

## Practical 11

### Network Applications and Configurations

- A. TCP/IP and Network Commands
- B. Email Overview
- C. Managing Network Interfaces
- D. Basic IP Routing and Gateways

#### A. TCP/IP and Network Commands

1. View the “/etc/services” file by typing: `cat /etc/services`  
What is the port number for the “smtp” service?

25

2. Show the result page by page by typing: `cat /etc/services | more`  
( **PIPE** the output of cat command to MORE, Jump the page one at a time by SPACEBAR)
3. search the result AUTOMATICALLY by typing `cat /etc/services | grep smtp`

```
jipx@ubuntu-jipx:~$ cat /etc/services | grep smtp
smtp      25/tcp      mail
urd       465/tcp      ssmtp smtps  # URL Rendesvous Directory for SSM
jipx@ubuntu-jipx:~$ _
```

4. Output the result to a text file “resultSmtplib.txt”

```
jipx@ubuntu-jipx:~$ cat /etc/services | grep smtp >resultSmtplib.txt
jipx@ubuntu-jipx:~$ ls
resultSmtplib.txt
jipx@ubuntu-jipx:~$ cat resultSmtplib.txt
smtp      25/tcp      mail
urd       465/tcp      ssmtp smtps  # URL Rendesvous Directory for SSM
jipx@ubuntu-jipx:~$
```

5. How many services related to SMTP?

```
wc -l resultSmtplib.txt
```

Write a single command to get the result.

```
jipx@ubuntu-jipx:~$ cat /etc/services | grep smtp | wc -l
2
```

please delete the temporary file generated “resultSmtplib.txt”

To remove (or delete) a file or directory in Linux from the command line, use the rm (remove) command. Be extra careful when removing files or directories with the rm command, because once the file is deleted it cannot be recovered.

6. Type `netstat -tuna` to list all Ports (tcp and udp) that are opened are listed as "LISTEN".

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7. Write a single command to get the total number of ports opened.

```
netstat -an | wc -l
```

8. Type `ifconfig` to display your machine's IP address.  
You should get a display similar to that shown below. This command allows you to find out the IP address & MAC address of your various network interfaces on your server.

```

jlp@buntuerver:~$ ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
    inet 192.168.145.131  netmask 255.255.255.0  broadcast 192.168.145.255
    inet6 fe80::20c:29ff:fe83:ac ec  prefixlen 64  scopeid 0x20<link>
    ether 00:0c:29:83:ac:ec  txqueuelen 1000  (Ethernet)
    RX packets 102214  bytes 135912203 (135.9 MB)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 48435  bytes 3055445 (3.0 MB)
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
    inet 127.0.0.1  netmask 255.0.0.0
    inet6 ::1  prefixlen 128  scopeid 0x10<host>
    loop txqueuelen 1000  (Local Loopback)
    RX packets 194  bytes 16274 (16.2 KB)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 194  bytes 16274 (16.2 KB)
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
  
```

ens33 IP address:	192.168.106.131
lo IP address:	127.0.0.1

9. You can also type `ip addr` to display your machine's IP address.

10. Type `ping www.google.com`

What is the IP address of domain name [www.google.com](http://www.google.com)

IP address(s) for <a href="http://www.google.com">www.google.com</a>	74.125.24.147
--	---------------

11. Try `nslookup www.google.com`, and `dig www.google.com`  
You should see response similar to the shown below.

```

jipx@buntuerver:~$ dig www.google.com

;<<> DiG 9.11.3-1ubuntu1.5-Ubuntu <<> www.google.com
;; global options: +cmd
;; Got answer:
;;->HEADER<<- opcode: QUERY, status: NOERROR, id: 30777
;; flags: qr rd ra; QUERY: 1, ANSWER: 6, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:: udp: 65494
;; QUESTION SECTION:
;www.google.com.                IN      A

;; ANSWER SECTION:
www.google.com.                5      IN      A      74.125.130.104
www.google.com.                5      IN      A      74.125.130.99
www.google.com.                5      IN      A      74.125.130.103
www.google.com.                5      IN      A      74.125.130.105
www.google.com.                5      IN      A      74.125.130.147
www.google.com.                5      IN      A      74.125.130.106

;; Query time: 13 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Sun Mar 03 04:53:41 UTC 2019
;; MSG SIZE rcvd: 139

jipx@buntuerver:~$

