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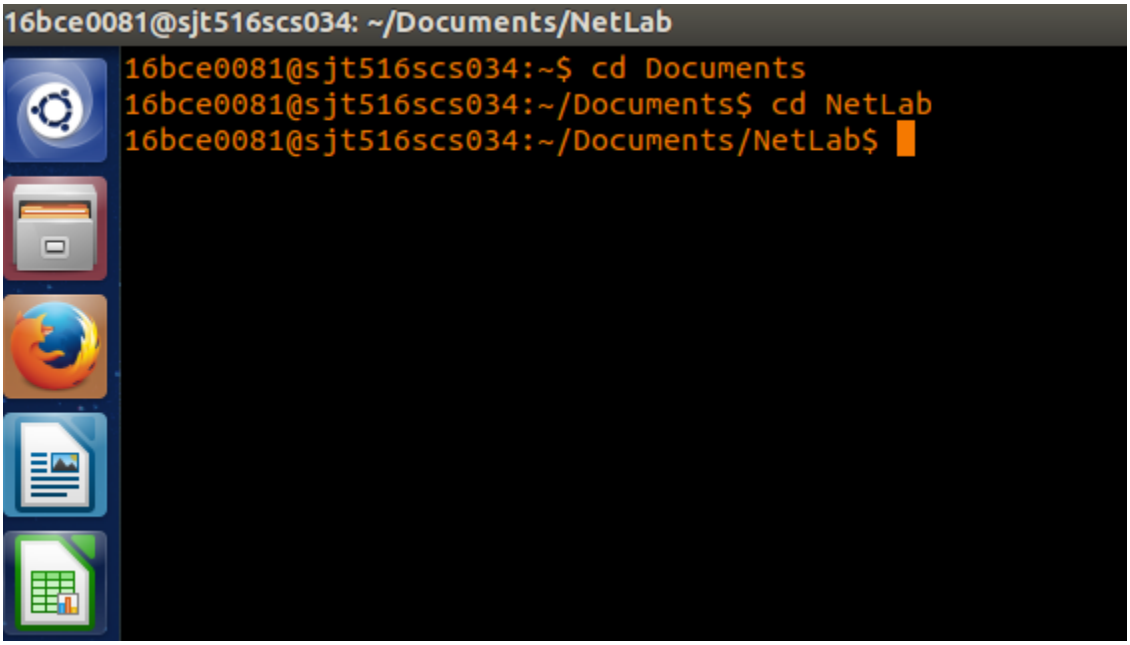
Reg. No.: 16BCE0081

Slot: L27 + L28

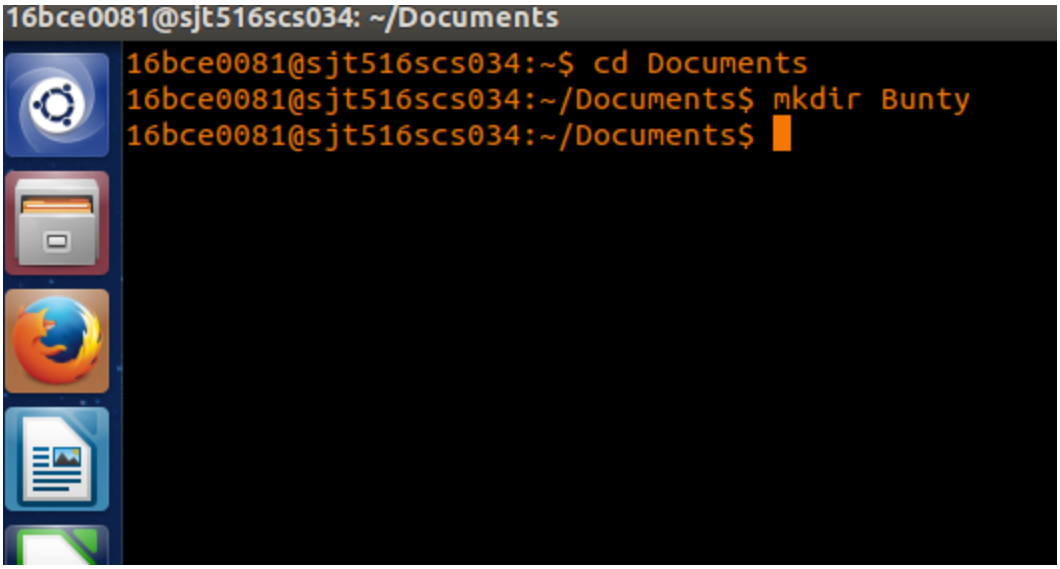
Sub: Networking Lab (CSE1004)

Basic Linux commands

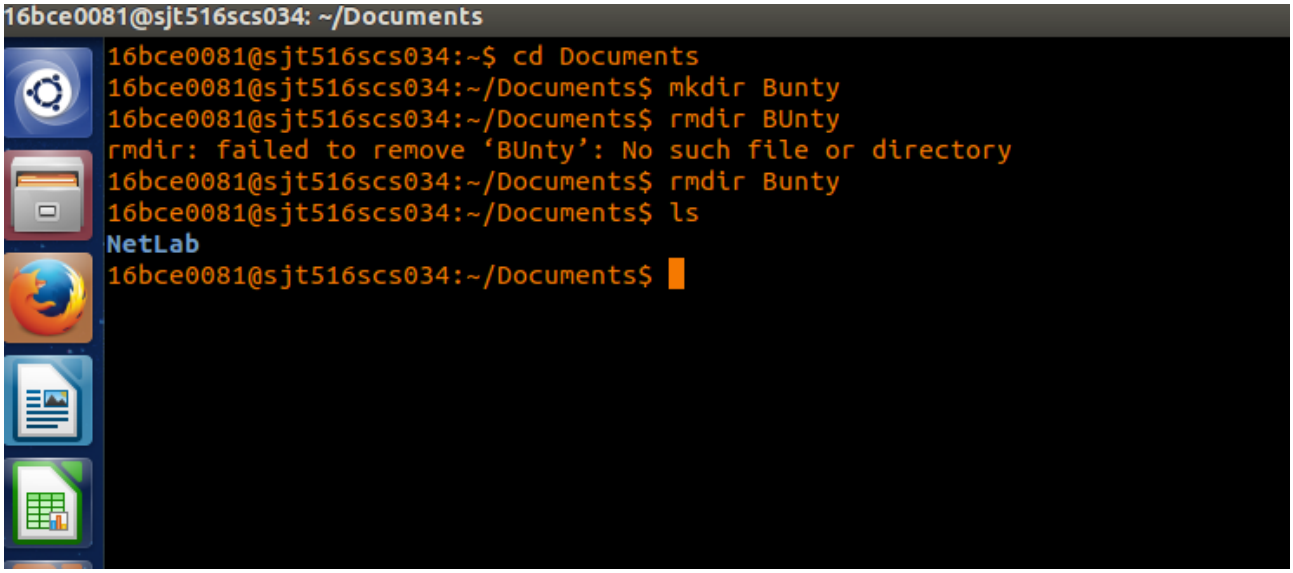
1. Command: cd
   Description: Change to new directory
   Syntax: cd Documents
   Output:



2. Command: mkdir
   Description: create new directory
   Syntax: mkdir Bunty
   Output:

3. 

