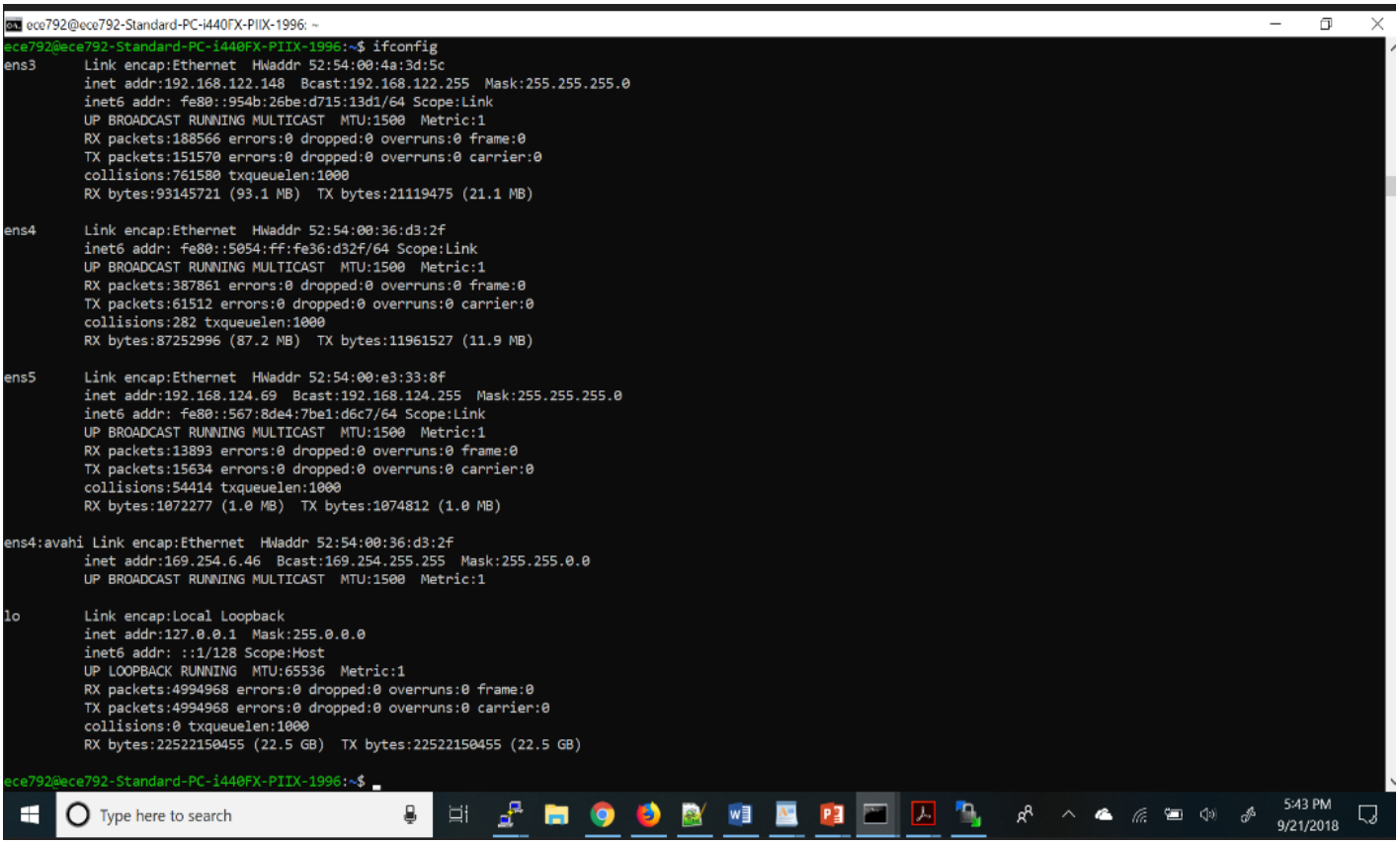
ECE792-038 Homework Assignment #1 Basic Topics Due Monday, September 17, 2018

No late homework will be accepted; turn in whatever you have completed. **Provide CLI**