```

Record down the DNS server IP address and port number

DNS server IP	74.125.24.106
DNS server viPORT	65494

12. Type `cat /etc/resolv.conf` to verify the DNS server name in the file:  
/etc/resolv.conf

```

jipx@buntuerver:~$ vi /etc/resolv.conf

```

```

# This file is managed by man:systemd-resolved(8). Do not edit.
#
# This is a dynamic resolv.conf file for connecting local clients to the
# internal DNS stub resolver of systemd-resolved. This file lists all
# configured search domains.
#
# Run "systemd-resolve --status" to see details about the uplink DNS servers
# currently in use.
#
# Third party programs must not access this file directly, but only through the
# symlink at /etc/resolv.conf. To manage man:resolv.conf(5) in a different way,
# replace this symlink by a static file or a different symlink.
#
# See man:systemd-resolved.service(8) for details about the supported modes of
# operation for /etc/resolv.conf.

nameserver 127.0.0.53
options edns0
search localdomain

```

13. Ping your physical Windows 10 machine  
Type `ping your_physical_Windows10_IP_address`  
Note: To find your\_physical\_Windows10\_IP\_address, run “ipconfig/all” in Windows and look for “IPv4 Address” under “VMWare Ethernet Adapter for VMnet8”

## B. Change your host name

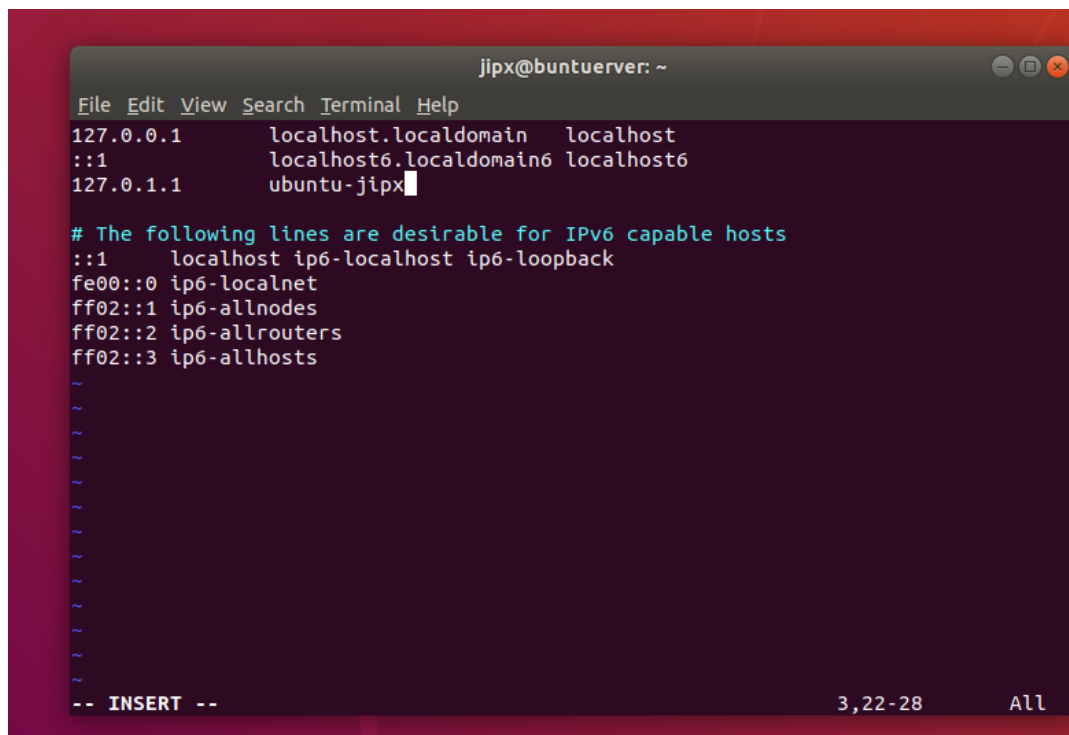
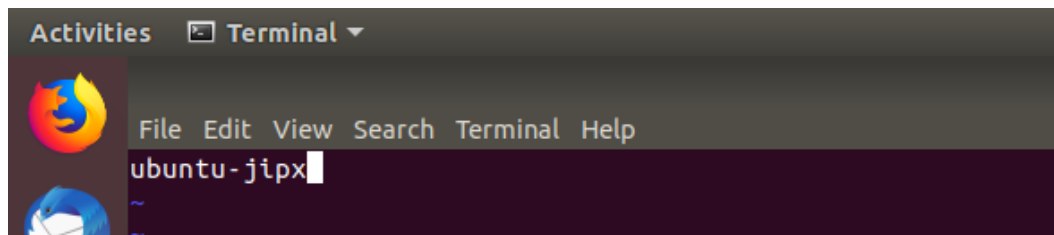
1. Press Ctrl+Alt+T on keyboard to open the terminal. When it opens, run the below command:

```
hostname
```

