



**ARBA MINCH INSTITUTE OF TECHNOLOGY**  
**FACULTY OF COMPUTING & SOFTWARE ENGINEERING**  
**Network Design**  
**ASSIGNMENTS**

PREPARED BY: Mr. BASHA KASIM Target: G4 IT 2017 E.C

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**OBJECTIVES**

**The objectives of these assignments are:**

- a. *To cover basic concepts of networking*
  - b. *To understand how networking protocols work*
  - c. *To understand basic Linux installation and setting up of the operating environment*
  - d. *To study LAN setup and understand basic LAN principles*
  - e. *To study tools for network analysis*
- 

**Assignment Completion Sheet**

Sr. No	Assignment Name	Assignment Type	Marks
1	Linux Installation	Individual	10
2	Networking commands in Linux	Individual	10
3	Study of LAN environment	Group	10
4	Use of Wireshark tool	Group	10
	<b>Total out of 40%</b>		

**Deadline: After 3 weeks, then presentations**

## Assignment 1: Linux Installation and Operating Environment

### Instructors should demonstrate:

1. Linux installation
2. Creating users
3. Creating user groups
4. Setting permissions for home directory of users
5. Important files and directories in Linux and their use
6. Configuring Apache server and Apache Tomcat
7. Configuring database using PostgreSQL

### Self-study questions for students:

1. List the stages of Linux boot process
2. What is run level? What are the predefined run levels?
3. Find out the run level of your computer
4. Find out the kernel version of your machine
5. What is NIS and NFS?
6. What is the use of RPM? List various options of **rpm command** with syntax
7. State the purpose of the following files and directories:
  - a. /home
  - b. /boot
  - c. /dev
  - d. /usr
  - e. /mnt
  - f. /media
  - g. /etc
  - h. /bin
  - i. /usr/bin
  - j. /etc/fstab
  - k. .bashrc

Signature of the instructor

Date

### Assignment Evaluation

0: Not done	<input type="text"/>	2: Late Complete	<input type="text"/>	4: Complete	<input type="text"/>
1: Incomplete	<input type="text"/>	3: Needs improvement	<input type="text"/>	5: Well, Done	<input type="text"/>

## Assignment 2 : Networking Commands in Linux

### Execute the following commands and write their output

#### 1. ping:

This command is used to test connectivity between two nodes. Ping use ICMP (Internet Control Message Protocol) to communicate to other devices. You can ping host name or ip address using below command.

**example:** *ping 201.54.100.1* or *ping www.google.com*

\$ping <server-ip-address>
Output:
\$ping localhost
Output:
\$ping <other-ip-in-network>
Output:

#### 2. hostname

Gives the host name of the computer they are logged into. To set the hostname permanently use /etc/sysconfig/network file.

\$hostname
Output :

#### 3. traceroute

**traceroute** is a network troubleshooting utility which shows number of hops taken to reach destination also determine packets traveling path.

\$traceroute ip-address
Output :

#### 4. netstat

**Netstat (Network Statistic)** command displays interfaces, connection information, routing table information etc.

\$netstat
Output :

Execute it with the following options and write the output:

netsta

t -t

netsta

t-s -t

netsta

t -i

## 5. ifconfig

ifconfig is used for displaying network interface information.

<code>\$/sbin/ifconfig</code>
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Output :
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## 6. who

Displays information of all users who are logged in

<code>\$who</code>
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Output :
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## 7. whoami

The whoami command writes the user name (i.e., login name) of the owner of the current login session to standard output.

<code>\$whoami</code>
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Output :
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## 8. nmap

Network mapper tool to discover hosts and services on a computer network.

<code>\$ nmap &lt;ip-address&gt;</code>
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Output :
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<code>\$ nmap &lt;server-ip-address&gt;</code>
--

Output :
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## 9. tcpdump

Tcpdump prints out a description of the contents of packets on a network interface that match the boolean expression; the description is preceded by a time stamp, printed, by default, as hours, minutes, seconds, and fractions of a second since midnight.

