

TCP/IP Network Addresses and Subnet Masks

“The Essentials for Troubleshooting” Practice

The following practice exercises support the Winter 1998 TCdigest article “Demystifying Subnet Masks.” You can view or download the article and the tearout (includes the Conversion Chart and mathematical formulas) in Adobe Acrobat format.

A. Determining Subnet Mask Results Using Command Output

Fill in the resultant addresses and values based upon the sample command output provided below:

1. **\$ netstat -in**

Name	Mtu	Network	Address	Ipkts	Ierrs	Opkts	Oerrs	Coll
en0	1500	<Link>8.0.5a.0.2f.c3		6720	0	9313	0	0
en0	1500	150.10	150.10.10.1	6720	0	9313	0	0

\$ ifconfig en0

```
en0: flags=8080863<UP, BROADCAST, NOTRAILERS, RUNNING, SIMPLEX, MULTICAST>
      inet 150.10.10.1          netmask 0xffff0000      broadcast 150.10.255.255
```

IP Address: _____ Network Address: _____ Broadcast Address: _____
 Subnet mask: _____ Host Address Range: _____

2. **\$ netstat -in**

Name	Mtu	Network	Address	Ipkts	Ierrs	Opkts	Oerrs	Coll
tr0	1492	<Link>8.0.5a.0.11.6a		165	0	197	0	0
tr0	1492	9.19.128	9.19.130.3	165	0	197	0	0

\$ ifconfig en0

```
tr0: flags=80a0043<UP, BROADCAST, NOTRAILERS, RUNNING, ALLCAST, MULTICAST>
      inet 9.19.130.3          netmask 0xfffff000      broadcast 9.19.143.255
```

IP Address: _____ Network Address: _____ Broadcast Address: _____
 Subnet mask: _____ Host Address Range: _____

3. **\$ netstat -in**

Name	Mtu	Network	Address	Ipkts	Ierrs	Opkts	Oerrs	Coll
en0	1500	<Link>8.0.5a.0.2f.c3		957	0	841	0	0
en0	1500	150.10.32	150.10.40.1	957	0	841	0	0

\$ ifconfig en0

```
en0: flags=8080863<UP, BROADCAST, NOTRAILERS, RUNNING, SIMPLEX, MULTICAST>
      inet 150.10.40.1          netmask 0xffffe000      broadcast 150.10.63.255
```

IP Address: _____ Network Address: _____ Broadcast Address: _____
 Subnet mask: _____ Host Address Range: _____

4. \$ netstat -in

Name	Mtu	Network	Address	Ipkts	Ierrs	Opkts	Oerrs	Coll
en0	1500	<Link>8.0.5a.0.2f.c3		4966	0	10521	0	0
en0	1500	150.10	150.10.10.1	4966	0	10521	0	0

\$ ifconfig en0

en0: flags=8080863<UP, BROADCAST, NOTRAILERS, RUNNING, SIMPLEX, MULTICAST>
 inet 150.10.10.1 netmask 0xffffe000 broadcast 150.10.31.255

IP Address: _____ Network Address: _____ Broadcast Address: _____
 Subnet mask: _____ Host Address Range: _____

B. Determining Subnet Mask Results Using the Conversion Chart:

Determine the network and broadcast addresses for the following address/subnet mask combinations. Note the combinations which are not recommended and the reason they are not recommended.

- | | |
|--|--|
| <p>1) IP Address: 111.6.17.8
 Subnet Mask: 255.255.240.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> | <p>7) IP Address: 165.19.59.6
 Subnet Mask: 255.255.192.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> |
| <p>2) IP Address: 22.50.6.4
 Subnet Mask: 255.224.0.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> | <p>8) IP Address: 165.19.120.52
 Subnet Mask: 255.255.192.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> |
| <p>3) IP Address: 172.8.54.29
 Subnet Mask: 255.255.255.240
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> | <p>9) IP Address: 14.200.150.10
 Subnet Mask: 255.255.0.255
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> |
| <p>4) IP Address: 18.92.75.6
 Subnet Mask: 255.255.224.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> | <p>10) IP Address: 150.8.173.99
 Subnet Mask: 255.255.224.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> |
| <p>5) IP Address: 194.6.17.8
 Subnet Mask: 255.255.0.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> | <p>11) IP Address: 14.9.253.6
 Subnet Mask: 255.255.254.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> |
| <p>6) IP Address: 250.250.250.250
 Subnet Mask: 255.255.255.0
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> | <p>12) IP Address: 14.9.253.6
 Subnet Mask: 255.255.255.254
 Network Address: _____
 Broadcast Address: _____
 Host Address Range: _____</p> |

C. Determining the Number of Hosts and Networks Using Mathematical Formulas

Use the formulas listed in the “Help with the Math” section (on the tearout) to fill in the number of possible networks, the number of possible hosts, and the step value. Optionally, calculate the host range. Check the step and host range values with the Conversion Chart.

