

Homework #1

Due Time: 2017/3/12 (Sun.) 22:00

Contact TAs: vegetable@csie.ntu.edu.tw

Submission

- Compress all your files into a file named **HW1_[studentID].zip** (e.g. HW1_bxx902xxx.zip), which contains two folders named **[studentID]_NA** and **[studentID]_SA** respectively.
- **Folder [studentID]_NA** should contain a pdf file of all your answers in *Network Administration Part*.
- **Folder [studentID]_SA** should contain all scripts to do the tasks in *System Administration Part*.
- Submit your zip file to ceiba.

Instructions and Announcements

- Discussions with others are encouraged. However, you should write down your solutions **in your own words**. In addition, for **each and every** problem you have to specify the references (the URL of the web page you consulted or the people you discussed with) on the first page of your solution to that problem.
- Problems below will be related to the materials taught in the class and may be far beyond that. Try to search for additional information on the Internet and give a reasonable answer.
- Some problems below may not have standard solutions. We will give you the points if your answer is followed by reasonable explanations.
- **NO LATE SUBMISSION IS ALLOWED.**

Network Administration

Part 1

The PTT dollar is the special and precious currency in PTT world, and a author may send PTT dollars to the first 100 users who upvoted his/her post, so-called 推文, in order to gain reputation. Wisely, user “LesMiserable” wants to write a program for auto-collecting PTT dollars (P 幣).

- (a) For simplicity, please help him search for posts with title including “發 P 幣”. Here are some steps for you to follow as hints:
1. Open Wireshark and start tracing packets.
 2. Log in to telnet://ptt.cc (In case of encoding issue, it would be more convenient to use PCMan or Welly/Nally for Mac OS)
 3. Search for titles with the keyword “發 P 幣”. (‘P’ is a halfwidth character.)
 4. Trace the Telnet data that you have transmitted to the PTT server.

Please write down the filter you use in Wireshark, also provide the strings in step 4 as an answer here. Remember to replace your id with “LesMiserable” and your password with “SECRET” when submitting your answer here since we are not interested in your little secret. (10%)

- (b) Name one protocol in the application layer and one in the transmission layer used in the steps of 1-(a). (7%)
- (c) “LesMiserable” has taken NASA course, knowing that there are 5 layers in the Internet protocol stack, which are application, transport, network, link and physical layer. However, he has no idea what happens exactly when surfing on PTT. Assume the transmission path from user “LesMiserable” to the PTT server only bypasses 1 router and 1 switch. Please help him by specifying the 4 network devices in the path and the layers processed in each of the devices. (8%)

Part 2

Caleb was taking a computer class from Finch and he just finished the class. Because this course is very important to him and he doesn’t want to lose any points, he wants to discuss his homework with you. But of course, you need to complete it first.

- (a) When you connect to school’s network, DHCP automatically do many things for you. Which layer of the five-layer model mentioned in class does DHCP belong to? Briefly explain it. (9%)
- (b) What do you need to do/check about device/software to connect to IPv6 host? List 4 of them. (8%)
- (c) Try to connect to nasa-hw1.csie.ntu.edu.tw/ipv6.html, which can only be connected through IPv6. Please paste what is on the website, and the time you accessed the website to your answer. (8%)

System Administration

You are asked to write a shell script for each following problem and submit all scripts in a zip. Each script should be named exactly as specified in the problem description and have its executable permission on.

You are allowed to use the standard (POSIX) shell or GNU Bash. If you use the standard shell, the first line of your script must be `#!/bin/sh`. If you use Bash, the first line of your script must be `#!/usr/bin/env bash`.

Before submission, make sure you test each script with the `shellcheck` command, available on CSIE workstations. It catches common mistakes and gives useful suggestions.

Update:

We will not run your script against an automatic checker; we will read your script one by one and grade it by your understanding of shell scripting. You don't have to treat it like a [Judgegirl](#) problem that disagrees even upon a single character.

1. Uptime (25%)

`uptime` is a useful command to get an bird's-eye view of the running system. Simulate the `uptime` command with shell script.

