CS105 – Computer Systems Spring 2023

Week 12: File IO

April 17-19, 2023

1. Consider the following code:

```
int main(int argc, char* argv[]){
    char buf[3] = "ab";
    int r = open("file.txt", O_RDONLY);
    int r1 = dup(r); // equivalent to dup2(r, r1);

    read(r, buf, 1);

    int pid;
    if((pid=fork()) == 0) {
        r1 = open("file.txt", O_RDONLY);
    } else{
        waitpid(pid, NULL, 0);
    }

    read(r1, buf+1, 1);

    printf("%s", buf);

    return 0;
}
```

   Assume that the disk file `file.txt` contains the string of characters `CS105` . Also assume that all system calls succeed. What will be the output when this code is compiled and run?

2. Consider a file systems that uses indexed allocation with the following parameters:

   - The disk is comprised of 2048 256-byte blocks.
   - Block numbers are 4-byte values.
   - Directory entries are 32 bytes.
   - Inodes contain 8 direct pointers, 1 indirect pointer, and 1 doubly-indirect pointer

   (a) What is the maximum size file that can be stored using only direct pointers?

   (b) What is the maximum size file that can be stored in this file system?

   (c) What is the maximum number of files that can be stored in a single directory?

   (d) What sequence of block accesses would have to occur to read (all of) a 21-byte file located in the root directory?

   (e) What sequence of block accesses would have to occur to read (all of) a 1959-byte file located a subdirectory of the root directory?

   (f) What sequence of block accesses would have to occur to read (all of) a 18688-byte file located in the root directory?