### Sample output for ARP protocol:

```
arp who-has 128.3.254.6 tell 128.3.254.68  
arp reply 128.3.254.6 is-at 02:07:01:00:01:c4
```

\$ tcpdump

Output :

Signature of the instructor

Date

### Assignment Evaluation

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## Assignment 3 : Study of LAN environment (Group Assignments)

Find out information about the network in your lab and fill in details below:

1. Total Number of computers in your lab:
2. Find details of any 5 computers:

	MAC address	IP address	LAN speed	Default mask	hostname
1					
2					
3					
4					
5					

3. Are the IP addresses assigned to the machines statically or dynamically?
4. Does the network have a DHCP server?
5. If yes, what is the address of the server ?
6. How many servers are configured? :

Details of servers :

	IP address	MAC address	Purpose
1			
2			
3			

7. Cables
  - a. Type :
  - b. Is it coaxial / twisted pair or fiber optic cable ?
  - c. Cable bandwidth
  - d. Maximum cable length limit
  - e. Connector used
8. Switches:

No	Company Name	MAC address	No. of ports	Managed / Unmanaged	IP's of Machines connected to

					the switch
1					
2					
3					
4					
5					

9. Routers:

No	Company Name	No. / Types of ports	Port speed	IP address	
1					
2					
3					

10. Is there wi-fi capability  
in the LAN? If yes,

- i. What is the Wi-fi access point address?
- ii. How many devices / IP addresses does it support?
- iii. What is the bandwidth? if no?
  - What additional devices are needed?
  - Where will you connect them?
  - What will be its IP address?

11. Is there internet access in the lab?

If not, what changes to the hardware / software must be made? If yes, what is the IP address of the router / gateway ?

12. Draw the Network Topology (show how machines and servers are connected using connectivity devices)

13. If 20 more machines must be added to the network, what changes must be made to the network?

14. If the network is to be divided into four subnetworks having 50 machines each, give a plan to do so. What additional devices will be needed? Give the IP address of each subnetwork and the address ranges for hosts in each subnetwork.

Signature of the instructor

Date

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## Assignment 4 : Use of Wireshark tool (Group Assignments)

### Demonstrate the use of Wireshark tool for network analysis

Wireshark is a free and open source packet analyzer. It is also a protocol analyzer tool which captures network traffic and analyzes it. It is used for network troubleshooting, analysis, software and communications protocol development, and education. Originally named Ethereal, the project was renamed Wireshark in May 2006.

#### Purpose:

- Network administrators use it to **troubleshoot network problems**
- Network security engineers use it to **examine security problems**
- Developers use it to **debug protocol implementations**
- People use it to **learn network protocol internals**

The wireshark GUI is as shown :

The screenshot displays the Wireshark interface with the following components labeled:

- command menus**: Points to the menu bar at the top (File, Edit, View, Go, Capture, Analyze, Statistics, Help).
- display filter specification**: Points to the filter field above the packet list.
- listing of captured packets**: Points to the packet list table.
- details of selected packet header**: Points to the packet details pane on the right.
- packet content in hexadecimal and ASCII**: Points to the packet bytes pane at the bottom.

No.	Time	Source	Destination	Protocol	Info
1	0.000000	192.168.1.46	128.121.50.122	TCP	1163 > http [SYN] Seq=0 Len=0 MSS=1460
2	0.127987	128.121.50.122	192.168.1.46	TCP	http > 1163 [SYN, ACK] Seq=0 Ack=1 win=57
3	0.128222	192.168.1.46	128.121.50.122	TCP	1163 > http [ACK] Seq=1 Ack=1 win=65535
4	0.123700	192.168.1.46	128.121.50.122	HTTP	GET /news/ HTTP/1.1
5	0.329641	128.121.50.122	192.168.1.46	TCP	[TCP segment of a reassembled PDU]
6	0.330326	128.121.50.122	192.168.1.46	HTTP	[TCP Previous segment lost] continuation
7	0.330467	192.168.1.46	128.121.50.122	TCP	1163 > http [ACK] Seq=612 Ack=1022 win=64
8	0.342042	128.121.50.122	192.168.1.46	TCP	[TCP Retransmission] [TCP segment of a re
9	0.342062	192.168.1.46	128.121.50.122	TCP	1163 > http [ACK] Seq=612 Ack=1022 win=64