Name: `my_uptime.sh`

Sample output:

```
root@ubuntu:~ # ./my_uptime.sh # uptime is just 7 hours, 13 minutes
08:12:22 up 7:13, 1 user, load average: 0.00, 0.00, 0.00
root@linux6:~ # ./my_uptime.sh
08:14:07 up 114 days, 8:13, 150 users, load average: 9.02, 9.49, 9.51
root@laptop:~ # ./my_uptime.sh
08:15:17 up 1 day, 10:22, 7 users, load average: 0.05, 0.10, 0.15
```

Beware the plurality trivia, i.e. “day” or “days”, “user” or “users” and don't forget to check out `man uptime`.

Update: regarding the format of `uptime`, please follow these rules:

- If less than one minute, print “0 min”.
- If less than one hour, print “xx min”.
- If less than a day, don't print “day”; just print “[hour]:[minute]”.
- The hour field, if less than 10, is padded with one space.
- If more than one day, don't forget to add “s” to “day”.
- You don't have to consider the cases where uptime is more than a week.
- For the curious, [here](#) is the actual implementation of `procps` `uptime`.

The following snippets are your building blocks:

```
# Get localtime
zdump /etc/local

# Get uptime
```

```
cat /proc/uptime
```

```
# Get logged-on users  
who
```

```
# Get load average  
cat /proc/loadavg
```

2. Where are you from? (15%)

We have many users on CSIE workstations, logging in from different countries, such as Singapore, Japan, Macau, etc. Find out which countries the workstation users are from. The user can be listed using `last -i`; the country name can be queried with `geoipllookup` (available on CSIE workstations); the output can be formatted by `uniq -c` and sorted by `sort -n`.

Please exclude IPs that cannot be queried.

Name: from.sh

Sample output:

```
root@linux6:~ # ./from.sh  
  1  JP, Japan  
  1  US, United States  
  2  MO, Macau  
  8  CN, China  
 11  HK, Hong Kong  
 75  SG, Singapore  
558  TW, Taiwan
```

3. Phone number checker (10%)

These are valid phone numbers:

```
0912345678  
0912-345678  
0912-345-678  
09xxxxxxx # where x is a digit  
09xx-xxxxxx # likewise  
09xx-xxx-xxx # likewise
```

anything other than these is deemed invalid, for example:

```
0912345-678
```

If the phone number is valid, print it out. If not, do nothing.

Name: phone_check.sh

Sample output:

```
./phone_check.sh 0912-345-678 # Valid so print it out  
0912-345-678  
./phone_check.sh 0912-345-6789 # Invalid so do nothing
```

4. (Bonus) NOL parser (10%)

Write a script to parse the following page (directly downloaded from nol.ntu.edu.tw and translated from *Big-5* to *UTF-8*): <https://www.csie.ntu.edu.tw/~yunchih/stuff/nol.html.txt>, which is a list of courses offered by the graduate institute of CSIE.

You are asked to extract the **course name**, the **instructor's name**, and the **course time** in each row, right-padded with spaces in a width of 50, 20, 10, respectively (See **Update below**). Since you are probably an undergraduate student uninterested in *Seminar*, *Special Project* and *Thesis*, if the script is supplied with the **-g** argument, exclude courses whose names **contain** those strings. Furthermore, if any field is missing (shown as ` ` in HTML), you should replace it with N/A.

Update: you can directly use the following command to format the output:

```
printf "%-50s\t%-20s\t%-10s\n" "$name" "$professor" "$time"
```

