

The Final Exam of Network Programming (2015-1)

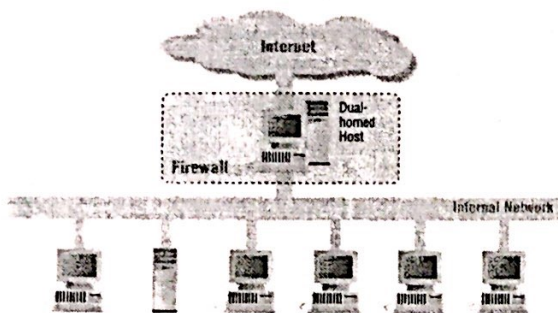
January 7th, 2016

(Total: 110 points)

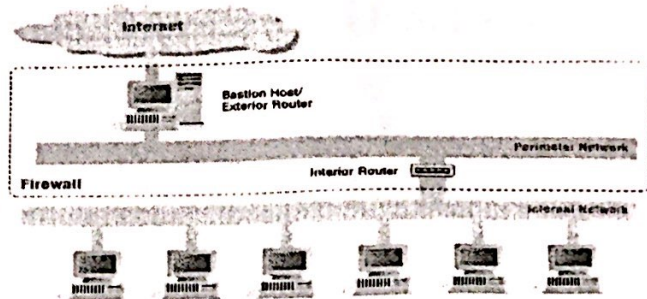
1. (5%) Explain the key idea of *effective user IDs* in UNIX.
2. (4%) For the following program segment, indicate where the problem is and how to fix it.

```
...
int flag = 0;
...
mychld() {    flag = 1; }
...
main() { ...; signal(SIGCHLD, mychld); ...}
...
for(;;) {
    while(flag==0)
        pause();
    // when each child process finishes, process it here.
    ...
}
```

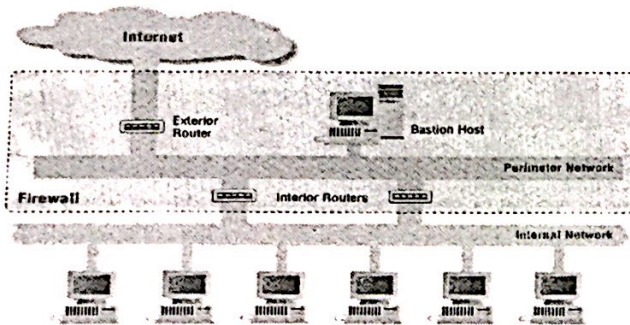
3. (18%) Write a simple and short program (named `wrapper`) for the following:
 - (a) create three child processes `p1`, `p2` and `error_handler`,
 - (b) forward `stdin` (or 0) messages of `wrapper` to `stdin` (or 0) of `p1`,
 - (c) forward `stdout` (or 1) of `p1` to `stdin` (or 0) of `p2`,
 - (d) forward `stdout` (or 1) of `p2` back to `wrapper`'s `stdout` (or 1),
 - (e) forward `stderr` (or 2) of both `p1` and `p2` to `error_handler`'s `stdin` (or 0), and
 - (f) forward `stdout` (or 1) of `error_handler` back to `wrapper`'s `stdout` (or 1).
 - (g) forward `stderr` (or 2) of `error_handler` back to `wrapper`'s `stderr` (or 2).
4. (18%) Write a simple and short program (named `test`) for the single process concurrent server doing this: All messages from clients are broadcast to all clients. (Assume that the `connectTCP` and `passiveTCP` functions are provided.)
5. (6%) In the expiration model of HTTP, describe the method of calculating the age of an object and the principle behind it.
6. (16%) In Apache, it can be configured to support pre-allocation and `fastcgi`.
 - (a) Explain what pre-allocation is.
 - (b) Explain what `FastCGI` is.
 - (c) Describe how both work together in UNIX.Hint: for (a) and (b), also describe their advantages; for (c) need to illustrate.
7. (6%) Explain what is `inetd` in UNIX. Describe how it works, why it is important in UNIX, and how it is related to firewalls.
8. (8%) For each of the following four firewall architectures, indicate whether it is safe and explain the reason.



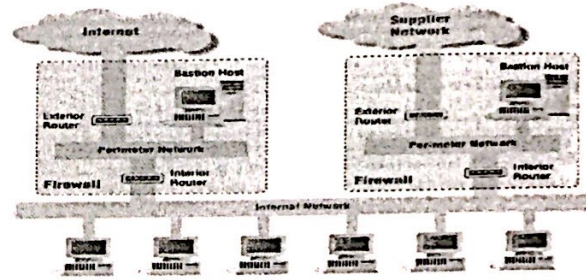
(a) ✓



(b) ✓



(c) ✗



(d) ✓

9. (10%) In a *standard* firewall, if we want to allow outbound ftp connections only, how do you design your proxy servers in DMZ and how do you change FTP clients to allow ftp services with passive mode? Also, design your policy setting table for the interior routers.
10. (5%) If a mail system supports “piping” in the fields of “To” and “From” without any protection, design a simple way to attack the system and explain the reason.
11. (6%) For an NAT, assume that it is Cone NAT as described in the class. Briefly describe how to do UDP hole punching on the NAT.
12. (8%) For SUN RPC, let the server netprog.csie.nctu.edu.tw have a RPC process including:

```

registerrpc(MYSERVER=5, MYVERSION=2, PROCEDURE=1, funcA, ...);
svc_run();

```

the client on student1.csie.nctu.edu.tw have the following actions:

```

callrpc(“netprog.csie.nctu.edu.tw”, MYSERVER=5, MYVERSION=2,PROCEDURE=1, ....);

```

Please explain how the above functions works with Portmapper. Please use a flow chart to illustrate the work of each function.