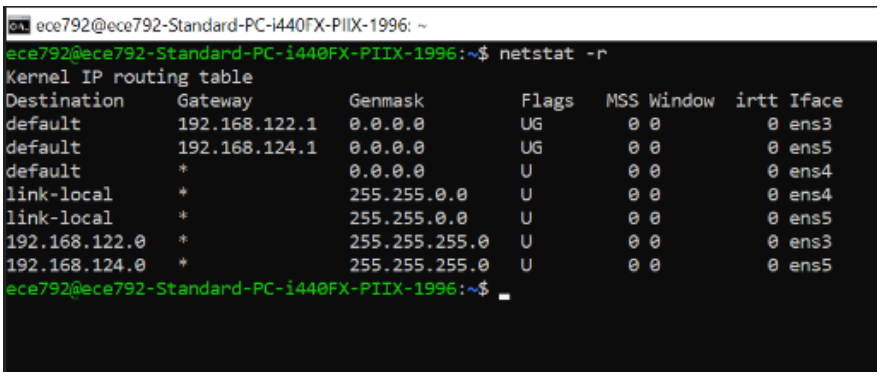
output/Screenshot to support your answer

Problem 1. *(10 Points)* **Basic Linux network verification tasks.** Using the CLI Utility, show the following default configurations of your machine:

1. Interfaces



2.Routing table



2 DNS

```
ece792@ece792-Standard-PC-i440FX-PIIX-1996: ~
# Dynamic resolv.conf(5) file for glibc resolver(3) generated by resolvconf(8)
#     DO NOT EDIT THIS FILE BY HAND -- YOUR CHANGES WILL BE OVERWRITTEN
nameserver 127.0.1.1
~
~
~
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~
"/etc/resolv.conf" [readonly] 3L, 172C
```

3 DHCP (You might need to look at some configurations file)

```
ece792@ece792-Standard-PC-i440FX-PIIX-1996: ~
# Configuration file for /sbin/dhclient.
#
# This is a sample configuration file for dhclient. See dhclient.conf's
#       man page for more information about the syntax of this file
#       and a more comprehensive list of the parameters understood by
#       dhclient.
#
# Normally, if the DHCP server provides reasonable information and does
#       not leave anything out (like the domain name, for example), then
#       few changes must be made to this file, if any.
#

option rfc3442-classless-static-routes code 121 = array of unsigned integer 8;

send host-name = gethostname();
request subnet-mask, broadcast-address, time-offset, routers,
        domain-name, domain-name-servers, domain-search, host-name,
        dhcp6.name-servers, dhcp6.domain-search, dhcp6.fqdn, dhcp6.sntp-servers,
        netbios-name-servers, netbios-scope, interface-mtu,
        rfc3442-classless-static-routes, ntp-servers;

#send dhcp-client-identifier 1:0:a0:24:ab:fb:9c;
#send dhcp-lease-time 3600;
#supersede domain-name "fugue.com home.vix.com";
#prepend domain-name-servers 127.0.0.1;
#require subnet-mask, domain-name-servers;
timeout 300;
#retry 60;
#reboot 10;
#select-timeout 5;
#initial-interval 2;
#script "/sbin/dhclient-script";
#media "-link0 -link1 -link2", "link0 link1";
#reject 192.33.137.209;

#alias {
#  interface "eth0";
#  fixed-address 192.5.5.213;
#  option subnet-mask 255.255.255.255;
#}
                                                                    1,1           Top
```

Problem 2. *(10 Points)* **Basic Linux performance verification tasks.** Using the CLI Utility, show following performance stats of your machine.