2. To change the name permanently, run command to edit the host files:

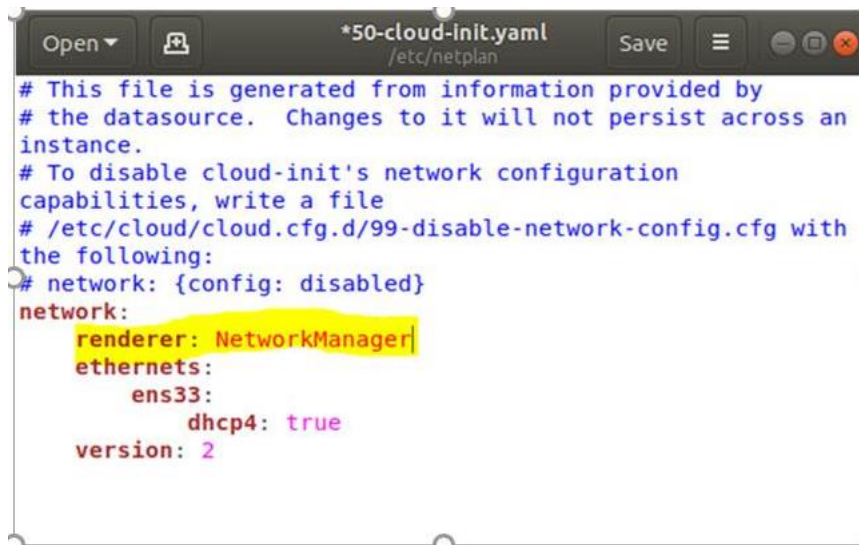
Note: For Ubuntu server without a GUI, run `sudo vi /etc/hostname` and `sudo vi /etc/hosts` and edit them one by one.

In both files, change the name to what you want and save them.



3. Edit the file `/etc/netplan/50-cloud-init.yaml` and add in the following line:  
`renderer: NetworkManager`

Type `sudo gedit /etc/netplan/50-cloud-init.yaml`



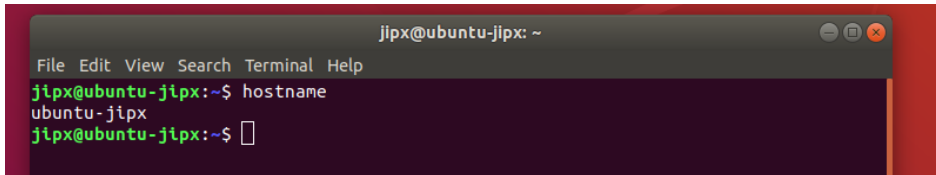
4. Run `sudo netplan` to apply, to effect the change

