

## Homework #1 Solution

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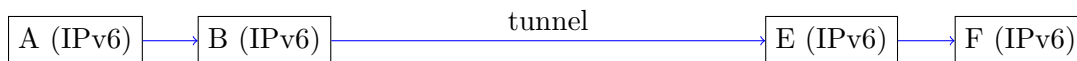
### Network Administration

#### 1. Internet Protocol Stack: 5-layer Model

- (a) Transport: port (and IP)  
Network: IP  
Link: MAC
- (b) (Please google it.)

#### 2. IP

- (a) IPv4:  $2^{32}$   
Ipv6:  $2^{128}$
- (b) AAAA record
- (c) We view the intervening set of IPv4 routers between two IPv6 routers as a tunnel. At node B, it puts the whole IPv6 datagram in the data field of an IPv4 datagram and sent it through the tunnel. At node E, it extracts the IPv6 datagram from the IPv4 datagram and route the extracted IPv6 datagram as normal.



#### 3. Wireshark

- (a) dns  
8.8.8.8
- (b) dns && dns.qry.name == headhunt.com.tw  
202.153.190.77
- (c) ip.dst == 202.153.190.77  
HTTP, TCP
- (d) ip.dst == 202.153.190.77 && frame contains wireshark  
HTTP
- (e) HTTPS

## System Administration

### 1 Short Answer Questions

#### 1.1 More Permissions! (5%)

(1) Please fill in the table (T or F), in which you should compare different permission setting on directories, and also give a brief conclusion about it.

Note: subdir is the directory under dir.

Dir Permission	Delete Rename Create files	List dir (ls)	Read file content	Write file content	cd dir	cd subdir	List subdir (ls)	Access subdir files
--- (0)	F	F	F	F	F	F	F	F
-w- (2)	F	F	F	F	F	F	F	F
r-- (4)	F	T	F	F	F	F	F	F
rw- (6)	F	T	F	F	F	F	F	F
--x (1)	F	F	T	T	T	T	T	T
-wx (3)	T	F	T	T	T	T	T	T
r-x (5)	F	T	T	T	T	T	T	T
rwx (7)	T	T	T	T	T	T	T	T

Without execute permission, we can do almost nothing. On the other hand, it's also dangerous to keep the bit on, since that even only with execution permission, we can get almost all information in the directory.

NOTE 1: One error in the table -> -0.5 point.

NOTE 2: If you only fill in the table (without conclusion), you will only get one point.

(2) Without explanation: -1 point.

Briefly, it doesn't work at all (on Linux). You can change it on a Mac (or actually, also FreeBSD), but most of the time the permission won't be modified. For simplicity, we'll only describe the case of Linux.

The permissions on symbolic link are not used. It's always readable, but of course it can't be writable or executable (how do you write or execute a "pointer" to a file?); you can only modify a symbolic link by create / delete (rename or unlink, etc.) it.

(3) One error: -0.5 point.

- setuid: Allow user to run an executable with the permissions of the executable's owner.
- setgid: Allow user to run an executable with the permissions of the executable's group.
- sticky bit: It's a permission bit set on a file or directory to limit the permission of deletion or rename of the file (under the directory) to the owner.

#### 1.2 Deeper, deeper (3%)

(1)

The character sequence consisting of "#!" at the beginning of a script is called "shebang" (she-bang, hashbang, pound-bang, hash-pling, etc.).

In Unix-like system, it means that if the file is an executable, then the program loader will use the rest of the line as an interpreter directive.

(2)

The first (`#!/usr/bin/env bash`) is better:

1. Don't need to worry about the different path in distinct distribution / OS.
2. Use the path that user desires.

The last (`#!/usr/bin/bash`) is better:

1. Use the same path for different user (for unity).

NOTE: You'll get the credit once you give reasonable explanation.

### 1.3 Copy Monster (2%)

Briefly, `rsync` is more powerful than `cp`, but also more dangerous; also, `rsync` can synchronize the files between local system and remote system. On the other hand, `cp` is more lightweight and not as complex as `rsync`. In my opinion, no one is definitely better than the other. It depends on lots of factors.

E.g. If you're doing some daily backup tasks, `rsync` might be better since that you only need to "sync" the files, and `rsync` will check the timestamps to decide which ones need to be updated. If you're just copying some files (in local system), `cp` should be better since that `cp` makes the decision to copy only on metadata, and it will just copy your files without much consideration.

NOTE: You'll get the credit once you give reasonable explanation.

## 2 Shell Scripting

Please refer to course website for the sample answer of `deploy.sh`, `jobs.sh` and `lottery.sh`.