1. **CPU usage:** Display three reports of statistics for all processors at two second intervals. Which CPU is least used (*idle* most of the time)?

```
==============================================CPU USAGE ================================

This is the output when we stress the cpu using the command " stress-ng -c 4 -l 80 --timeout 60s "

ece792@ece792-Standard-PC-i440FX-PIIX-1996:~$ mpstat -P ALL 2 3
Linux 4.10.0-28-generic (ece792-Standard-PC-i440FX-PIIX-1996)   09/21/2018      _x86_64_        (4 CPU)

01:31:34 PM  CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
01:31:36 PM  all   80.95    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   19.05
01:31:36 PM    0   82.09    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   17.91
01:31:36 PM    1   77.61    0.00    0.50    0.00    0.00    0.50    0.00    0.00    0.00   21.39
01:31:36 PM    2   81.59    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   18.41
01:31:36 PM    3   81.50    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   18.50

01:31:36 PM  CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
01:31:38 PM  all   79.65    0.00    0.12    0.00    0.00    0.12    0.00    0.00    0.00   20.10
01:31:38 PM    0   79.90    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   20.10
01:31:38 PM    1   76.50    0.00    0.00    0.00    0.00    0.50    0.00    0.00    0.00   23.00
01:31:38 PM    2   80.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   20.00
01:31:38 PM    3   82.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   18.00

01:31:38 PM  CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
01:31:40 PM  all   79.35    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   20.65
01:31:40 PM    0   79.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   21.00
01:31:40 PM    1   80.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   20.00
01:31:40 PM    2   77.50    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   22.50
01:31:40 PM    3   81.41    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   18.59

Average:     CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
Average:     all   79.98    0.00    0.04    0.00    0.00    0.04    0.00    0.00    0.00   19.93
Average:       0   80.33    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   19.67
Average:       1   78.04    0.00    0.17    0.00    0.00    0.33    0.00    0.00    0.00   21.46
Average:       2   79.70    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   20.30
Average:       3   81.64    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00   18.36
ece792@ece792-Standard-PC-i440FX-PIIX-1996:~$
```

From the results of CLI output the least used CPU is CPU 1 as it has more percentage of IDLE time (21.46%)

when system is idle we got the corresponding result:

```
ece792@ece792-Standard-PC-i440FX-PIIX-1996:~$ mpstat -P ALL 2 3
Linux 4.10.0-28-generic (ece792-Standard-PC-i440FX-PIIX-1996)   09/21/2018      _x86_64_        (4 CPU)

01:35:10 PM  CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
01:35:12 PM  all    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00
01:35:12 PM    0    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00
01:35:12 PM    1    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00
01:35:12 PM    2    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00
01:35:12 PM    3    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00

01:35:12 PM  CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
01:35:14 PM  all    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00
01:35:14 PM    0    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00
01:35:14 PM    1    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00
01:35:14 PM    2    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00
01:35:14 PM    3    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  100.00

01:35:14 PM  CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
01:35:16 PM  all    0.25    0.00    0.12    0.12    0.00    0.12    0.00    0.00    0.00   99.38
01:35:16 PM    0    0.50    0.00    0.50    0.00    0.00    0.00    0.00    0.00    0.00   99.00
01:35:16 PM    1    0.00    0.00    0.00    0.50    0.00    0.00    0.00    0.00    0.00   99.50
01:35:16 PM    2    0.00    0.00    0.00    0.00    0.00    0.50    0.00    0.00    0.00   99.50
01:35:16 PM    3    0.00    0.00    0.50    0.00    0.00    0.00    0.00    0.00    0.00   99.50

Average:     CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
Average:     all    0.08    0.00    0.04    0.04    0.00    0.04    0.00    0.00    0.00   99.79
Average:       0    0.17    0.00    0.17    0.00    0.00    0.00    0.00    0.00    0.00   99.67
Average:       1    0.00    0.00    0.00    0.17    0.00    0.00    0.00    0.00    0.00   99.83
Average:       2    0.00    0.00    0.00    0.00    0.00    0.17    0.00    0.00    0.00   99.83
Average:       3    0.00    0.00    0.17    0.00    0.00    0.00    0.00    0.00    0.00   99.83
ece792@ece792-Standard-PC-i440FX-PIIX-1996:~$
```

Here the idle time for all the CPUs are 100%

2. **Memory usage:** Display 3 reports of MEM statistics for every active task in the system at two second intervals. Which one is the most memory intensive task.