Type `sudo netplan apply`

5. Restart your Ubuntu VM.

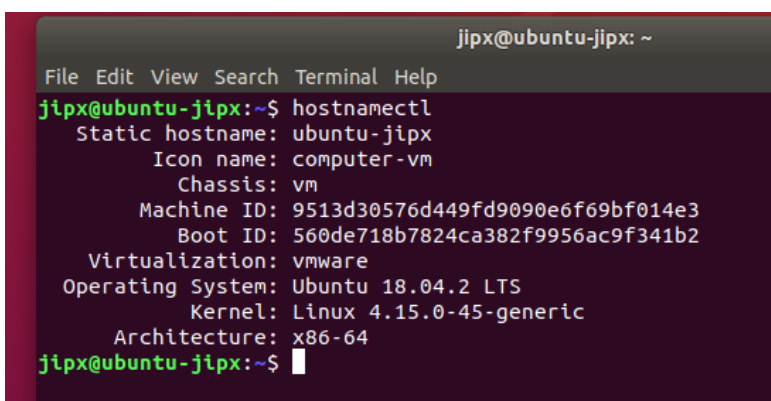
6. Type `cat /etc/hosts`  
`cat /etc/hostname`  
 You will notice that the settings have been changed.

7. Type `hostname` to reconfirm that the computer name has indeed changed.



```
jipx@ubuntu-jipx: ~
File Edit View Search Terminal Help
jipx@ubuntu-jipx:~$ hostname
ubuntu-jipx
jipx@ubuntu-jipx:~$
```

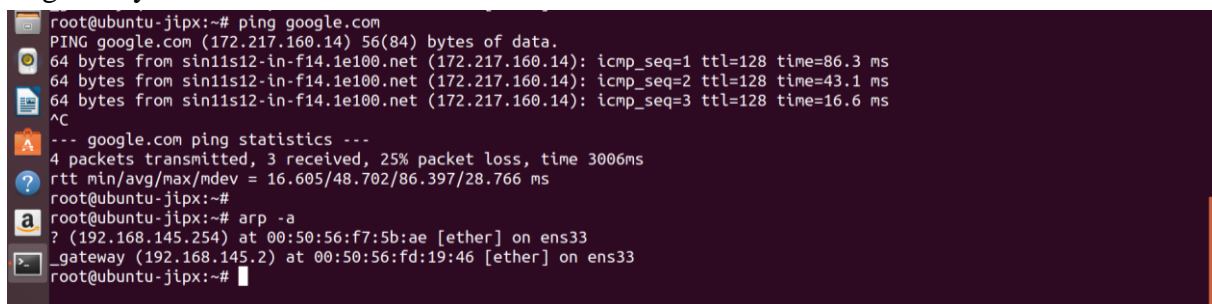
8. Type `hostnamectl` to reconfirm that the computer name has indeed changed.



```
jipx@ubuntu-jipx: ~
File Edit View Search Terminal Help
jipx@ubuntu-jipx:~$ hostnamectl
Static hostname: ubuntu-jipx
Icon name: computer-vm
Chassis: vm
Machine ID: 9513d30576d449fd9090e6f69bf014e3
Boot ID: 560de718b7824ca382f9956ac9f341b2
Virtualization: vmware
Operating System: Ubuntu 18.04.2 LTS
Kernel: Linux 4.15.0-45-generic
Architecture: x86-64
jipx@ubuntu-jipx:~$
```

### C. Basic IP Routing and Gateways (make sure firewall is open)

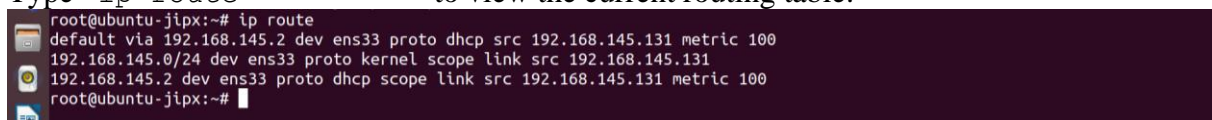
1. Ping to another machine e.g. `ping www.google.com`
2. Type `arp -a` to view the ARP cache. Can you find the MAC address of gateway?



```
root@ubuntu-jipx:~# ping google.com
PING google.com (172.217.160.14) 56(84) bytes of data:
64 bytes from sin11s12-in-f14.1e100.net (172.217.160.14): icmp_seq=1 ttl=128 time=86.3 ms
64 bytes from sin11s12-in-f14.1e100.net (172.217.160.14): icmp_seq=2 ttl=128 time=43.1 ms
64 bytes from sin11s12-in-f14.1e100.net (172.217.160.14): icmp_seq=3 ttl=128 time=16.6 ms
^C
--- google.com ping statistics ---
4 packets transmitted, 3 received, 25% packet loss, time 3006ms
rtt min/avg/max/mdev = 16.605/48.702/86.397/28.766 ms
root@ubuntu-jipx:~#
root@ubuntu-jipx:~# arp -a
? (192.168.145.254) at 00:50:56:f7:5b:ae [ether] on ens33
*_gateway (192.168.145.2) at 00:50:56:fd:19:46 [ether] on ens33
root@ubuntu-jipx:~#
```

