

# Systems Programming

## Hand-written Assignment 4

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1.

```
1 #include <stdio.h>
2 #include <stdlib.h>
3 #include <sys/types.h>
4 #include <sys/stat.h>
5 #include <errno.h>
6 #include <fcntl.h>
7 #include <string.h>
8 #include <signal.h>
9 #include <unistd.h>
10 int main(int argc, int argc[])
11 int fd_1[2], fd_2[2], buffer_2;
12 pid_t pid_child, pid_grand;
13 char buffer_1[100];
14 pipe(fd_1); pipe(fd_2);
15 if (pid_child = vfork()) == 0 then
16     if ((pid_grand = fork()) > 0) then
17         close(fd_1[0]); close(fd_2[0]);
18         write(fd_2[1], &pid_grand, sizeof(pid_grand));
19         write(fd_1[1], "I'm gonna die.", 20);
20         return 0;
21     end
22     else if (pid_grand == 0) then
23         close(fd_1[1]); close(fd_2[0]); close(fd_2[1]);
24         read(fd_1[0], buffer_1, sizeof(buffer));
25         exit(0);
26     end
27 end
28 else
29     close(fd_1[0]); close(fd_1[1]); close(fd_2[1]);
30     read(fd_2[0], &buffer_2, sizeof(int));
31     waitpid(pid_child, NULL, 0);
32     return buffer_2;
33 end
```

Algorithm 1: double\_fork()

## 2.

### (a)

We can use less memory. Seeing that the memory to save a link in InBox is definitely far smaller than the memory to save a whole file in InBox.

### (b)

Although both of them have advantages and disadvantages, I think symbolic link is better. Seeing that if Alice put a symbolic link in Bob's InBox, she can stop Bob from reading the file by changing the filename or other ways in the future. However, if Alice put a hard link, it means that Bob will always have the right to read the file. Based on humanity, Alice will change her mind and won't share her file with Bob some day. As a result, symbolic link is a better choice.

### (c)

(1) --x  
(2) -- --  
(3) --x

### (d)

Yes. Because a person has rwx rights in his own directory in general, and we only need -wx rights to remove a file from a directory. "w" is used to remove, and "x" is used to find the file which you want to remove.