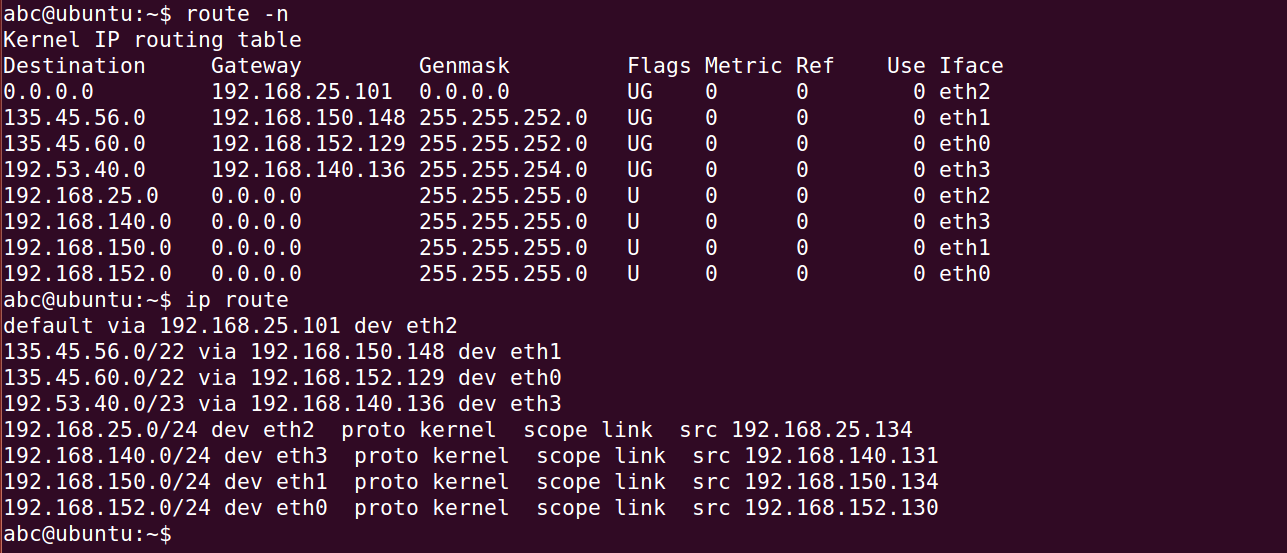
计算机网络第二次作业：

1. 请说明下列Linux命令的功能：ping，netstat，ifconfig，ip, route，tcpdump，iptables。可以使用Linux的man命令（如man ping, man ip等等）查看这些命令的使用方法。
2. 有以下四个IP地址块（address block）：
3. 192.168.0.0/23
4. 192.168.2.0/23
5. 192.168.4.0/22
6. 192.168.8.0/21

请分别算出这四个IP地址块对应的网络掩码（netmask）。请写出计算过程。

若将这四个IP地址块进行聚合，聚合后得到的IP地址块的IP地址前缀（IP Prefix）是多少？请写出计算过程。

1. 在某一路由器中有如下路由表（注：route命令和ip route都显示输出了路由表）：



请说明对于下面的每一个地址，如果到达的数据包中的目的地址为该IP地址，那么该路由器将怎样处理？

1. 135.45.63.10
2. 135.45.57.14
3. 135.45.52.2
4. 192.53.40.7
5. 192.53.56.7
6. 192.168.25.7
7. 在熟悉以太网帧（Frame）结构、IP分组（IP Packet）结构、TCP报文（TCP Segment）结构的基础上，针对下表中列出的六条以太网帧进行分析：
8. 下列哪三条以太网帧中包含了一个TCP连接建立过程的三次握手过程？TCP连接的服务器端和客户端选定的初始序列号（ISN：Initial Sequence Number）各是多少（以16进制表示）？三次握手过程中的第三条TCP报文的序列号（Sequence Number）是多少（16进制表示）？
9. 请写出这条TCP连接的服务器端的IP地址、客户端的IP地址。IP地址以点分十进制表示。
10. 这条TCP连接的客户端、服务器的端口号各是多少？
11. 第5个以太网帧中TCP报文的序列号是多少（以16进制表示）？携带的数据（Payload）的长度是多少字节？设发出第5个以太网帧的一方为主机A，主机A在发出第五个帧中的TCP报文后接着发送后续数据，这个接下来发出的TCP报文的序列号是多少（以16进制表示）？