MAC address of your gateway	00:50:56:e2:74:b8
-----------------------------	-------------------

3. Type `ip route` to view the current routing table.

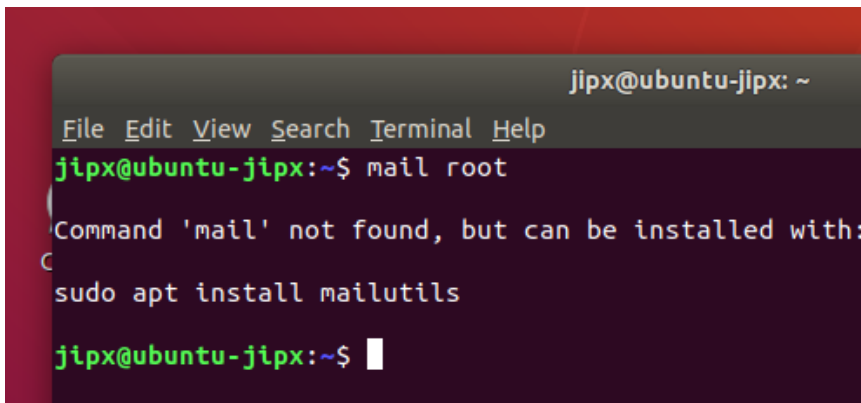


```
root@ubuntu-jipx:~# ip route
default via 192.168.145.2 dev ens33 proto dhcp src 192.168.145.131 metric 100
192.168.145.0/24 dev ens33 proto kernel scope link src 192.168.145.131
192.168.145.2 dev ens33 proto dhcp scope link src 192.168.145.131 metric 100
root@ubuntu-jipx:~#
```

## D. Email Overview

1. As user student, send an email to root.

mail root

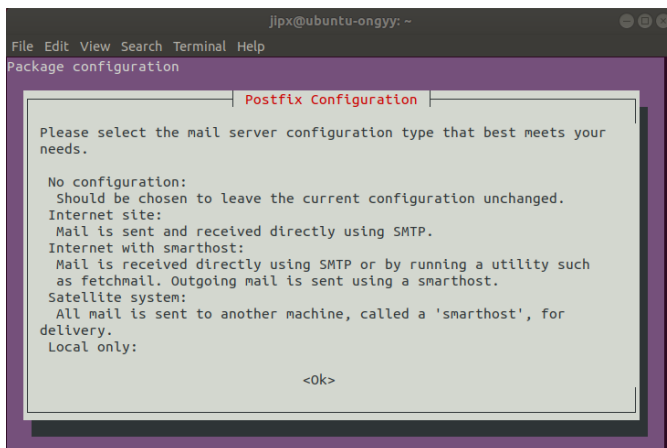


```
jipx@ubuntu-jipx: ~  
File Edit View Search Terminal Help  
jipx@ubuntu-jipx:~$ mail root  
Command 'mail' not found, but can be installed with:  
C sudo apt install mailutils  
jipx@ubuntu-jipx:~$
```