Command: rmdir
Description: remove empty directory (remove files first)
Syntax: rmdir Bunty
Output:



4. Command: mv
Description: change name of directory
Syntax: mv <Source> <Dest>

5. Command: pwd
Description: show current directory
Syntax: pwd

6. Command: date
Description: show date and time

Syntax: date

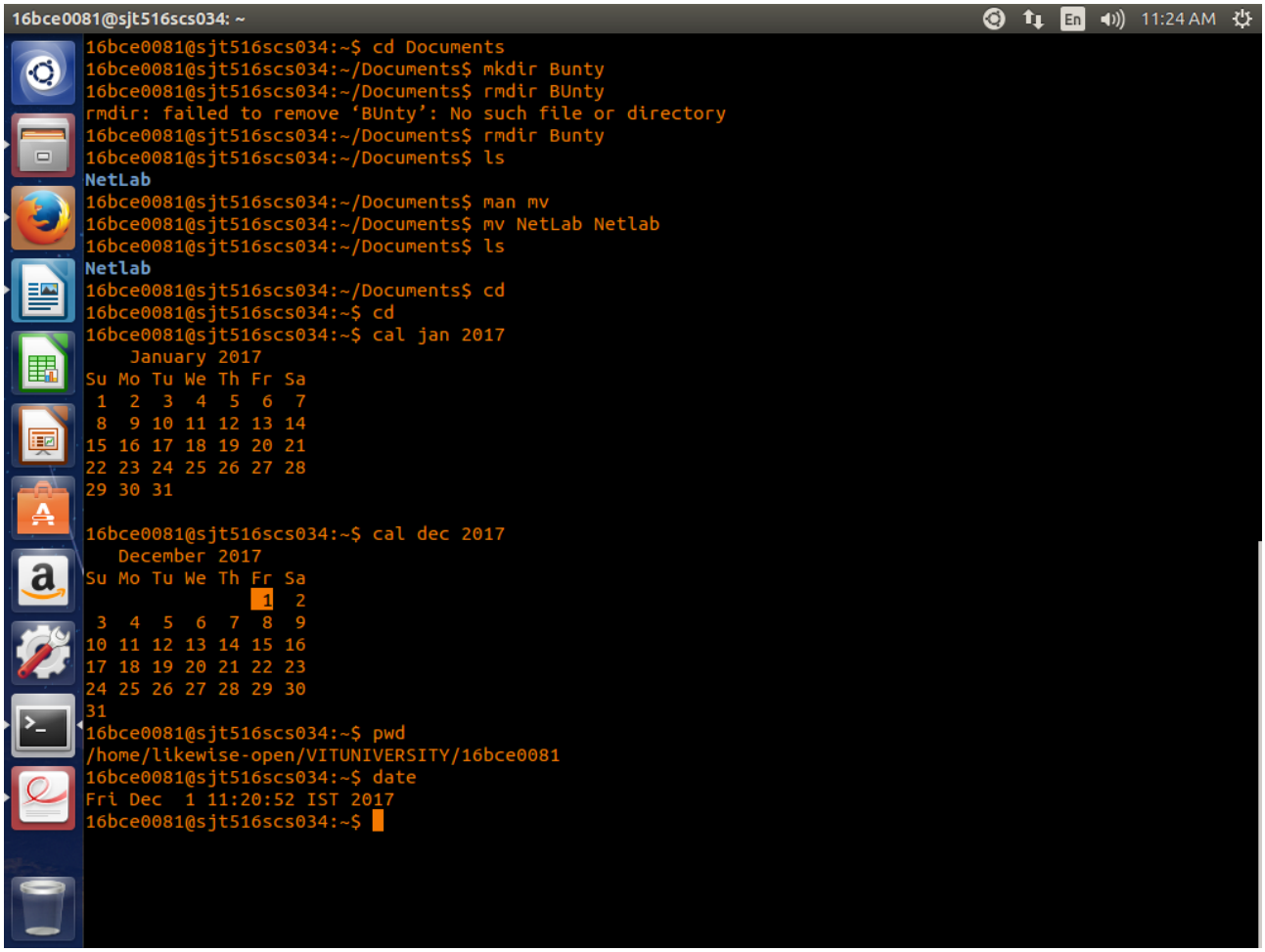
7. Command: history
   Description: list of previously executed commands
   Syntax: history

8. Command: cal
   description: Prints a calendar for the specified month of the specified year.
   Syntax: cal <mon> <year>

9. Command: man
   description: show online documentation by program name
   Syntax: man <command>

10. Command: w
    Description: who is on the system and what they are doing
    Syntax: w

Outputs from 4 to 10



11. Command: whoami
Description: who is logged onto this terminal
Syntax: whoami

12. Command: uptime
Description; show one line summary of system status
Syntax: uptime

13. Command: tty
Description: know the terminal name
Syntax: tty

14. Command: uname
Description: print system information
Syntax: uname

15. Command: cat
Description: view files

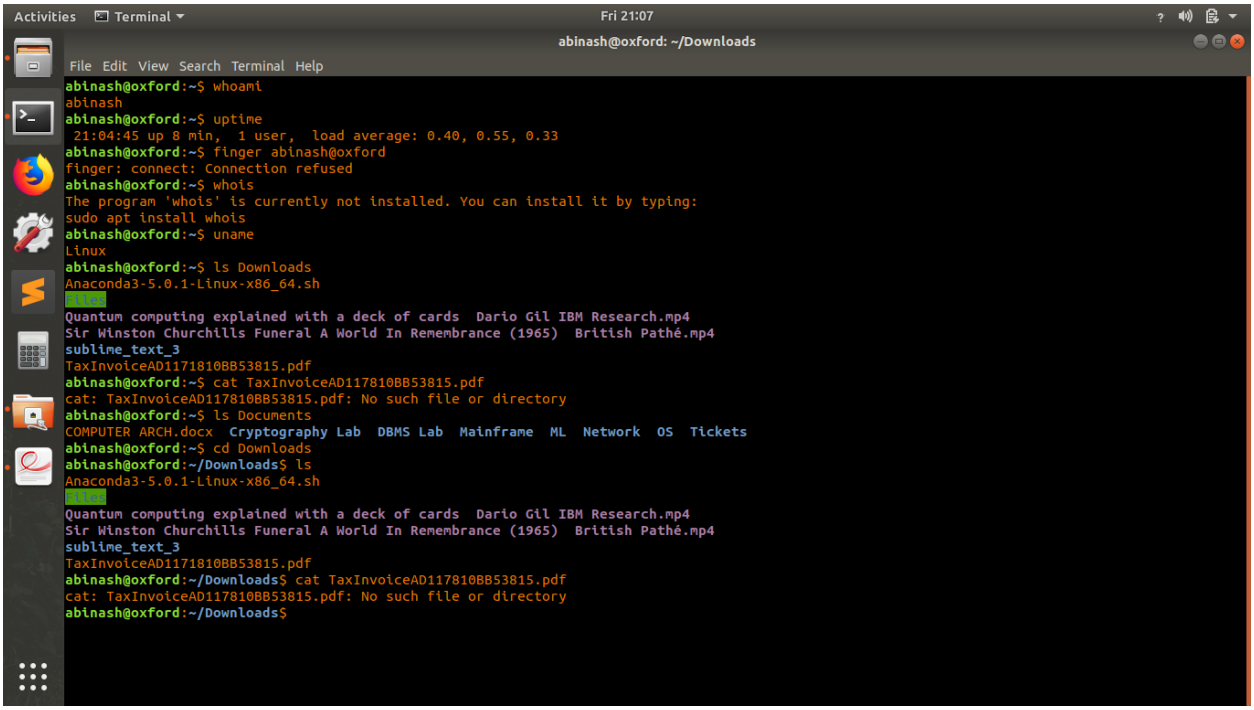
Syntax: cat <filename>

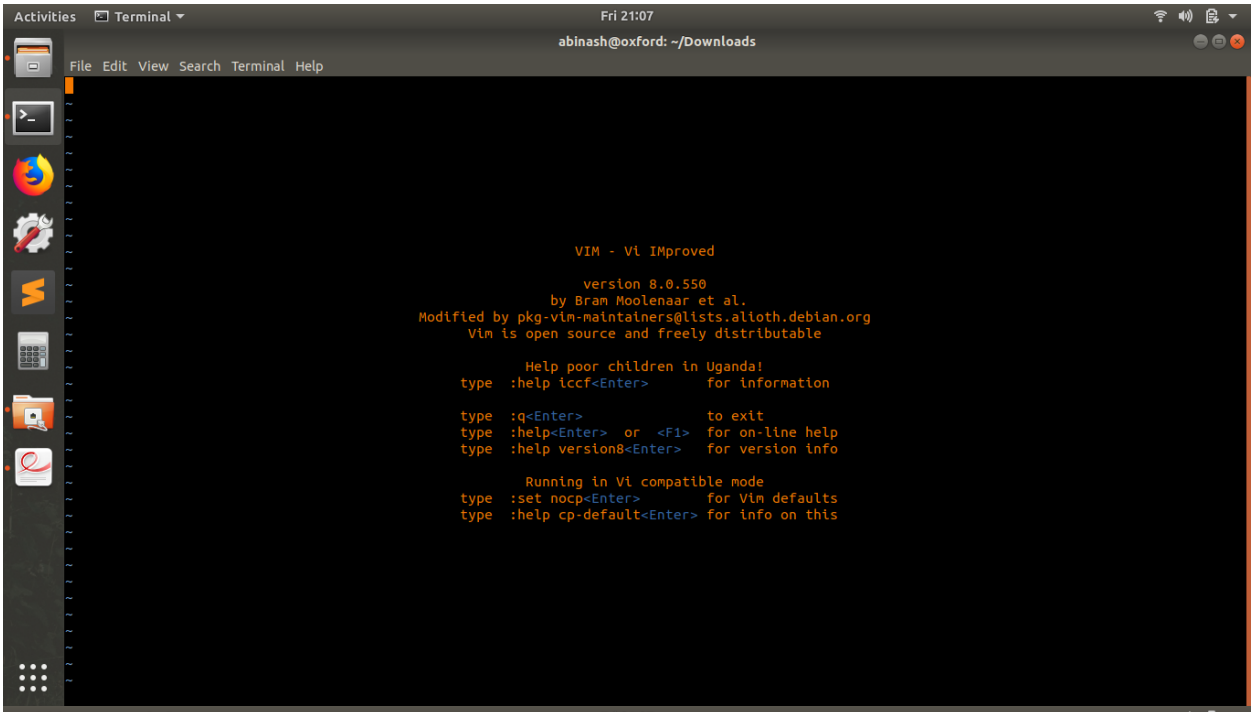
16. Command: ls
Description: list files in a directory and their attributes
Syntax: ls

