

Self-assessment test

CS546 - Fall 2016

CS546 is a graduate-level course in computer systems security. While there are no formal pre-requisites for this course, an undergraduate-level exposure to standard computer science concepts is expected. Without this background, you are likely to struggle in the course.

To help students assess their preparedness for this course, this is a self-assessment test. Try to answer these questions on your own (no need to hand the answers in). You should know the answers to most of these questions. If you find yourself struggling, you may be better off taking other courses to fill in this missing background.

- * [OS] What is a system call? How does a process invoke a system call? Explain what happens in the processor when a process invokes a system call. Why are system calls needed?
- * [OS] What is virtual memory (or virtual address spaces)? How is it different from physical memory? How do operating systems translate between virtual memory and physical memory?
- * [OS] Supposing you had a hypothetical machine with an infinite amount of physical memory. Would we still need the concept of virtual memory? Why or why not?
- * [OS] What is a segmentation violation (aka segmentation fault)? When can it happen?
- * [Architecture] What is a trap? What is an interrupt? What is an exception? What is a signal?
- * [Architecture] Explain how the virtual address space of a typical user process is laid out. Where is the code of the process stored? Where do the stack and heap go? What about the code and data of the operating system?
- * [Architecture] Why does a process keep a stack of activation records as it executes? What is stored within an activation record?
- * [PL and Compilers] What is a data type? What is a type system?
- * [PL and Compilers] Explain in detail the steps used by a compiler to transform a program from source code to an executable program.
- * [PL and Compilers] Consider the following toy C program:

```
void main (void) {  
    int p, *q;  
    p = &p;  
    q = p;  
}
```

Would this C program compile? What would happen if you run it? What would happen if you add a statement to print the value of `*q` at the end of the program? Can you write an equivalent program in Java? Why or why not?