## 1.112.1 Fundamentals of TCP/IP Weight 4

Linux Professional Institute Certification — 102

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1.112.1 Fundamentals of TCP/IP Weight 4

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Private addresses

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/etc/services
Main port numbers
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# Topic 112 Networking Fundamentals [14]

1.112.1 Fundamentals of TCP/IP [4]

1.112.3 TCP/IP configuration and troubleshooting [7]

1.112.4 Configure Linux as a PPP client [3]

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# Description of Objective 1.112.1 Fundamentals of TCP/IP

Candidates should demonstrate a proper understanding of network fundamentals. This objective includes the understanding of IP-addresses, network masks and what they mean (i.e. determine a network and broadcast address for a host based on its subnet mask in "dotted guad" or abbreviated notation or determine the network address, broadcast address and netmask when given an IP-address and number of bits). It also covers the understanding of the network classes and classless subnets (CIDR) and the reserved addresses for private network use. It includes the understanding of the function and application of a default route. It also includes the understanding of basic internet protocols (IP, ICMP, TCP, UDP) and the more common TCP and UDP ports (20, 21, 23, 25, 53, 80, 110, 119, 139, 143, 161).

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# Key files, terms, and utilities include: 1.112.1 Fundamentals of TCP/IP

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/etc/services — file mapping port numbers to names

ftp — FTP client program

telnet — telnet client program

host — program to test DNS servers

ping — program to test connectivity to other machines via ICMP

dig — program to test DNS servers

traceroute — program to test the path to a remote machine, showing routers along the way

whois — queries information about the owner of a domain

## (2.2) Networking Fundamentals [14]

- 1.112.1 Fundamentals of TCP/IP [4]
- 1.112.3 TCP/IP configuration and troubleshooting [7]
- 1.112.4 Configure Linux as a PPP client [3]

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## Fundamentals of TCP/IP [4]

Resources of interest

W. Richard Stevens. TCP/IP Illustrated, Volume 1: The Protocols Addison Wesley

Olaf Kirch and Terry Dawson. Linux Network Administrator's Guide O'Reilly 2000. http://tldp.org/LDP/nag2/

Angie Nash and Jason Nash. LPIC 1 Certification Bible Hungry Minds

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## IP addressing

### This objective includes the understanding of:

- ▶ IP-addresses, network masks and what they mean, i.e.,
  - determine a network and broadcast address for a host based on its subnet mask in "dotted quad" or abbreviated notation or
  - determine the network address, broadcast address and netmask when given an IP-address and number of bits.

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```
Class A — 255 0 0 0
```

<u>0</u>0000000.00000000.00000000.00000000 - 0.0.0.0 <u>0</u>1111111.11111111.111111111 - 127.255.255.255

## Class B — 255.255.0.0

<u>10</u>000000.00000000.00000000.00000000 - 128.0.0.0 <u>10</u>111111.11111111.11111111.1111111 - 191.255.255.255

## Class C — 255.255.255.0

<u>110</u>00000.00000000.00000000.00000000 - 192.0.0.0 <u>110</u>11111.11111111.11111111.1111111 - 223.255.255.25

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## Class A — 255.0.0.0

<u>0</u>0000000.00000000.00000000.0000000 - 0.0.0.0 <u>0</u>1111111.11111111.11111111.1111111 - 127.255.255.255

### Class B — 255.255.0.0

Class C — 255.255.255.0

<u>110</u>00000.00000000.0000000.00000000 - 192.0.0.0 <u>110</u>11111.11111111.11111111.1111111 - 223.255.255.25

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Class A — 255.0.0.0
```

<u>0</u>0000000.00000000.00000000.0000000 - 0.0.0.0 <u>0</u>1111111.11111111.11111111.1111111 - 127.255.255.255

### Class B — 255.255.0.0

## Class C — 255.255.255.0

```
<u>110</u>00000.00000000.0000000.00000000 - 192.0.0.0
<u>110</u>11111.11111111.11111111.11111111 - 223.255.255.255
```

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### Class A — 255.0.0.0

<u>0</u>0000000.00000000.00000000.00000000 - 0.0.0.0 <u>0</u>1111111.11111111.11111111.1111111 - 127.255.255.255

### Class B — 255.255.0.0

Class C — 255.255.255.0

<u>110</u>00000.00000000.00000000.00000000 - 192.0.0.0 1101111.11111111.11111111.1111111 - 223.255.255.255

## IP Address - Loopback

Reserved Space 127.0.0.0 — 127.255.255.255 127.0.0.1 localhost

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## IP Address - Private Networks

There are IP ranges set aside for privite address spaces. These should not be made visible on the internet.

### Class A

10.0.0.0 -- 10.255.255.255

## Class B

172.16.0.0 -- 172.32.255.255

## Class C

192.168.0.0 -- 192.168.255.255

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## IP Address — Subneting

Network: 192.168.192.0

Subnet: 255.255.255.224

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## IP Address - Default Route

\$ sudo route add default gw 192.168.1.1 ←

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## **DoD Layer Model**

Application ftp, telnet, mail, http protocols
Transport TCP, UDP protocols
Network IP, ICMP, IGMP protocols
Link Ethernet, Token Ring, FDDI

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## **Basic Internet Protocols**

IP ICMP TCP UDP

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/etc/services Main port numbers

## Ports and Port Numbers

Listing the Ports

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\$ less /etc/services

ftp 21/tcp

ftp 21/udp fsp fspd

ssh 22/tcp # SSH Remote Login Protocol

ssh 22/udp # SSH Remote Login Protocol

telnet 23/tcp telnet 23/udp

# 24 - private mail system

smtp 25/tcp mail smtp 25/udp mail

time 37/tcp timserver

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## Ports and Port Numbers

```
FTP 20, 21
 Telnet 23
  SSH 22
  smtp 25
  DNS 53
   http 80
 pop3 110
  nntp 119
netbios 137, 138, 139
 imap2 143
 snmp 161
```

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Main port numbers

## Port Number vRanges

1–255 Original reserved ports (till 1992) (256-1023 UNIX)

1–1023 Well Known or Famous Port Numbers - Reserved 1024–65535 Unprivileged

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