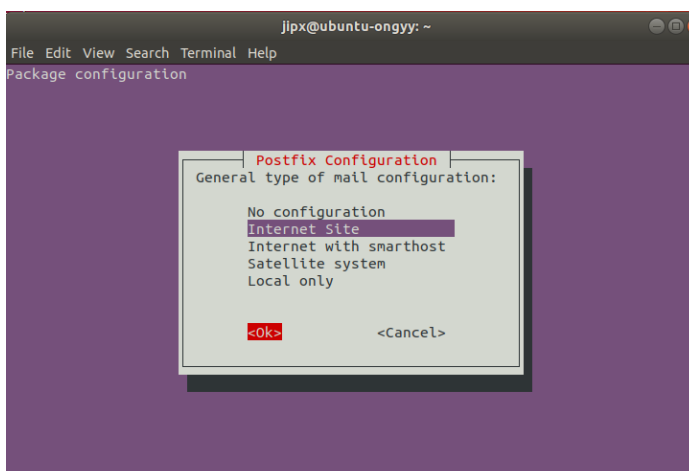
If mailutils not installed, you will see the above error.

**Type: sudo apt install mailutils**

Press **<tab>** key (cursor will be moved to "Ok"). Press the **<enter>** key.

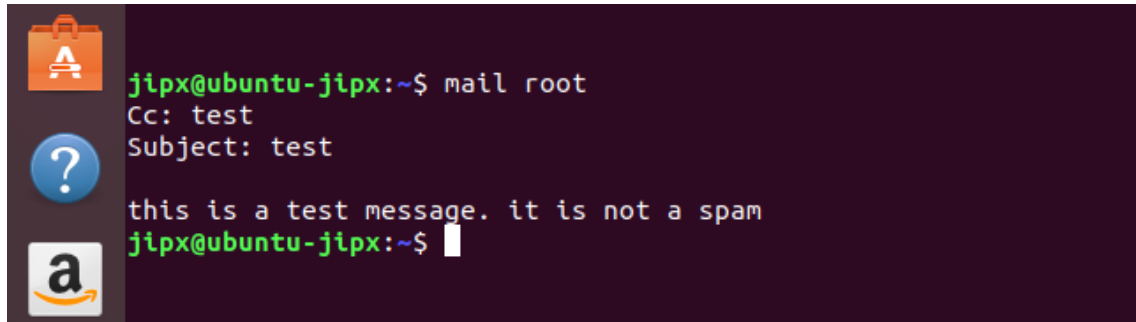


Select Internet Site & Ok (use **<tab>** key). Press the **<enter>** key.



After installation, type `mail root` again.

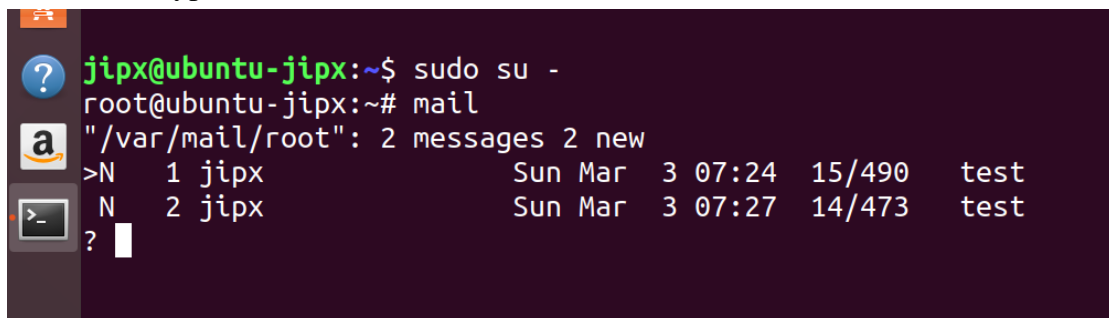
2. Type in a subject and press `<enter>`
3. Type in the mail message. When you have completed typing the mail message, press `<Control-D>` to end the message.



```
jipx@ubuntu-jipx:~$ mail root
Cc: test
Subject: test
this is a test message. it is not a spam
jipx@ubuntu-jipx:~$
```

if you see error: *"mail: cannot send message: process exited with a non-zero status"*:  
please refer to [troubleshooting](#)

