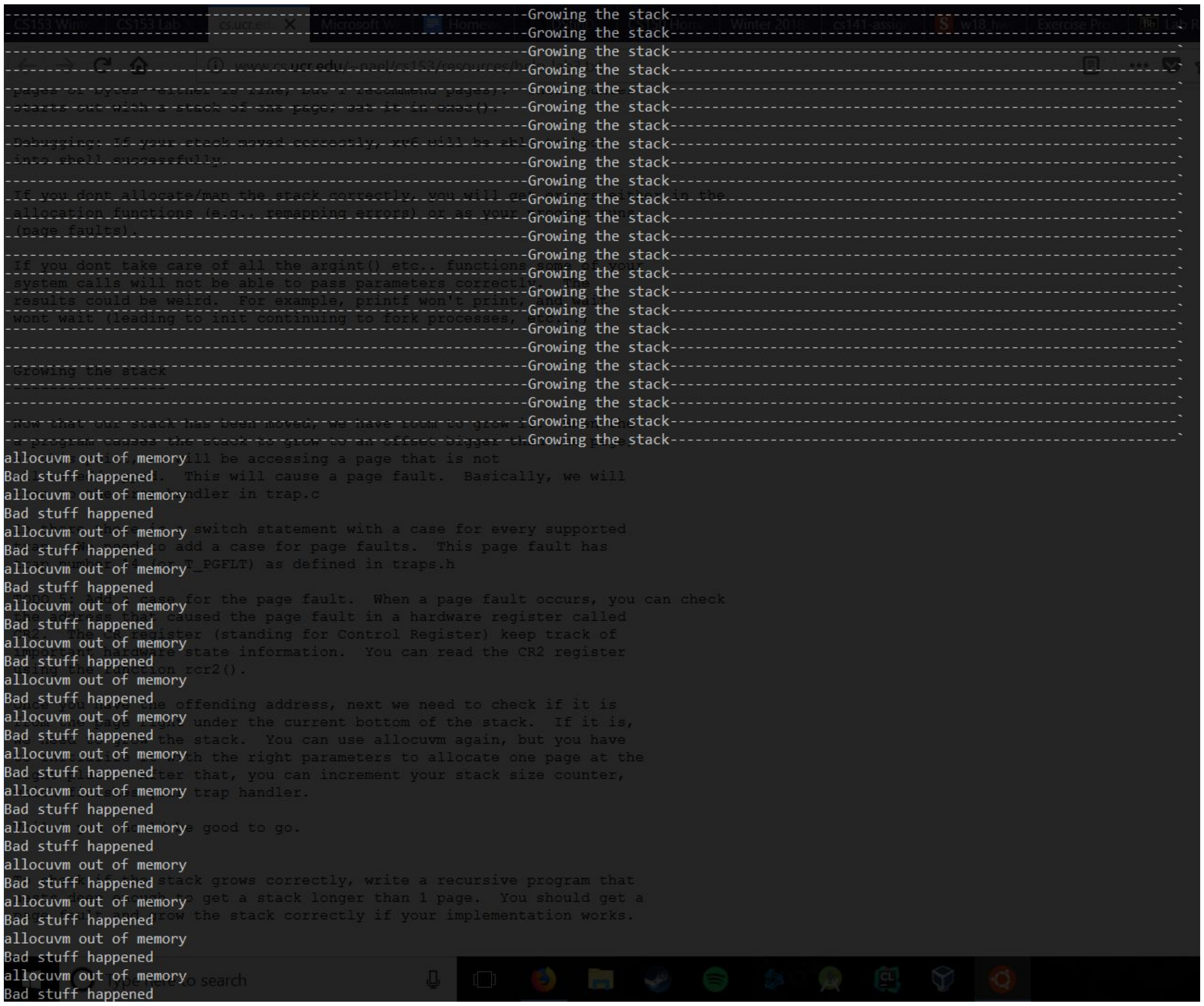

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