Name: nol_parser.sh

Sample output:

```
./nol_parser.sh -f input_file.html
Thesis (Ph.D.)           N/A                      N/A
Seminar                  CHANG RUEY-FENG         N/A
Special Project         JA-LING WU              N/A
Special Project         LI-CHEN FU              N/A
Special Project         WEN-CHIN CHEN          N/A
Special Project         GEN-HUEY CHEN          N/A
Special Project         JIEH HSIANG            N/A
Special Project         LAI, FEI-PEI           N/A
Special Project         HSIN-HSI CHEN          N/A
Special Project         MING OUH YOUNG         N/A
Special Project         OYANG, YEN-JEN         N/A
Special Project         YUNG-JEN HSU           N/A
Special Project         CHIOU-SHANN FUH        N/A
Special Project         YUH-DAUH LYUU         N/A
Special Project         N/A                    N/A
Special Project         CHIH-JEN LIN           N/A
Special Project         TEI-WEI KUO            N/A
Special Project         PANGFENG LIU          N/A
Special Project         PHONE LIN              N/A
Special Project         CHIA-LIN YANG          N/A
Special Project         YI-PING HUNG           N/A
Special Project         CHAO, KUN-MAO          N/A
Special Project         CHENG-FU CHOU          N/A
Special Project         AI-CHUN PANG           N/A
Special Project         CHI-SHENG SHIH        N/A
Special Project         YUNG-YU CHUANG        N/A
Special Project         SHIH-HAO HUNG          N/A
Special Project         HSUEH-I LU             N/A
Special Project         XUE ZHI-WEN           N/A
Special Project         CHANG RUEY-FENG        N/A
Special Project         TSENG Y. JANE          N/A
Special Project         CHENG PU-JEN           N/A
```

Special Project	LIN SHOU-DE	N/A
Special Project	LI MING-SUI	N/A
Special Project	SHU HONG-MING	N/A
Special Project	STEVEN LIAO	N/A
Special Project	BING-YU CHEN	N/A
Special Project	HSUAN-TIEN LIN	N/A
Special Project	HSIN-MU (MICHAEL) TSAI	N/A
Special Project	MIKE Y. CHEN	N/A
Special Project	JONATHAN LEE	N/A
Special Project	JYH-SHING ROGER JANG	N/A
Special Project	WEI-CHUNG HSU	N/A
Special Project	HSU-CHUN HSIAO	N/A
Special Project	TONY TAN	N/A
Special Project	YUN-NUNG CHEN	N/A
Thesis (M.S.)	N/A	N/A
Special Project	LIN-SHAN LEE	N/A
Special Project	JA-LING WU	N/A
Special Project	LI-CHEN FU	N/A
Special Project	WEN-CHIN CHEN	N/A
Special Project	GEN-HUEY CHEN	N/A
Special Project	JIEH HSIANG	N/A
Special Project	LAI, FEI-PEI	N/A
Special Project	HSIN-HSI CHEN	N/A
Special Project	MING OUH YOUNG	N/A
Special Project	OYANG, YEN-JEN	N/A
Special Project	YUNG-JEN HSU	N/A
Special Project	CHIOU-SHANN FUH	N/A
Special Project	YUH-DAUH LYUU	N/A
Special Project	N/A	N/A
Special Project	CHIH-JEN LIN	N/A
Special Project	TEI-WEI KUO	N/A
Special Project	PANGFENG LIU	N/A
Special Project	PHONE LIN	N/A
Special Project	CHIA-LIN YANG	N/A
Special Project	YI-PING HUNG	N/A
Special Project	CHAO, KUN-MAO	N/A
Special Project	CHENG-FU CHOU	N/A
Special Project	AI-CHUN PANG	N/A
Special Project	CHI-SHENG SHIH	N/A
Special Project	YUNG-YU CHUANG	N/A
Special Project	SHIH-HAO HUNG	N/A
Special Project	HSUEH-I LU	N/A
Special Project	XUE ZHI-WEN	N/A
Special Project	CHANG RUEY-FENG	N/A
Special Project	TSENG Y. JANE	N/A
Special Project	CHENG PU-JEN	N/A
Special Project	LIN SHOU-DE	N/A
Special Project	LI MING-SUI	N/A
Special Project	SHU HONG-MING	N/A
Special Project	STEVEN LIAO	N/A

