

Hands-on Lab Description

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CS-NET-00001 – Check Computer Network Setup

Category:

CS-NET: Computer Networking

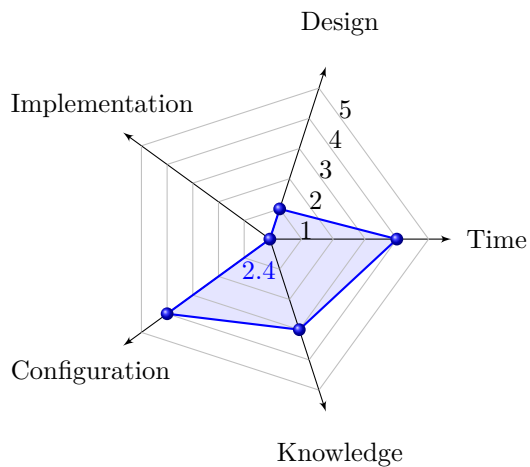
Objectives:

- 1 Learn a given network's setup
- 2 Check network connectivity and network service reachability.

Estimated Lab Duration:

- 1 Expert: 10 minutes
- 2 Novice: 20 minutes

Difficulty Diagram:



Difficulty Table.

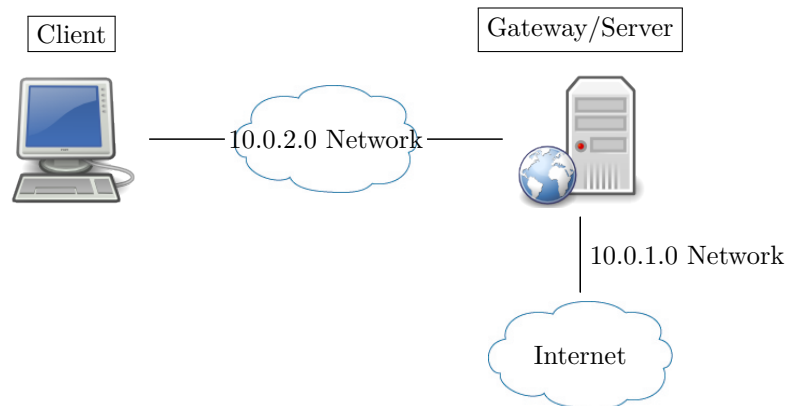
Measurements	Values (0-5)
Time	4
Design	1
Implementation	0
Configuration	4
Knowledge	3
Score (Average)	2.4

Required OS:

Linux: Ubuntu 18.04 LTS

Lab Running Environment:

VirtualBox <https://www.virtualbox.org/> (Reference Labs: CS-SYS-00101)



- 1 Client: Linux (Ubuntu 18.04 LTS)
- 2 Gateway/Server: Linux (Ubuntu 18.04 LTS)
- 3 Network Setup:
Local NAT Network: 10.0.2.0/24
Internet is connected through address: 10.0.2.1

Lab Preparations:

Initial setup: no packet forwarding rules are setup on the Gateway.
Pre-knowledge: A short Linux tutorial (CS-SYS-00001)

Lab Overview

In this lab, you are required to inspect your computer's network set up to understand: (a) identify network interfaces, (b) discover network configurations such as MAC addresses and IP addresses, (c) discover local and global networking configuration to enable local and global communication, (d) practice well-known networking tools to discover network configurations, and (e) use networking tools to change network configurations.

Task 1 Handy network tools

Before starting Task 2, it is useful to check if several tools that have been installed in the system, which can be used for network management, monitoring, and diagnostics. On Linux, there are some handy network tools that you can install:

```
$ sudo apt install net-tools % basic network tools for ubuntu such as ifconfig,
    route, ip, etc.
$ sudo apt install traceroute % tools to track packets sending path
$ sudo apt install wireshark % a network sniffer tool. If commandline only, you may
    install tshark instead
$ sudo apt install ifmetric % it changes the route metrics for an interface
$ sudo apt install gnome-system-tools % it consists a set of backends perl scripts
    to manipulate the system's configuration
```

Task 2 Check Network Setup

- 1 Usually system will assign one DHCP interfaces on 10.0.2.0/24 network to allocate IP addresses to each VM.
- 2 Changing IP addresses may cause network disconnection, thus change with cautious or DO NOT change IP addresses for each VM interface unless told so in the lab description.
- 3 In order to raise the privilege to run some commands (i.e., usually see "...operation not permitted"), then increase user's privilege is required to run "sudo -i" and escalate the privilege.