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Frame | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | ec | 6c | 9f | | 05 | | 3e | | 5c | | 00 | | 0e | | c6 | | c2 | | 79 | | 48 | | 08 | | 00 | | 45 | 00 |
| 00 | 34 | 55 | | ac | | 40 | | 00 | | 80 | | 06 | | 00 | | 00 | | ac | | 10 | | 01 | | da | | 6a | 0b |
| d1 | 1d | c5 | | 05 | | 00 | | 50 | | ee | | 8d | | d6 | | c5 | | 00 | | 00 | | 00 | | 00 | | 80 | 02 |
| fa | f0 | e9 | | 39 | | 00 | | 00 | | 02 | | 04 | | 05 | | b4 | | 01 | | 03 | | 03 | | 08 | | 01 | 01 |
| 04 | 02 |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  |  |
| 2 | ec | 6c | | 9f | | 05 | | 3e | | 5c | | 00 | | 0e | | c6 | | c2 | | 79 | | 48 | | 08 | | 00 | 45 | 00 |
| 00 | 34 | | 5c | | bb | | 40 | | 00 | | 80 | | 06 | | 00 | | 00 | | ac | | 10 | | 01 | | da | db | ee |
| 04 | 09 | | c5 | | 3a | | 00 | | 50 | | 90 | | c6 | | ee | | 73 | | 00 | | 00 | | 00 | | 00 | 80 | 02 |
| fa | f0 | | 8e | | 08 | | 00 | | 00 | | 02 | | 04 | | 05 | | b4 | | 01 | | 03 | | 03 | | 08 | 01 | 01 |
| 04 | 02 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  |  |  |
| 3 | 00 | 0e | | c6 | | c2 | | 79 | | 48 | | ec | | 6c | | 9f | | 05 | | 3e | | 5c | | 08 | | 00 | 45 | 00 |
| 00 | 34 | | 00 | | 00 | | 40 | | 00 | | 3a | | 06 | | b2 | | e2 | | db | | ee | | 04 | | 09 | ac | 10 |
| 01 | da | | 00 | | 50 | | c5 | | 3a | | 3c | | 44 | | 0c | | c2 | | 90 | | c6 | | ee | | 74 | 80 | 12 |
| 39 | 08 | | 1a | | 49 | | 00 | | 00 | | 02 | | 04 | | 05 | | b4 | | 01 | | 01 | | 04 | | 02 | 01 | 03 |
| 03 | 09 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  |  |  |
| 4 | ec | 6c | | 9f | | 05 | | 3e | | 5c | | 00 | | 0e | | c6 | | c2 | | 79 | | 48 | | 08 | | 00 | 45 | 00 |
| 00 | 28 | | 5c | | bc | | 40 | | 00 | | 80 | | 06 | | 00 | | 00 | | ac | | 10 | | 01 | | da | db | ee |
| 04 | 09 | | c5 | | 3a | | 00 | | 50 | | 90 | | c6 | | ee | | 74 | | 3c | | 44 | | 0c | | c3 | 50 | 10 |
| 01 | 00 | | 8d | | fc | | 00 | | 00 | |  | |  | |  | |  | |  | |  | |  | |  |  |  |
| 5 | ec | 6c | | 9f | | 05 | | 3e | | 5c | | 00 | | 0e | | c6 | | c2 | | 79 | | 48 | | 08 | | 00 | 45 | 00 |
| 02 | a3 | | 5c | | bd | | 40 | | 00 | | 80 | | 06 | | 00 | | 00 | | ac | | 10 | | 01 | | da | db | ee |
| 04 | 09 | | c5 | | 3a | | 00 | | 50 | | 90 | | c6 | | ee | | 74 | | 3c | | 44 | | 0c | | c3 | 50 | 18 |
| 01 | 00 | | 90 | | 77 | | 00 | | 00 | | 47 | | 45 | | 54 | | 20 | | 2f | | 20 | | 48 | | 54 | 54 | 50 |
| 2f | 31 | | 2e | | 31 | | 0d | | 0a | | 48 | | 6f | | 73 | | 74 | | 3a | | 20 | | 77 | | 77 | 77 | 2e |
| 73 | 69 | | 6e | | 61 | | 2e | | 63 | | 6f | | 6d | | 2e | | 63 | | 6e | | 0d | | 0a | | 55 | 73 | 65 |
| 72 | 2d | | 41 | | 67 | | 65 | | 6e | | 74 | | 3a | | 20 | | 4d | | 6f | | 7a | | 69 | | 6c | 6c | 61 |