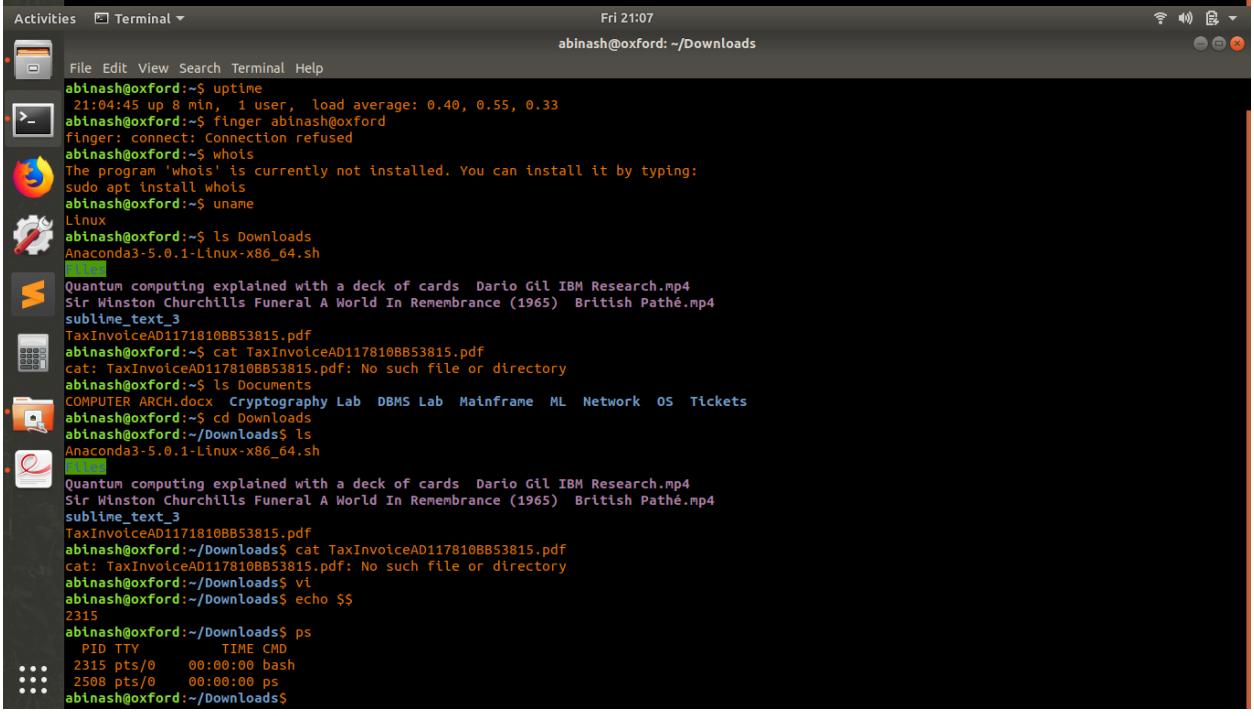
17. Command: vi
Description: full-featured screen editor for modifying text files
Syntax: vi

18. Command: echo $$
Description: process id of current shell
Syntax: echo $$

19. Command: ps
Description: process status
Syntax: ps

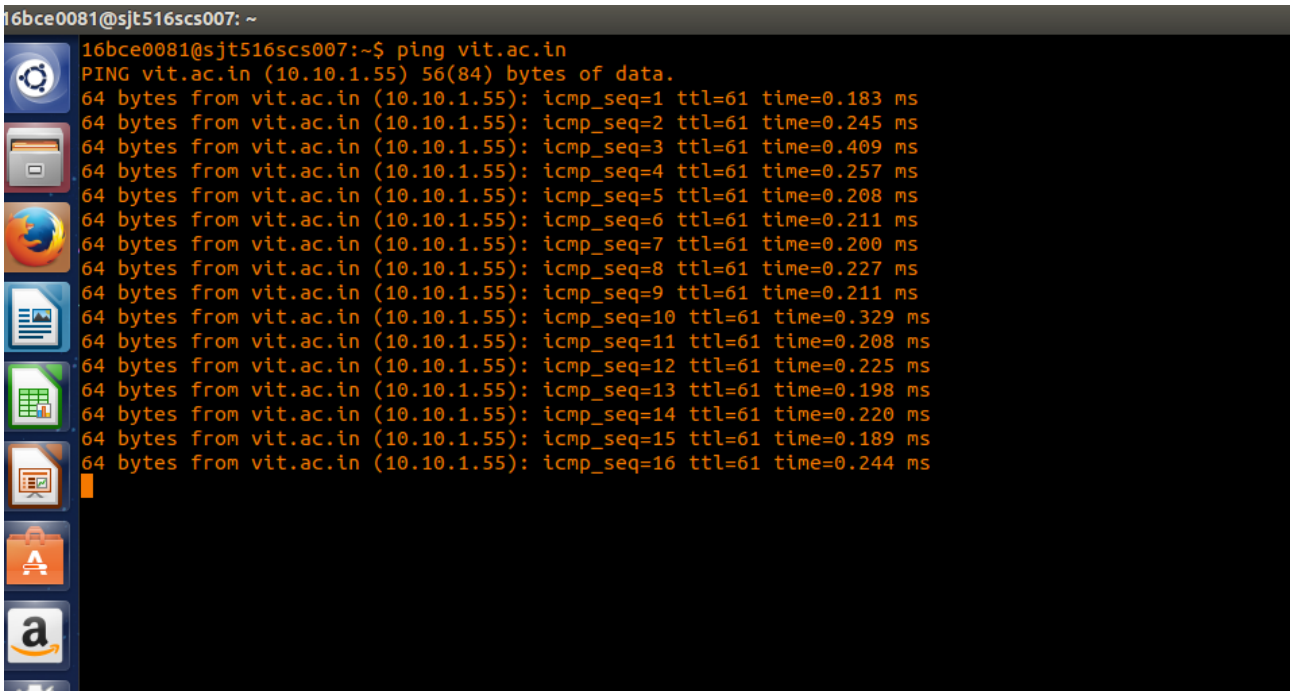



Activities
Terminal
Fri 21:07
abinash@oxford: ~/Downloads
File Edit View Search Terminal Help
VIM - Vi IMproved
version 8.0.550
by Bram Moolenaar et al.
Modified by pkg-vim-maintainers@lists.alioth.debian.org
Vim is open source and freely distributable
Help poor children in Uganda!
type :help iccf<Enter> for information
type :q<Enter> to exit
type :help<Enter> or <F1> for on-line help
type :help version8<Enter> for version info
Running in Vi compatible mode
type :set nocp<Enter> for Vim defaults
type :help cp-default<Enter> for info on this