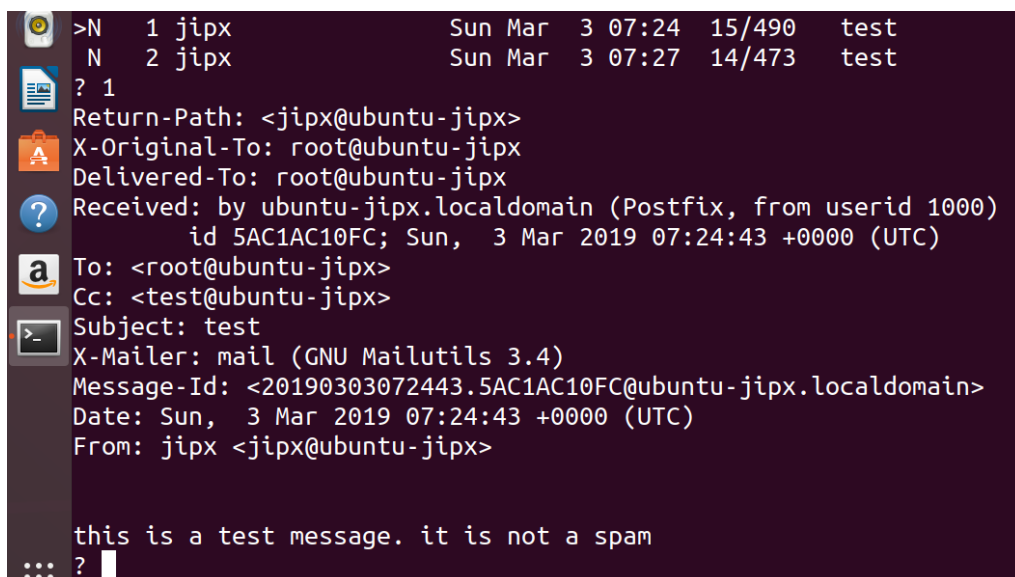
4. As user root, type `mail`



```
jipx@ubuntu-jipx:~$ sudo su -
root@ubuntu-jipx:~# mail
"/var/mail/root": 2 messages 2 new
>N 1 jipx Sun Mar 3 07:24 15/490 test
N 2 jipx Sun Mar 3 07:27 14/473 test
? 
```

A list of mail will be displayed. (Note: N means new mail received)

5. Type `<number>` to read mail, where `<number>` is the number of the mail you wish to read.



```
>N 1 jipx Sun Mar 3 07:24 15/490 test
N 2 jipx Sun Mar 3 07:27 14/473 test
? 1
Return-Path: <jipx@ubuntu-jipx>
X-Original-To: root@ubuntu-jipx
Delivered-To: root@ubuntu-jipx
Received: by ubuntu-jipx.localdomain (Postfix, from userid 1000)
        id 5AC1AC10FC; Sun, 3 Mar 2019 07:24:43 +0000 (UTC)
To: <root@ubuntu-jipx>
Cc: <test@ubuntu-jipx>
Subject: test
X-Mailer: mail (GNU Mailutils 3.4)
Message-Id: <20190303072443.5AC1AC10FC@ubuntu-jipx.localdomain>
Date: Sun, 3 Mar 2019 07:24:43 +0000 (UTC)
From: jipx <jipx@ubuntu-jipx>

this is a test message. it is not a spam
? 
```



6. Type `s` to save the read mail to mbox.

7. Type `h` to view the mail headers.

```
? h 2
>R 2 jipx Sun Mar 3 07:27 14/473 test
? 
```

(Note: R means mail read)

8. To delete mails, type `d <number>`, where `<number>` is the number of the mail to be deleted.

9. Type `q` to quit the “mail” program.

### TroubleShooting

*mail: cannot send message: process exited with a non-zero status*

(1) Check the mail log

```
sudo cat /var/log/mail.log
```

which said:

```
postfix/sendmail[27115]: fatal: open /etc/postfix/main.cf: No such file or directory
```

(2)

```
sudo dpkg-reconfigure postfix
```

source: <https://unix.stackexchange.com/questions/185365/mail-cannot-send-message-process-exited-with-a-non-zero-status>

*End of Practical*