Note that: All Linux commands are case sensitive. Also make sure the firewall rules allowing remote access. A simple approach is to disable firewalls on every *vm* using:

```
$ ufw disable % on Ubuntu 14.04 and above
$ service iptables stop % on Ubuntu 12.04 and before.
```

Based on the network topology, learn how to use the following commands on Linux VMs:

1. Network interface operations and configurations:

```
$ sudo ifup interface_id % up an interface
$ sudo ifdown interface_id % down an interface
$ ifconfig % show all interface
$ ip a % show all interface
```

```
$ ethtool interface_id % show an ethernet interface setting
$ lshw -class network % show all network interfaces
```

2. Use *ip* command to check/set IP configurations:

```
$ sudo ip addr add 10.10.0.200/24 dev enp0s3 % assign ip address
    10.10.0.200/24 to an interface ens2, DON'T TRY THIS COMMAND ON VM
$ sudo ip link set dev enp0s3 up % set interface ens2 up
$ sudo ip link set dev enp0s3 down % set interface ens2 down
$ sudo ip route add default via 10.10.0.1 % set up default gateway to
    10.10.0.1
$ sudo ip addr flush enp0s3 % flush IP configurations on interface eth0
$ ip route show % show routing table
$ ip address show dev enp0s3 % show ip set up on interface ens2
```

3. Check networking setup:

```
$ route % Display existing routes
$ route -n % Display existing routes with numerical IP address (faster)
```

4. Network reachability:

```
$ ping ip_address % test the reachability of an IP address
$ traceroute ip_address % show the path to a giving IP_address
$ route add default gw 10.0.2.1 % add default gateway to 192.168.1.10
$ route delete default gw 10.0.2.1 % delete default gateway of 192.168.1.10
$ route add -host 192.168.1.51 reject % Reject routing to a particular host
$ route add -net 192.168.1.0 netmask 255.255.255.0 reject % Reject routing to
    a particular network
$ route add -net 192.168.3.0 netmask 255.255.255.0 gw 10.0.2.1 % add a static
    route
```

5. Network setup and statistics:

```
$ netstat -sp tcp % TCP protocol statistics
$ netstat -sp udp % UDP protocol statistics
$ netstat -a % show both listening and non-listening ports
$ netstat -l % show only listening ports
```

6. Capturing network traffic:

```
$ tcpdump -i enp0s3 % capture packets on interface eth0
$ tcpdump -n -i eth0 % capture IP address packets
$ tcpdump -i enp0s3 tcp % capture only tcp packets
$ tcpdump -i enp0s3 port 22 % capture packet from a specific port
$ tcpdump -i enp0s3 src 192.168.0.2 % capture packet from a source IP
$ tcpdump -i enp0s3 dst 50.116.66.139 % capture packet from a destination IP
$ tcpdump -c 5 -i enp0s3 % capture only 5 packets on interface eth0
$ tcpdump -A -i enp0s3 % display in ASCII format
$ tcpdump -D % display available interface
$ tcpdump -w 0001.pcap -i enp0s3 % capture packets in a file 0001.pcap
$ tcpdump -r 0001.pcap % read the captured file 0001.pcap
```

7. Remote access:

```
$ telnet ip_address % telnet to a host
$ ssh ip_address % ssch to a host
```

Task 3 Networking services

Learn how to use the following commands on Linux VMs for requesting networking services such as DNS, DHCP, ARP, etc.:

```
$ hostname % obtain the DNS name
$ host www.asu.edu % obtain DNS name of a URL
$ nslookup ip_address/url % check IP and URL mapping using DNS service
$ nslookup www.asu.edu % abtain DNS name and IP addresses of a URL (a little more
info)
$ dig ip_address/url % a more informational IP and URL mappting using DNS
service
$ dig www.asu.edu % abtain DNS name and IP addresses of a URL (more info)
$ arp ip_address % check MAC address and IP address mapping
$ nmap -A url % check runing service through port scanning
$ whois ip_address % Domain name
$ dhclient enp0s3 % request IP address for an interface using the DHCP
client
$ ... % many others
```

Deliverable

You are required to draw a network topology and note network configurations on the topology to show the discovered network setup by using various networking tools.

Related Information and Resource

```
Most frequently used computer networking commands:
http://www.tldp.org/LDP/GNU-Linux-Tools-Summary/html/c8319.htm
```

```
Internet commands:
http://www.tldp.org/LDP/GNU-Linux-Tools-Summary/html/x8751.htm
```

```
Remote access and downloading commands:
http://www.tldp.org/LDP/GNU-Linux-Tools-Summary/html/x8751.htm
```