**Details of selected packet (Frame 4):**

- Frame 4 (710 bytes on wire (568 bytes captured) on interface 0:00:00:00:00:00)
- Ethernet II, Src: Netgear\_61:8e:6d (00:09:5b:61:8e:6d), Dst: WestellT\_9f:92:b9 (00:0f:db:9f:92:b9)
- Internet Protocol, Src: 192.168.1.46 (192.168.1.46), Dst: 128.121.50.122 (128.121.50.122)
- Transmission Control Protocol, Src Port: 1163 (1163), Dst Port: http (80), Seq: 1, Ack: 1, Len: 656
- Hypertext Transfer Protocol
  - GET /news/ HTTP/1.1\r\n
  - Host: www.wireshark.org\r\n
  - User-Agent: Mozilla/5.0 (Windows; U; windows NT 5.1; en-US; rv:1.8.1.4) Gecko/20070515 Firefox/2.0.0.4\r\n
  - Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,image/png,\*/\*;q=0.5\r\n
  - Accept-Language: en-us,en;q=0.5\r\n
  - Accept-Encoding: gzip,deflate\r\n
  - Accept-Charset: iso-8859-1,utf-8;q=0.7,\*;q=0.7\r\n
  - Keep-Alive: 300\r\n
  - Connection: keep-alive\r\n
  - Referer: http://www.wireshark.org/faq.html\r\n
  - Cookie: \_\_utma=87653150.62471437.1181007382.1181007382.1181169142.2; \_\_utmz=87653150.1181007382.1.1.1.utm

**Packet bytes (hexadecimal and ASCII):**

Offset	Hex	ASCII
0000	00 0f db 9f 92 b9 00 09 5b 61 8e 6d 00 00 00 00	.....[.R..E..
0010	02 b8 0f 25 40 00 80 06 74 51 c0 a8 01 2e 80 79	...80...TQ....Y
0020	32 7a 04 8b 00 50 e8 bc 8e 1b 4e c6 f1 18 50 18	2Z...P...R...P.
0030	ff ff 77 74 00 00 47 45 54 20 2f 6e 65 77 73 2f	..WT..GET /news/
0040	20 48 94 54 50 2f 31 2e 31 0d 0a 48 6f 73 74 3a	HTTP/1.1..HOST:
0050	20 77 77 77 2e 77 69 72 65 72 68 61 72 6b 2e 6f	www.wireshark.o
0060	72 6f 0d 0a 55 73 65 72 2d 41 67 65 6a 74 3a 20	rg..User -Agent:
0070	4d 6f 7a 69 6c 6c 6c 6c 2f 23 2e 30 20 28 57 69 6e	Mozilla/ 5.0 (win
0080	64 6f 77 73 3b 20 55 3b 20 57 69 6e 64 6f 77 73	dows; U: windows
0090	20 4e 54 20 31 2e 31 3b 20 65 6e 20 55 3b 20 20	NT 5.1; en-US;
00a0	72 76 3a 31 2e 31 3b 2e 31 2e 34 29 20 47 65 63 60	rv:1.8.1.4) Geck
00b0	6f 2f 32 30 30 37 30 35 31 35 20 46 69 72 65 66	o/200705 15 Firef

- Capture and view network traffic
- Look at the packet headers of various protocols
- View the detailed contents of the following packets in hexadecimal.
  - Ethernet
  - IP
  - TCP
  - ARP

4. Write the contents of Ethernet frame header and list down the values of all fields in the header.

Header values in hexadecimal

- i. What is the Source MAC address
- ii. What is the destination MAC address
- iii. Is the destination MAC address of the server?
- iv. What is the value of CRC field?
- v. What is the destination MAC address of the Ethernet frame containing an ARP request?

5. View protocol hierarchy statistics

6. Follow TCP stream

Signature of the instructor

Date

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