IP Address: 51.99.165.17
 Subnet Mask: 255.255.192.0
 No. of Hosts: _____
 No. of Networks: _____
 Step: _____
 Host Range: _____

For additional practice, try the same calculations on the addresses listed in Section B. The Answer Key provides answers for the first three -- 1), 2), and 3) -- Address/Subnet Mask combinations in Section B.

Answer Key

TCP/IP Network Addresses and Subnet Masks “The Essentials for Troubleshooting” Practice

Answers for “Determining Subnet Mask Results Using Command Output”

- | | |
|--|---|
| <p>A. 1) IP Address: 150.10.10.1
 Network Address: 150.10.0.0
 Broadcast Address: 150.10.255.255
 Subnet Mask: 255.255.0.0
 Host Range: 150.10.0.1 thru 150.10.255.254</p> | <p>3) IP Address: 150.10.40.1
 Network Address: 150.10.32.0
 Broadcast Address: 150.10.63.255
 Subnet Mask: 255.255.224.0
 Host Range: 150.10.32.1 thru 150.10.63.254</p> |
| <p>2) IP Address: 9.19.130.3
 Network Address: 9.19.128.0
 Broadcast Address: 9.19.143.255
 Subnet Mask: 255.255.240.0
 Host Range: 9.19.128.1 thru 9.19.143.254</p> | <p>4) IP Address: 150.10.10.1
 Network Address: 150.10.0.0
 Broadcast Address: 150.10.31.255
 Subnet Mask: 255.255.224.0
 Host Range: 150.10.0.1 thru 150.10.31.254
 (Not recommended by RFC 950)</p> |

Answers for “Determining Subnet Mask Results Using the Conversion Chart”

- | | |
|---|---|
| <p>B. 1) Network Address: 111.6.16.0
 Broadcast Address: 111.6.31.255
 Host Range: 111.6.16.1 thru 111.6.31.254</p> | <p>7) Network Address: 165.19.0.0 <i>(However, not recommended by RFC 950.)</i>
 Broadcast Address: 165.19.63.255
 Host Range: 165.19.0.1 thru 154.19.63.254</p> |
| <p>2) Network Address: 22.32.0.0
 Broadcast Address: 22.63.255.255
 Host Range: 22.32.0.1 thru 22.63.255.254</p> | <p>8) Network Address: 165.19.64.0
 Broadcast Address: 165.19.127.255
 Host Range: 165.19.64.1 thru 165.19.127.254</p> |
| <p>3) Network Address: 172.8.54.16
 Broadcast Address: 172.8.54.31
 Host Range: 172.8.54.17 thru 172.8.54.30</p> | <p>9) Network Address: 14.200.0.10
 Broadcast Address: 14.200.255.10 <i>(This works in AIX, but a non-contiguous subnet mask is not recommended!)</i>
 Host Range: 14.200.1.10 thru 14.200.254.10</p> |

- | | |
|---|---|
| <p>4) Network Address: 18.92.64.0
Broadcast Address: 18.92.95.255
Host Range: 18.92.64.1 thru 18.92.95.254</p> | <p>10) Network Address: 150.8.160.0
Broadcast Address: 150.8.191.255
Host Range: 150.8.160.1 thru 150.8.191.254</p> |
| <p>5) Network Address: <i>Not a valid subnet mask</i>
Broadcast Address: <i>Because this is a Class C address, this is, technically, supernetting.</i>
Host Range: None</p> | <p>11) Network Address: 14.9.252.0
Broadcast Address: 14.9.253.255
Host Range: 14.9.252.1 thru 14.9.253.254</p> |
| <p>6) Network Address: <i>(Not valid - beyond class E.)</i>
Broadcast Address: <i>(This is not a valid IPv4 address. Class A thru C unicast addresses must begin with a number between 1 and 223.)</i>
Host Range: None</p> | <p>12) Network Address: 14.9.253.6 <i>(Not valid - no host addr. range.)</i>
Broadcast Address: 14.9.253.7
Host Range: None</p> |

Answers for "Determining the Number of Hosts and Networks Using Mathematical Formulas"

- C. 1) No. of Hosts: 2^{14} or 16,384
No. of Networks: 2^{18} or 262,144
Step: 64
Host Range: 51.99.129.1 thru 51.99.191.254

Answers for the first three address combinations in Section B.

- 1) No. of Hosts: 2^{12} or 4,096
No. of Networks: 2^{20} or 1,048,576
- 2) No. of Hosts: 2^{21} or 2,097,152
No. of Networks: 2^{11} or 2,048
- 3) No. of Hosts: 2^8 or 256
No. of Networks: 2^{24} or 16,777,216

(Note: These values do not consider RFC 950 recommendations.)

Not so fast, Mighty Mask Warriors! If you find it in your calculating hearts to let us know what this practice did for you, please write the editor. Just click the "Write the Editor" button from any page on TCdiaest OnLine.