

Assignment #2

CS106E Spring 2018, Young

In this assignment we cover networking and operating systems. This assignment is due by class time next Wednesday April 25th. Please submit it on Canvas before 1:30pm lecture.

For this assignment, write up the answer to each question in either a text file, PDF, or a Microsoft Word file. At the top of the file include both your name and your partner's name. If you are doing the assignment by yourself put down "Partner: none" just below your name in the file.

To submit this assignment (and future assignments) on Canvas, you must form a homework group by going to the People tab. If you are working with a partner, add yourself and your partner to a group. If you are working by yourself, you should still form a group.

Please show your work for problems 7 and 8

Hardware

1. Find out how many cores your CPU has. What percentage of your CPU processing power is currently in use?
2. Find out how much of your computer's RAM is currently in use. Which program or process is using the most memory? Try to reach 100% RAM utilization (i.e. by running a lot of programs or by opening a lot of websites in your web browser). What happens to the performance of your computer?
3. Suppose you write a recursive function but forget to add a base case which ends the recursion. For example, something like:

```
int factorial(int n) {  
    return n * factorial(n - 1);  
}
```

What effect will this have on the call stack? Try writing and running an infinite recursion in your favorite language and see what happens.

Operating Systems

4. Suppose your computer has 4GB of RAM and a 512GB SSD. You're working on a remote group project that requires you to use a text editor (like Microsoft Word), a messaging platform (like Slack) and a web browser (like Firefox). You're also simultaneously listening to a music app (like iTunes). Suppose your text editor requires 2GB of memory, your messaging platform requires 1GB, your browser requires 2GB, and your music app requires 2GB. Will your computer be able to handle this workflow?

How will your computer likely respond if you were to load a video player app that requires 3GB of memory?

For this problem, you may assume that an application must be in main memory whenever you're interacting with it (inputting text, or making web requests, or playing music/video).

Computer Networks

5. Determine the IP address of your computer. Determine the MAC addresses (also known as Physical Address) of your computer. Note that each network interface of your computer will have a different MAC address. For example, if your computer has WiFi **and** an Ethernet port, your computer will have two MAC addresses.
6. Using your favorite DNS resolution tool (or just an online DNS tool like dns.google.com), look up the IP addresses of cs.stanford.edu, engineering.stanford.edu, and axess.stanford.edu. What do you notice about these addresses? Now, look up the IP address of a hostname not affiliated with Stanford (such as cs.gatech.edu). How does this address compare to the Stanford-affiliated IP addresses?
7. How long would transferring a 250 megabyte video take between two computers which are on the same 100 megabit per second Ethernet network? Assume ideal transfer rates with no overhead and no other computers trying to use the network.
8. How long would the same transfer take assuming a third computer on the network was also active and taking up 50% of the available bandwidth for another unrelated task?