Activities
Terminal
Fri 21:07
abinash@oxford: ~/Downloads
File Edit View Search Terminal Help
abinash@oxford:~$ uptime
21:04:45 up 8 min, 1 user, load average: 0.40, 0.55, 0.33
abinash@oxford:~$ finger abinash@oxford
finger: connect: Connection refused
abinash@oxford:~$ whois
The program 'whois' is currently not installed. You can install it by typing:
sudo apt install whois
abinash@oxford:~$ uname
Linux
abinash@oxford:~$ ls Downloads
Anaconda3-5.0.1-Linux-x86_64.sh
Files
Quantum computing explained with a deck of cards Dario Gil IBM Research.mp4
Sir Winston Churchills Funeral A World In Remembrance (1965) British Pathé.mp4
sublime_text_3
TaxInvoiceAD1171810BB53815.pdf
abinash@oxford:~$ cat TaxInvoiceAD117810BB53815.pdf
cat: TaxInvoiceAD117810BB53815.pdf: No such file or directory
abinash@oxford:~$ ls Documents
COMPUTER ARCH.docx Cryptography Lab DBMS Lab Mainframe ML Network OS Tickets
abinash@oxford:~$ cd Downloads
abinash@oxford:~/Downloads$ ls
Anaconda3-5.0.1-Linux-x86_64.sh
Files
Quantum computing explained with a deck of cards Dario Gil IBM Research.mp4
Sir Winston Churchills Funeral A World In Remembrance (1965) British Pathé.mp4
sublime_text_3
TaxInvoiceAD1171810BB53815.pdf
abinash@oxford:~/Downloads$ cat TaxInvoiceAD117810BB53815.pdf
cat: TaxInvoiceAD117810BB53815.pdf: No such file or directory
abinash@oxford:~/Downloads$ vi
abinash@oxford:~/Downloads$ echo $$
2315
abinash@oxford:~/Downloads$ ps
PID TTY TIME CMD
2315 pts/0 00:00:00 bash
2508 pts/0 00:00:00 ps
abinash@oxford:~/Downloads$

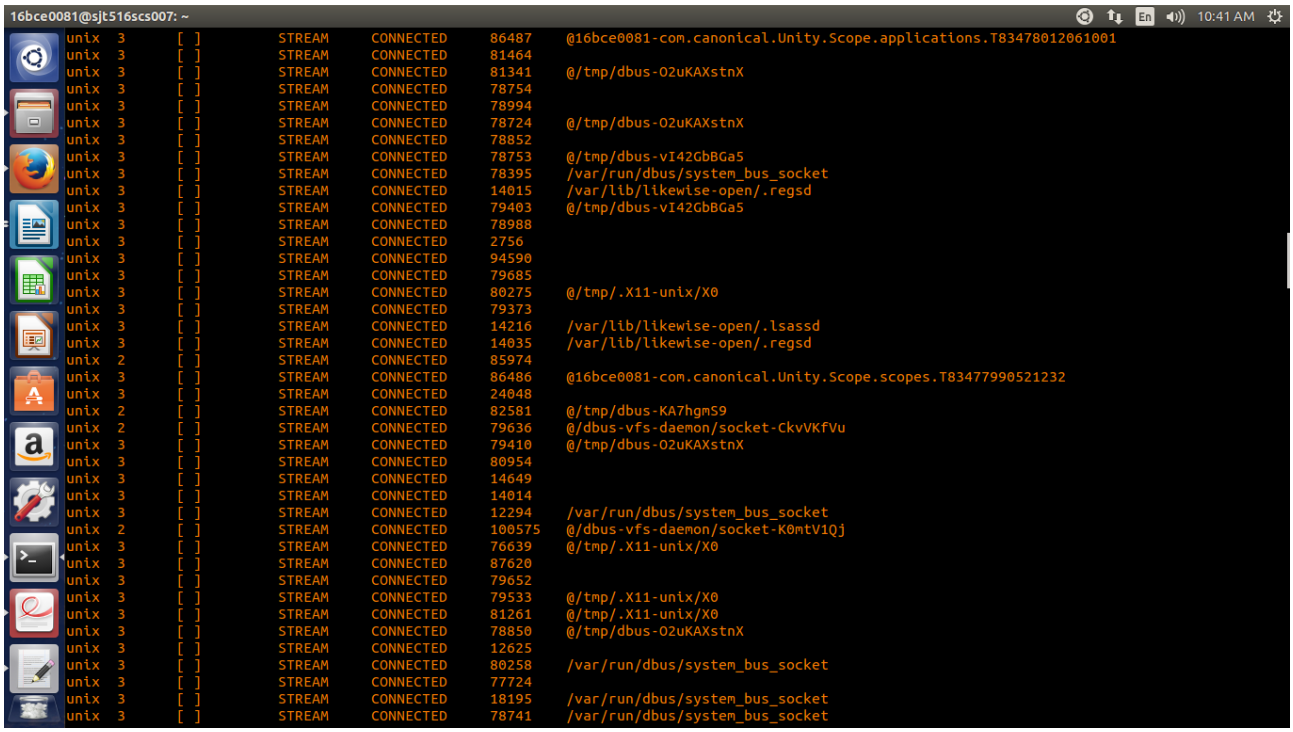
Basic network commands

1. ping
Description: sends echo requests to the host specified on the command line, and lists the responses
received.
Command name: ping
Command Syntax: ping ipAddress or hostname
Output:



2. netstat

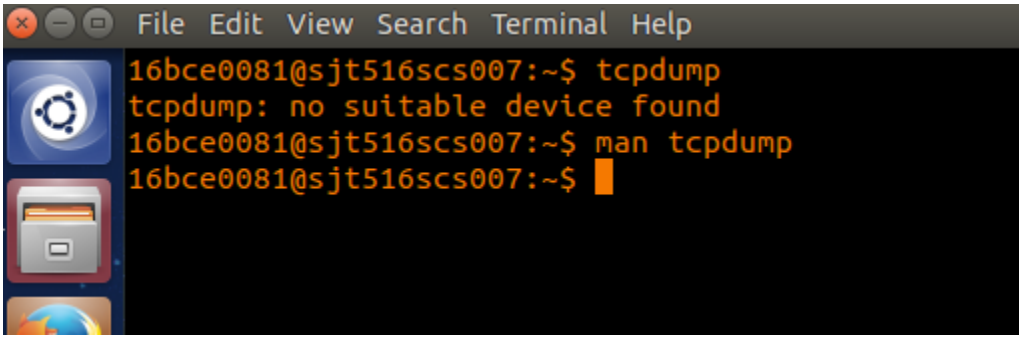
Description: It will tell us what the status of ports are ie. open, closed, waiting connections. It is used to display the TCP/IP network protocol statistics and information.
Command name: netstat
Command Syntax: netstat
Output:



3. tcpdump

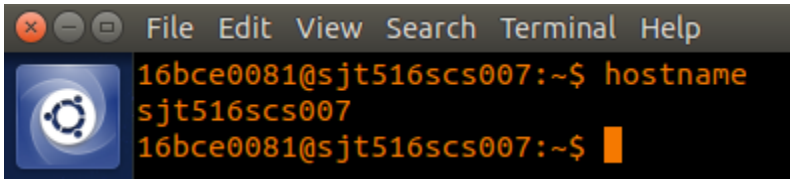
Description: This is a sniffer, a program that captures packets off a network interface and interprets them.
Command name: tcpdump
Command Syntax: tcpdump
Output:

4.



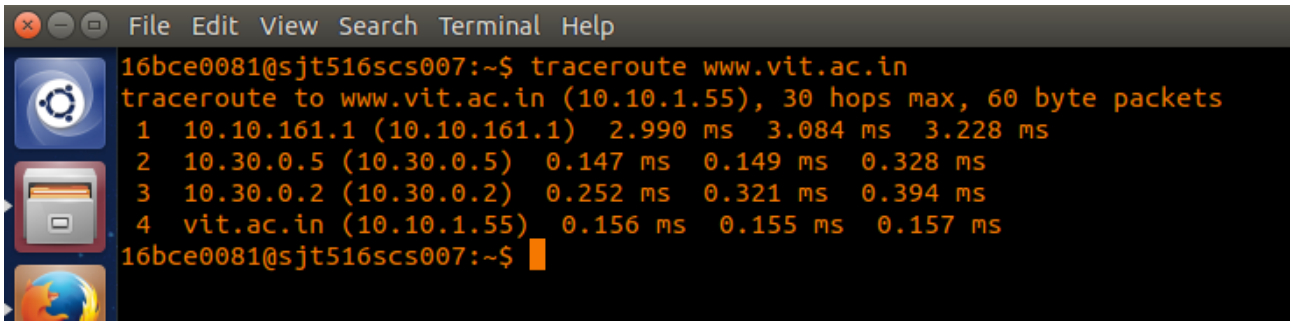
hostname

Description: Tells the user the host name of the computer they are logged into.
Command name: hostname
Command Syntax: hostname
Output:



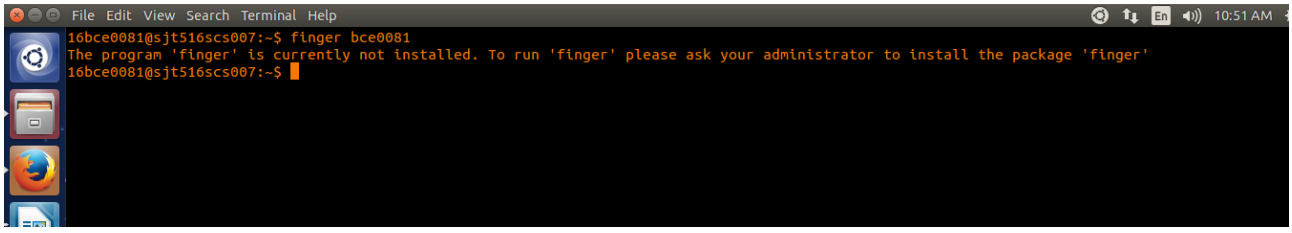
5. traceroute

Description: traceroute will show the route of a packet. It attempts to list the series of hosts through which our packets travel on their way to a given destination.
Command name: traceroute
Command Syntax: traceroute machineName or ip
Output:



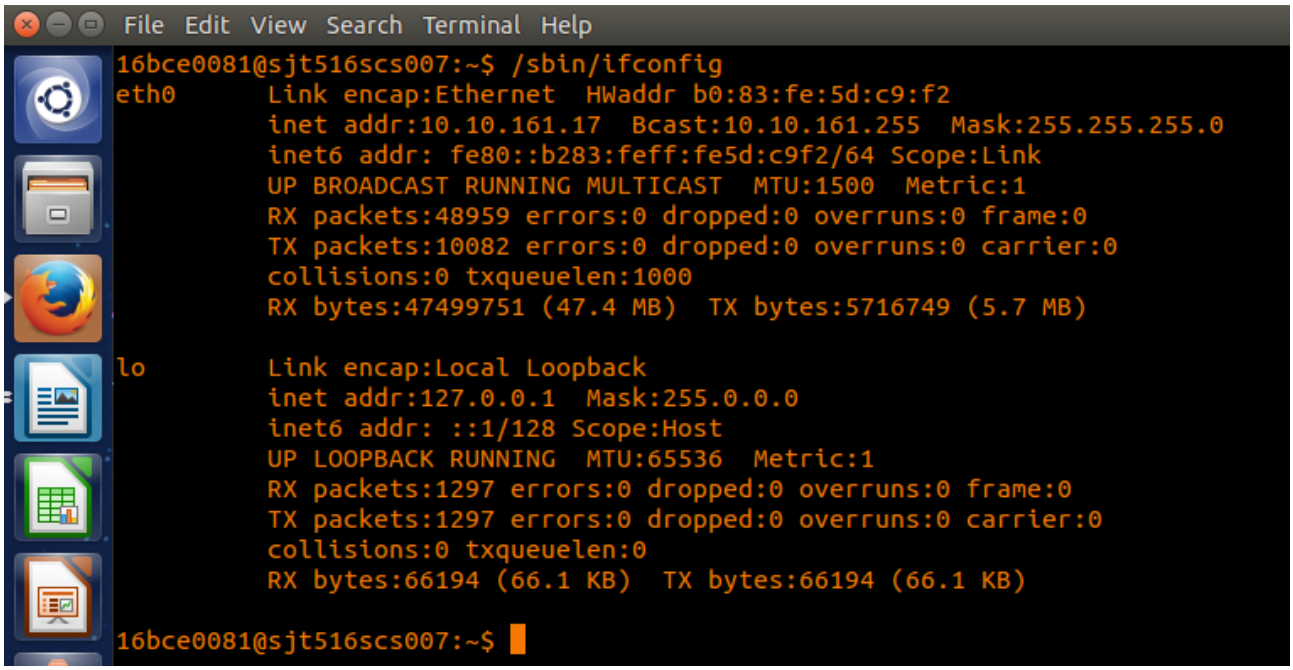
6. finger

Description: Retrieves information about the specified user.
Command name: finger
Command Syntax: finger bce0081
Output:



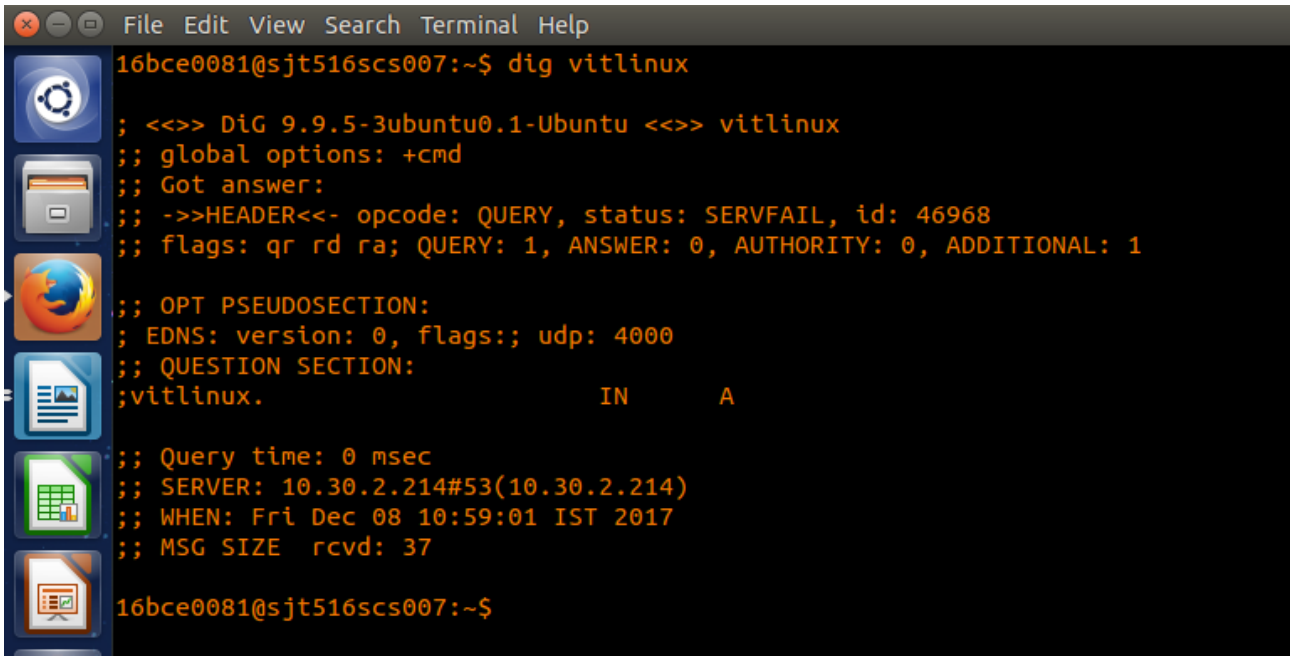
7. ifconfig

Description: This command is used to configure network interfaces, or to display their current configuration.
Command name: ifconfig
Command Syntax: ifconfig
Output:



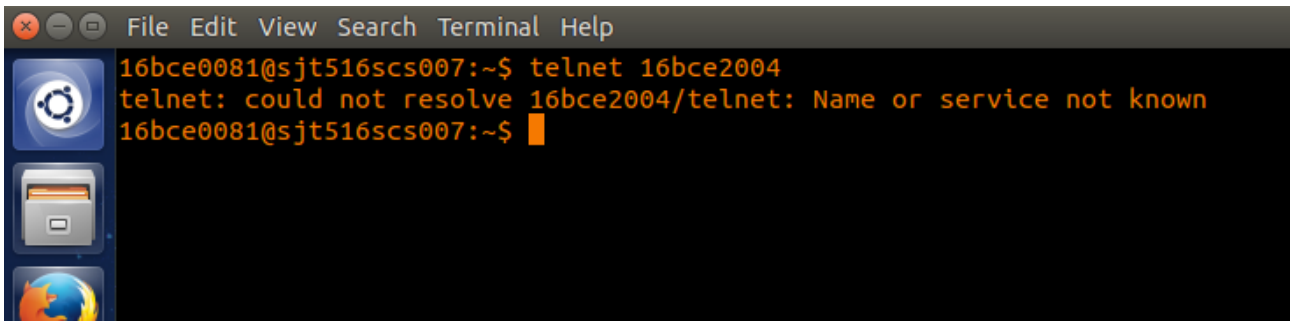
8. dig

Description: The "domain information groper" tool. If a hostname is given as an argument, it outputs information about that host, including it's IP address, hostname and various other information.
Command name: dig
Command Syntax: dig vitlinux
Output:



9. telnet

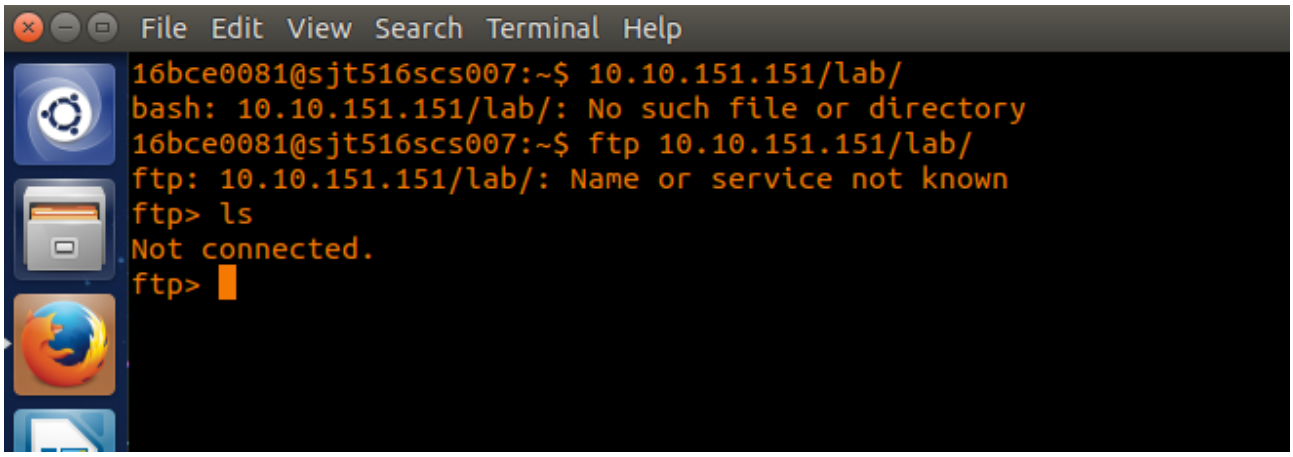
Description: telnet allows you to log in to a computer, just as if you were sitting at the terminal. Once your username and password are verified, you are given a shell prompt. From here, you can do anything requiring a text console.
Command name: telnet
Command Syntax: telnet 16bce2004
Output:



10. ftp

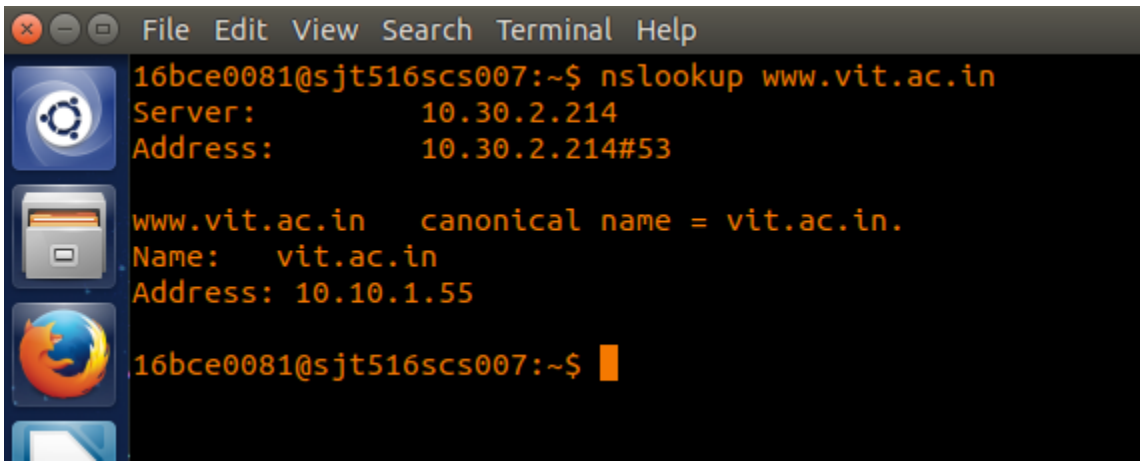
Description: To connect to an FTP server.
Command name: ftp

Command Syntax: ftp 10.10.151.151/lab/
Output:



11. nslookup

Description: returns the ipaddress of the given hostname and vice versa.
Command name: nslookup
Command Syntax: nslookup www.vit.ac.in
Output:



Switch

A network switch (also called switching hub, bridging hub, officially MAC bridge) is a computer networking device that connects devices together on a computer network by using packet switching to receive, process, and forward data to the destination device.

Eg.

(i) Cisco small business SG300-28 28-port Gigabit Ethernet rackmount switch
(ii) D-Link 24-Port 10/100 Mbps Unmanaged Fast Ethernet Switch DES-1024A Network Switch
(iii) TP-LINK TL-SG1024D 24-Port Gigabit Desktop Switch
(iv) Cisco Catalyst WS-C3650-24TS-L Ethernet Switch

Bridge

A network bridge is a computer networking device that creates a single aggregate network from multiple communication networks or network segments.

Eg.:

(i) Quadro M32X
(ii) AXIS C8033 Network Audio Bridge
(iii) Cisco 1410 Series Bridge
(iv) G.Shdsl 4 Wire Router Bridge

Hub

A hub is a component of a network with a high-degree node. Hubs have a significantly larger number of links in comparison with other nodes in the network.

Eg.:

(i) SIGARAM 4 Port Usb Hub 2.0 Ultra
(ii) TECH SHOP 4 Port Ultra High Speed USB Hub 480 Mbps
(iii) eErlik 4 Port Ultra High Speed USB Hub 480 Mbps
(iv) Quantum 4 Port USB Hub

Router

A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet. A data packet is typically forwarded from one router to another router through the networks that constitute an internetwork until it reaches its destination node.

Eg.:

(i) TP-LINK TL-WR740N Router
(ii) iball WRA300N3GT 300 Mbps Wireless 3G Router
(iii) TP-LINK TD-W8960N 300Mbps Wireless N ADSL2+ Modem Router

(iv) Alcatel MW40CJ 4G Wi-Fi Router

Gateways

A gateway is a node (router) in a computer network, a key *stopping point* for data on its way to or from other networks.

Eg.:

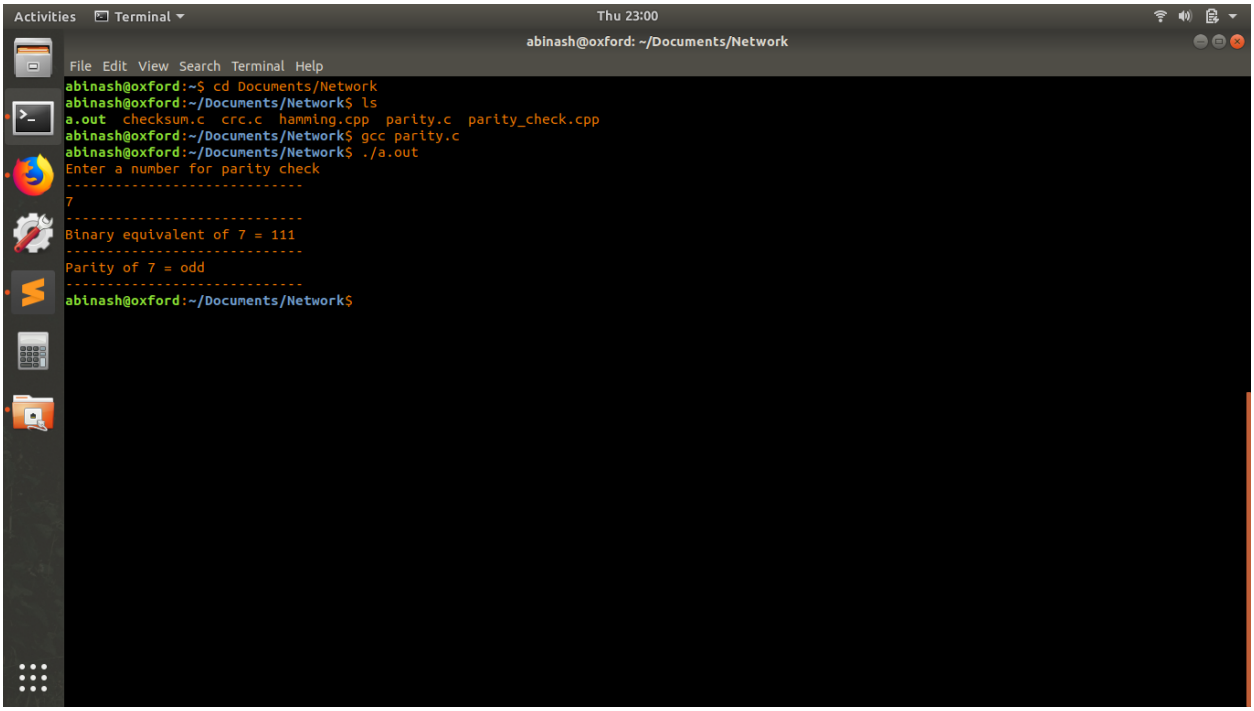
(i) Maretron USB100 Nmea 2000 USB Gateway
(ii) Actisense NMEA Networks USB Gateway
(iii) Cisco VG248 - gateway (VG248)
(iv) LORA LORAWAN INDUSTRIAL GATEWAY 868MHZ