Special Project	BING-YU CHEN	N/A
Special Project	HSUAN-TIEN LIN	N/A
Special Project	HSIN-MU (MICHAEL) TSAI	N/A
Special Project	MIKE Y. CHEN	N/A
Special Project	JONATHAN LEE	N/A
Special Project	JYH-SHING ROGER JANG	N/A
Special Project	WEI-CHUNG HSU	N/A
Special Project	HSU-CHUN HSIAO	N/A
Special Project	TONY TAN	N/A
Special Project	YUN-NUNG CHEN	N/A
Seminar	SHU HONG-MING	N/A
Seminar	LI MING-SUI	N/A
Advanced Operating System	CHI-SHENG SHIH	Thu 7,8,9
Brain Theory	CHENG-YUAN LIOU	Wed 7,8,9
Performance Modeling	CHENG-FU CHOU	Wed 7,8,9
Performance Modeling	TAY YOUNG CHIANG	Wed 2,3,4
Principles of Financial Computing	YUH-DAUH LYUU	Wed 2,3,4
Numerical Methods	CHIH-JEN LIN	Mon 2,3,4
Natural Language Processing	HSIN-HSI CHEN	Thu 2,3,4
Software Engineering Design	JONATHAN LEE	Tue 6,7,8
Information Theory and Coding Techniques	JA-LING WU	Mon 7,8,9
Applied Algebra	WEN-CHIN CHEN	Tue 7,8,9
Advanced Compiler Design	WEI-CHUNG HSU	Mon A,B,C
Advanced Computer Networks	AI-CHUN PANG	Mon 7,8,9
Advanced Computer Architecture	CHIA-LIN YANG	Tue 7,8,9
Parallel Programming	PANGFENG LIU	Tue 7,8,9
Multimediuim Computing Environment	CHANG RUEY-FENG	Wed 3,4,5
Virtual Reality	MING OUH YOUNG	Mon 7,8,9
Medical Information System	LAI, FEI-PEI	Tue 6,7,8
Cryptography and Network Security	HSU-CHUN HSIAO	Wed 7,8,9
Digital Visual Effects	YUNG-YU CHUANG	Wed 7,8,9
An Introduction to Advanced Performance Modeling	PHONE LIN	Tue 7,8,9
Game Programming	MIKE Y. CHEN	Tue 7,8,9
Web Retrieval and Mining	CHENG PU-JEN	Fri 2,3,4
Technical Writing and Research Method	LIN SHOU-DE	Tue 7,8,9
Introduction to Digital Speech Processing	LIN-SHAN LEE	Wed 2,3,4
Embedded Operating System Implementation	XUE ZHI-WEN	Thu 7,8,9
Advanced Human Computer Interaction	MIKE Y. CHEN	Tue 2,3,4
Next-generation Wireless Networks	AI-CHUN PANG	Tue 2,3,4
Gpu Programming	WEI-CHAO CHEN	Mon A,B,C
Advanced Computer Vision	CHIOU-SHANN FUH	Tue 7,8,9
Metabolomics	TSENG Y. JANE	Thu 6,7,8
Topics in Machine Learning	CHIH-JEN LIN	Tue 2,3,4
Advanced Topics in Systems Research	SHIH-HAO HUNG	Mon 7,8,9
Location Based Technologies,Applications and Services	CHENG-HONG CHO	Mon 7,8,9
Big Data Systems	STEVEN LIAO	Fri A,B,C
Virtual Machines	WEI-CHUNG HSU	Thu 7,8,9
Intelligent Conversational Bot	YUN-NUNG CHEN	Tue 2,3,4
Machine Learning Techniques	HSUAN-TIEN LIN	Tue 5,6
Introduction to Communication Complexity	TONY TAN	Mon 2,3,4

Net Arts

N/A

Wed 7,8,9

Music Signal Analysis and Retrieval

JYH-SHING ROGER JANG

Mon 2,3,4

./nol_parser.sh -f input.html -g		
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Brain Theory	CHENG-YUAN LIOU	Wed 7,8,9
Performance Modeling	CHENG-FU CHOU	Wed 7,8,9
Performance Modeling	TAY YOUNG CHIANG	Wed 2,3,4
Principles of Financial Computing	YUH-DAUH LYUU	Wed 2,3,4
Numerical Methods	CHIH-JEN LIN	Mon 2,3,4
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Music Signal Analysis and Retrieval	JYH-SHING ROGER JANG	Mon 2,3,4

```
./nol_parser.sh -f /proc/meow.html
Input file not found
./nol_parser.sh
Missing input file
```

You don't need to consider other pages on NOL, just parse the one provided.