   Ans: From the observation the highest memory used process is lightdm which uses 0.3% of the CPU

```
top - 12:47:28 up 3 days, 22:55,  1 user,  load average: 0.00, 0.00, 0.00
Tasks: 154 total,   1 running, 153 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.1 us,  0.0 sy,  0.0 ni, 99.8 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
KiB Mem : 24687732 total, 23198592 free,   284612 used,  1204528 buff/cache
KiB Swap: 25162748 total, 25162748 free,        0 used. 23908664 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU %MEM     TIME+ COMMAND
 1259 lightdm   20   0  981752  63472  48140 S   0.0  0.3  10:47.58 unity-greeter
  902 root      20   0  363924  44996  28460 S   0.0  0.2   3:00.82 Xorg
 1303 lightdm   20   0  668728  42240  28364 S   0.0  0.2   7:03.48 nm-applet
  809 root      20   0  461656  40356  13952 S   0.0  0.2   0:42.02 NetworkManager
 1719 lightdm   20   0  483156  31440  24444 S   0.0  0.1   0:01.63 notify-osd
 1317 lightdm   20   0  565896  31292  23140 S   0.0  0.1   0:01.06 indicator-keybo
  831 root      20   0  435292  25068  13912 S   0.0  0.1   0:12.63 snapd
 1305 lightdm   20   0  694664  24860  20384 S   0.0  0.1   0:01.70 unity-settings-
 1408 whoopsie  20   0  534096  19952  11024 S   0.0  0.1   0:12.42 whoopsie
 1316 lightdm   20   0  464588  13920  12120 S   0.0  0.1   0:02.84 indicator-datet
 1325 lightdm   20   0  403144  12952  11352 S   0.0  0.1   7:22.33 indicator-appli
```

```
top - 12:47:32 up 3 days, 22:55,  1 user,  load average: 0.00, 0.00, 0.00
Tasks: 154 total,   1 running, 153 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.0 us,  0.0 sy,  0.0 ni,100.0 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
KiB Mem : 24687732 total, 23198468 free,   284700 used,  1204564 buff/cache
KiB Swap: 25162748 total, 25162748 free,        0 used. 23908560 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU %MEM     TIME+ COMMAND
 1259 lightdm   20   0  981752  63472  48140 S   0.0  0.3  10:47.58 unity-greeter
  902 root      20   0  363924  44996  28460 S   0.0  0.2   3:00.82 Xorg
 1303 lightdm   20   0  668728  42240  28364 S   0.0  0.2   7:03.48 nm-applet
  809 root      20   0  461656  40356  13952 S   0.0  0.2   0:42.02 NetworkManager
 1719 lightdm   20   0  483156  31440  24444 S   0.0  0.1   0:01.63 notify-osd
 1317 lightdm   20   0  565896  31292  23140 S   0.0  0.1   0:01.06 indicator-keybo
  831 root      20   0  435292  25068  13912 S   0.0  0.1   0:12.63 snapd
 1305 lightdm   20   0  694664  24860  20384 S   0.0  0.1   0:01.70 unity-settings-
 1408 whoopsie  20   0  534096  19952  11024 S   0.0  0.1   0:12.42 whoopsie
 1316 lightdm   20   0  464588  13920  12120 S   0.0  0.1   0:02.84 indicator-datet
```


```
top - 12:47:32 up 3 days, 22:55,  1 user,  load average: 0.00, 0.00, 0.00
Tasks: 154 total,   1 running, 153 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.0 us,  0.0 sy,  0.0 ni,100.0 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
KiB Mem : 24687732 total, 23198468 free,   284700 used,  1204564 buff/cache
KiB Swap: 25162748 total, 25162748 free,        0 used. 23908560 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU %MEM     TIME+ COMMAND
 1259 lightdm   20   0  981752  63472  48140 S   0.0  0.3  10:47.58 unity-greeter
  902 root      20   0  363924  44996  28460 S   0.0  0.2   3:00.82 Xorg
 1303 lightdm   20   0  668728  42240  28364 S   0.0  0.2   7:03.48 nm-applet
  809 root      20   0  461656  40356  13952 S   0.0  0.2   0:42.02 NetworkManager
 1719 lightdm   20   0  483156  31440  24444 S   0.0  0.1   0:01.63 notify-osd
 1317 lightdm   20   0  565896  31292  23140 S   0.0  0.1   0:01.06 indicator-keybo
  831 root      20   0  435292  25068  13912 S   0.0  0.1   0:12.63 snapd
 1305 lightdm   20   0  694664  24860  20384 S   0.0  0.1   0:01.70 unity-settings-
 1408 whoopsie  20   0  534096  19952  11024 S   0.0  0.1   0:12.42 whoopsie
 1316 lightdm   20   0  464588  13920  12120 S   0.0  0.1   0:02.84 indicator-datet
```