Error Detection

Parity Check

```
#include <stdio.h>

int getParity(int n)

{

   int parity = 0;

   while (n)

   {

      parity = !parity;

      n = n & (n - 1);

   }

   return parity;

}


int convert(int dec){


   if (dec == 0)

      return 0;

   else

      return (dec % 2 + 10 * convert(dec / 2));

}
```

```
int sender(){
    int num;
    printf("Enter a number for parity check\n");
    printf("----------------------------\n");
    scanf("%d", &num);
    return num;
}

void receiver(int m){
    int result = getParity(m);
    printf("----------------------------\n");
    printf("Binary equivalent of %d = %d\n", m, convert(m));
    printf("----------------------------\n");
    if(result == 1)
        printf("Parity of %d = odd\n", m);
    else
        printf("Parity of %d = even\n", m);
}

int main(){
    int sender_val = sender();
    receiver(sender_val);
    printf("----------------------------\n");
    return 0;
}
```



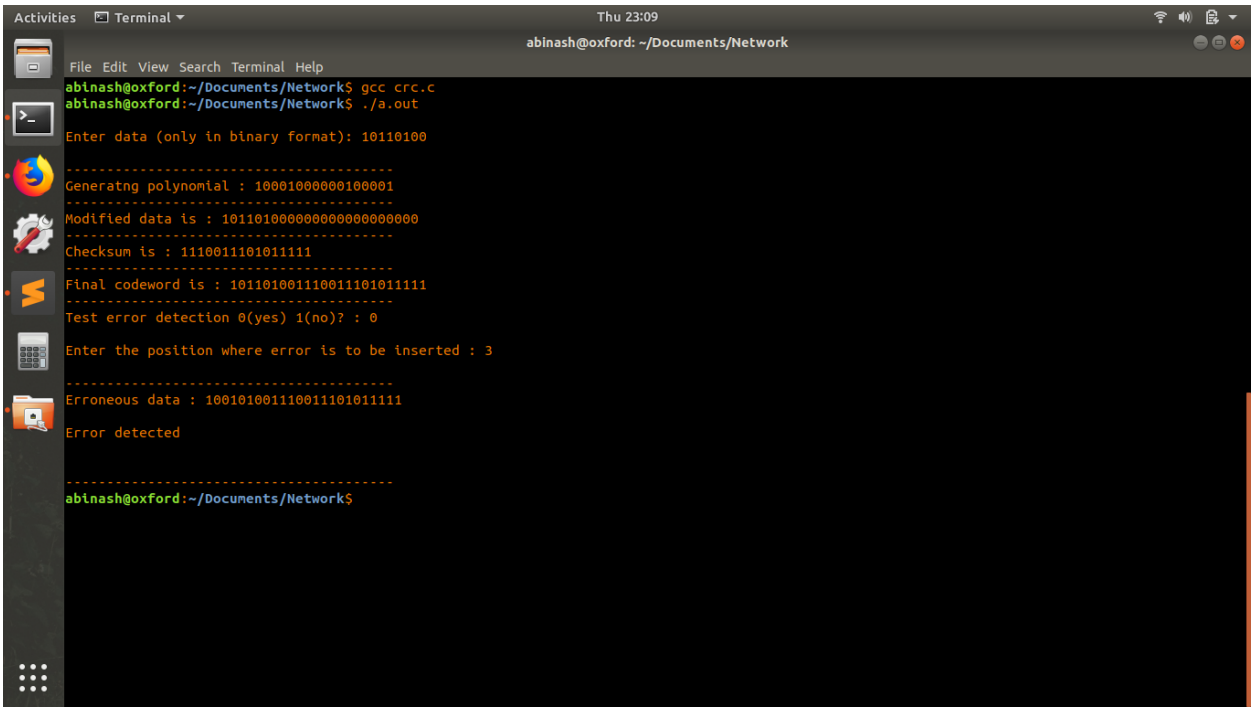
CRC

```
#include<stdio.h>
#include<string.h>
#define N strlen(g)

char t[28],cs[28],g[]="10001000000100001";
int a,e,c;

void xor(){
    for(c=1;c<N;c++)
    cs[c] = ((cs[c] == g[c])?'0':'1');
}

void crc(){
    for(e=0;e<N;e++)
        cs[e]=t[e];
```

```
    do{
        if(cs[0]=='1')
            xor();
        for(c=0;c<N-1;c++)
            cs[c]=cs[c+1];
        cs[c]=t[e++];
    }while(e<=a+N-1);
}

void sender(){
    printf("\nEnter data (only in binary format): ");
    scanf("%s",t);
    printf("\n---------------------------------------");
    printf("\nGeneratng polynomial : %s",g);
    a=strlen(t);
    for(e=a;e<a+N-1;e++)
        t[e]='0';
    printf("\n---------------------------------------");
    printf("\nModified data is : %s",t);
    printf("\n---------------------------------------");
}

void testing(){
    printf("\nChecksum is : %s",cs);
    for(e=a;e<a+N-1;e++)
        t[e]=cs[e-a];
    printf("\n---------------------------------------");
    printf("\nFinal codeword is : %s",t);
```

```
    printf("\n----------------------------------------");
    printf("\nTest error detection 0(yes) 1(no)? : ");
    scanf("%d",&e);
}

void receiver(){
    if(e==0){
        do{
            printf("\nEnter the position where error is to be inserted : ");
            scanf("%d",&e);
        }while(e==0 || e>a+N-1);

        t[e-1]=(t[e-1]=='0')?'1':'0';
        printf("\n----------------------------------------");
        printf("\nErroneous data : %s\n",t);
    }
}

int main(){
    sender();
    crc();
    testing();
    receiver();
    crc();

    for(e=0;(e<N-1) && (cs[e]!='1');e++);
        if(e<N-1)
            printf("\nError detected\n\n");
```

```
        else
            printf("\nNo error detected\n\n");
            printf("\n----------------------------------------\n");
        return 0;
}
```

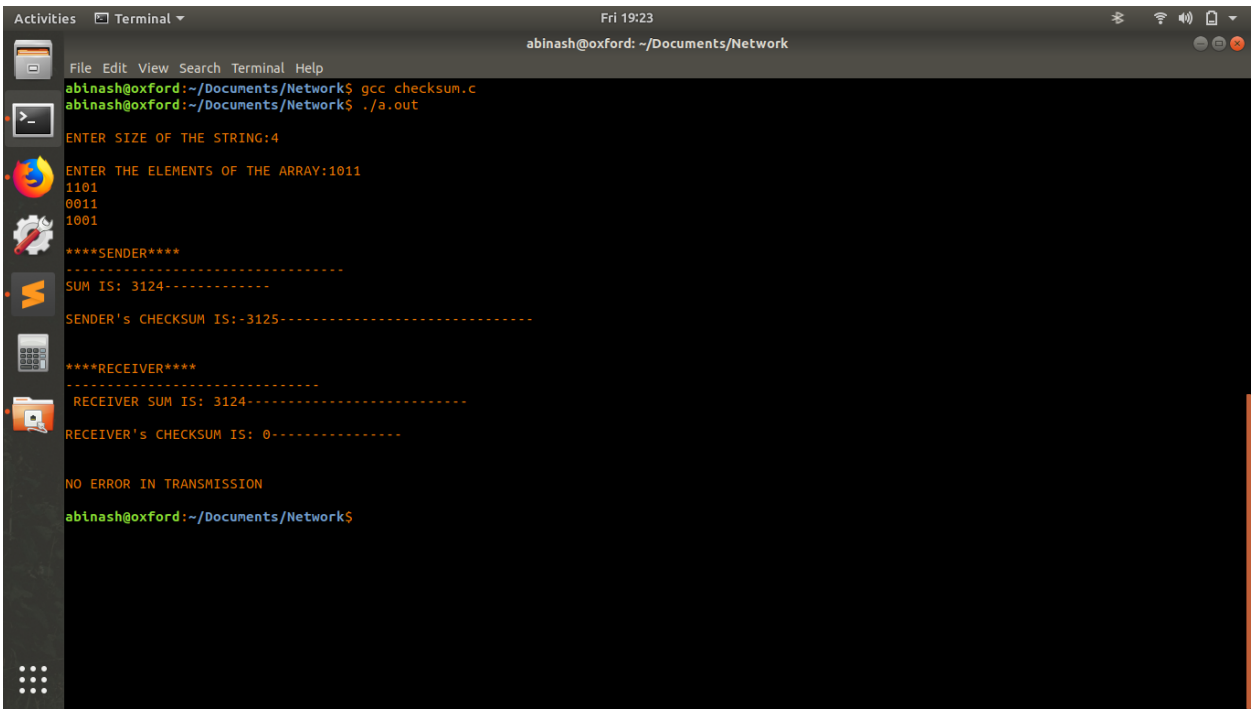


Checksum

```
#include<stdio.h>
#include<math.h>

 int sender(int b[10],int k)
 {
        int checksum,sum=0,i;
  printf("\n****SENDER****\n");
  printf("---------------------------------\n");

for(i=0;i<k;i++)
```

```
  sum+=b[i];
                printf("SUM IS: %d",sum);
          printf("-------------\n");

            checksum=~sum;
            printf("\nSENDER's CHECKSUM IS:%d",checksum);
       printf("-------------------------------\n");
            return checksum;
}

int receiver(int c[10],int k,int scheck)
{
int checksum,sum=0,i;
            printf("\n\n****RECEIVER****\n");
       printf("-------------------------------\n");
            for(i=0;i<k;i++)
                sum+=c[i];
            printf(" RECEIVER SUM IS: %d",sum);
            printf("---------------------------\n");
         sum=sum+scheck;
            checksum=~sum;
            printf("\nRECEIVER's CHECKSUM IS: %d",checksum);
         printf("----------------\n");
                return checksum;
  }
int main()
   {
            int a[10],i,m,scheck,rcheck;
```

```
        printf("\nENTER SIZE OF THE STRING:");
        scanf("%d",&m);
        printf("\nENTER THE ELEMENTS OF THE ARRAY:");
        for(i=0;i<m;i++)
        scanf("%d",&a[i]);
        scheck=sender(a,m);
        rcheck=receiver(a,m,scheck);
        if(rcheck==0)
                printf("\n\nNO ERROR IN TRANSMISSION\n\n");
        else
                printf("\n\nERROR DETECTED");
 return 0;
}
```



Error Correction

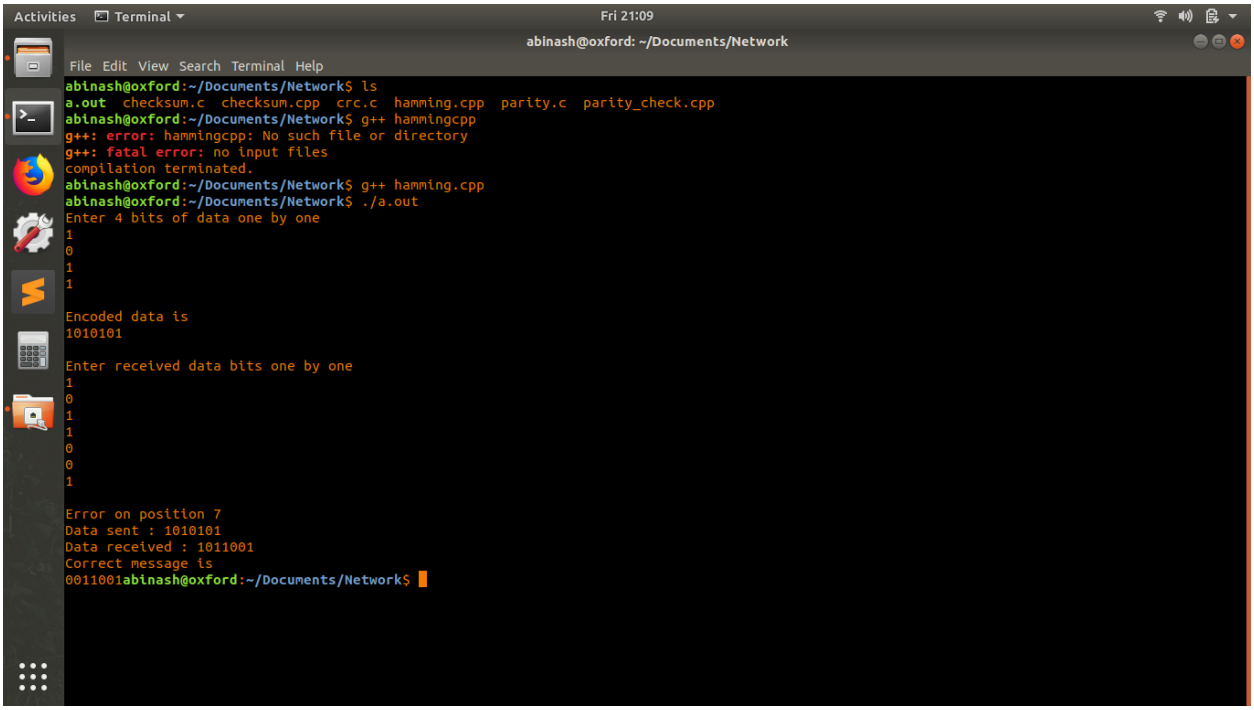
Hamming Code

```
#include<iostream>
```

```
using namespace std;

int main() {
    int data[10];
    int dataatrec[10],c,c1,c2,c3,i;

    cout<<"Enter 4 bits of data one by one\n";
    cin>>data[0];
    cin>>data[1];
    cin>>data[2];
    cin>>data[4];

    //Calculation of even parity
    data[6]=data[0]^data[2]^data[4];
    data[5]=data[0]^data[1]^data[4];
    data[3]=data[0]^data[1]^data[2];

    cout<<"\nEncoded data is\n";
    for(i=0;i<7;i++)
        cout<<data[i];

    cout<<"\n\nEnter received data bits one by one\n";
    for(i=0;i<7;i++)
        cin>>dataatrec[i];

    c1=dataatrec[6]^dataatrec[4]^dataatrec[2]^dataatrec[0];
    c2=dataatrec[5]^dataatrec[4]^dataatrec[1]^dataatrec[0];
```

```
c3=dataatrec[3]^dataatrec[2]^dataatrec[1]^dataatrec[0];
c=c3*4+c2*2+c1 ;

if(c==0) {
   cout<<"\nNo error while transmission of data\n";
}
else {
   cout<<"\nError on position "<<c;

   cout<<"\nData sent : ";
   for(i=0;i<7;i++)
      cout<<data[i];

   cout<<"\nData received : ";
   for(i=0;i<7;i++)
      cout<<dataatrec[i];

   cout<<"\nCorrect message is\n";

   //if errorneous bit is 0 we complement it else vice versa
   if(dataatrec[7-c]==0)
      dataatrec[7-c]=1;
   else
       dataatrec[7-c]=0;
   for (i=0;i<7;i++) {
      cout<<dataatrec[i];
   }
}
```

```
    return 0;
}
```


Activities
Terminal
Fri 21:09
abinash@oxford: ~/Documents/Network
File Edit View Search Terminal Help
abinash@oxford:~/Documents/Network$ ls
a.out checksum.c checksum.cpp crc.c hamming.cpp parity.c parity_check.cpp
abinash@oxford:~/Documents/Network$ g++ hammingcpp
g++: error: hammingcpp: No such file or directory
g++: fatal error: no input files
compilation terminated.
abinash@oxford:~/Documents/Network$ g++ hamming.cpp
abinash@oxford:~/Documents/Network$ ./a.out
Enter 4 bits of data one by one
1
0
1
1
Encoded data is
1010101
Enter received data bits one by one
1
0
1
1
0
0
1
Error on position 7
Data sent : 1010101
Data received : 1011001
Correct message is
0011001abinash@oxford:~/Documents/Network$