For complete data see Problem2_partb_memstats file using notepad ++

Problem 3. *(20 Points)* **Basic Linux tasks, use of tools.** Install iperf traffic generator on your system. Run iperf command (iperf -c < *ipofyourVM* > -t 10 -l < *packetsize*(*eg*100*B*) >). Keep doubling packet sizes from 100 B to 6400B for different run. What is the average throughput achieved by the iperf data transfe for different packet sizer? Explain your observation. (Note: Before running client you nee to start your server iperf -s < *ipofyourVM* >)

Problem3_iperf.txt

(*also file available in the folder question123)

With the increase in packet size i,e(doubling the size of packet)the throughput and bandwidth is almost getting doubled as TCP performance increases

with the increase in packet size the no of system calls to be made becomes less.

Problem 4. *(50 Points)* **Slow server Problem.**

1. **Monitoring Script**

   Write a shell script to do the following tasks:

(a) Log the CPU load averages in a CSV file with T second granularity. (format of csv: timestamp, 1 min load average, 5 min load average, 15 min load average)

(b) Generate alert

   i. "HIGH CPU usage" if CPU usage in last one minute is more than a user defined threshold X .

   ii. "Very HIGH CPU usage" if CPU usage in last 5 minutes is more than a user defined threshold Y and load is increasing.

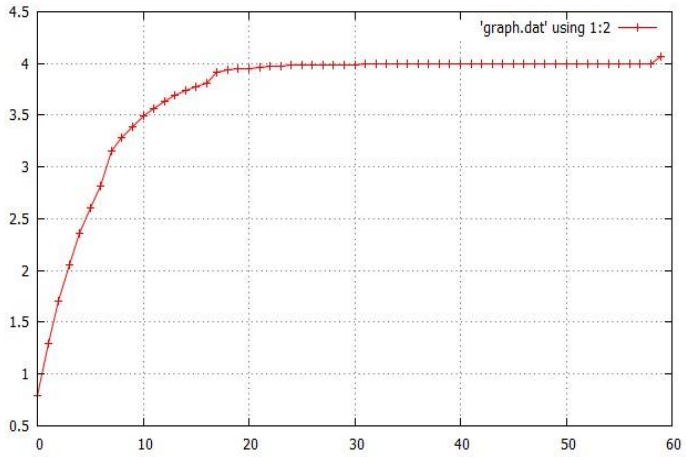
   Log alert messages in a separate CSV file as timestamp, alert String, CPU load Average

Test this script by running a cron job. Submit your script (with readme) and a graph showing one minute load average taken every 10 seconds over 10 minutes duration.

2. **Log cleaning scripts** A script to clear log files every hour (You can use cron job or log rotation)

```
ece792@ece792-Standard-PC-i440FX-PIIX-1996:~/HW1$ dir
caller.sh  memstats_1  Problem2_partb_memstats  q4.sh  remove_log.sh
ece792@ece792-Standard-PC-i440FX-PIIX-1996:~/HW1$ clear
ece792@ece792-Standard-PC-i440FX-PIIX-1996:~/HW1$ bash caller.sh
Load Monitor Script Starting...
Enter the Threshold X1 for setting High CPU alert
3
Enter the Theshold X5 for setting very HIGH CPU alert
4
Enter The granularity value T in seconds
10
Enter total time T in minutes
10
Executing the  Script...
HIGH CPU usage
HIGH CPU usage
HIGH CPU usage
HIGH CPU usage
HIGH CPU usage
HIGH CPU usage
HIGH CPU usage
HIGH CPU usage
HIGH CPU usage
HIGH CPU usage
```

```
ece792@ece792-Standard-PC-i440FX-PIIX-1996:~$ stress-ng -c 4
stress-ng: info:  [22657] defaulting to a 86400 second run per stressor
stress-ng: info:  [22657] dispatching hogs: 4 cpu
stress-ng: info:  [22657] cache allocate: default cache size: 4096K
```



X-axis time T, Y axis 1min load %