| 2f | 35 | | 2e | | 30 | | 20 | | 28 | | 57 | | 69 | | 6e | | 64 | | 6f | | 77 | | 73 | | 20 | 4e | 54 |
| 20 | 31 | | 30 | | 2e | | 30 | | 3b | | 20 | | 57 | | 69 | | 6e | | 36 | | 34 | | 3b | | 20 | 78 | 36 |
| 34 | 3b | | 20 | | 72 | | 76 | | 3a | | 35 | | 36 | | 2e | | 30 | | 29 | | 20 | | 47 | | 65 | 63 | 6b |
| 6f | 2f | | 32 | | 30 | | 31 | | 30 | | 30 | | 31 | | 30 | | 31 | | 20 | | 46 | | 69 | | 72 | 65 | 66 |
| 6f | 78 | | 2f | | 35 | | 36 | | 2e | | 30 | | 0d | | 0a | | 41 | | 63 | | 63 | | 65 | | 70 | 74 | 3a |
| 20 | 74 | | 65 | | 78 | | 74 | | 2f | | 68 | | 74 | | 6d | | 6c | | 2c | | 61 | | 70 | | 70 | 6c | 69 |
| 63 | 61 | | 74 | | 69 | | 6f | | 6e | | 2f | | 78 | | 68 | | 74 | | 6d | | 6c | | 2b | | 78 | 6d | 6c |
| 2c | 61 | | 70 | | 70 | | 6c | | 69 | | 63 | | 61 | | 74 | | 69 | | 6f | | 6e | | 2f | | 78 | 6d | 6c |
| 3b | 71 | | 3d | | 30 | | 2e | | 39 | | 2c | | 2a | | 2f | | 2a | | 3b | | 71 | | 3d | | 30 | 2e | 38 |
| 0d | 0a | | 41 | | 63 | | 63 | | 65 | | 70 | | 74 | | 2d | | 4c | | 61 | | 6e | | 67 | | 75 | 61 | 67 |
| 65 | 3a | | 20 | | 7a | | 68 | | 2d | | 43 | | 4e | | 2c | | 7a | | 68 | | 3b | | 71 | | 3d | 30 | 2e |
| 38 | 2c | | 65 | | 6e | | 2d | | 55 | | 53 | | 3b | | 71 | | 3d | | 30 | | 2e | | 35 | | 2c | 65 | 6e |
| 3b | 71 | | 3d | | 30 | | 2e | | 33 | | 0d | | 0a | | 41 | | 63 | | 63 | | 65 | | 70 | | 74 | 2d | 45 |
| 6e | 63 | | 6f | | 64 | | 69 | | 6e | | 67 | | 3a | | 20 | | 67 | | 7a | | 69 | | 70 | | 2c | 20 | 64 |
| 65 | 66 | | 6c | | 61 | | 74 | | 65 | | 0d | | 0a | | 43 | | 6f | | 6f | | 6b | | 69 | | 65 | 3a | 20 |
| 72 | 6f | | 74 | | 61 | | 74 | | 65 | | 63 | | 6f | | 75 | | 6e | | 74 | | 3d | | 32 | | 3b | 20 | 55 |
| 5f | 54 | | 52 | | 53 | | 31 | | 3d | | 30 | | 30 | | 30 | | 30 | | 30 | | 30 | | 31 | | 31 | 2e | 33 |
| 30 | 38 | | 64 | | 33 | | 65 | | 36 | | 39 | | 2e | | 35 | | 39 | | 65 | | 65 | | 61 | | 33 | 62 | 63 |
| 2e | 66 | | 62 | | 37 | | 31 | | 66 | | 36 | | 35 | | 63 | | 3b | | 20 | | 55 | | 5f | | 54 | 52 | 53 |
| 32 | 3d | | 30 | | 30 | | 30 | | 30 | | 30 | | 30 | | 31 | | 31 | | 2e | | 33 | | 30 | | 39 | 61 | 33 |
| 65 | 36 | | 39 | | 2e | | 35 | | 39 | | 65 | | 65 | | 61 | | 33 | | 62 | | 63 | | 2e | | 62 | 32 | 37 |
| 39 | 63 | | 30 | | 39 | | 31 | | 3b | | 20 | | 55 | | 4f | | 52 | | 3d | | 77 | | 77 | | 77 | 2e | 62 |
| 69 | 6e | | 67 | | 2e | | 63 | | 6f | | 6d | | 2c | | 62 | | 6c | | 6f | | 67 | | 2e | | 73 | 69 | 6e |
| 61 | 2e | | 63 | | 6f | | 6d | | 2e | | 63 | | 6e | | 2c | | 3b | | 20 | | 53 | | 49 | | 4e | 41 | 47 |
| 4c | 4f | | 42 | | 41 | | 4c | | 3d | | 31 | | 32 | | 32 | | 2e | | 32 | | 32 | | 34 | | 2e | 35 | 32 |
| 2e | 31 | | 37 | | 5f | | 31 | | 35 | | 30 | | 38 | | 38 | | 31 | | 31 | | 37 | | 30 | | 38 | 2e | 34 |
| 30 | 32 | | 38 | | 33 | | 31 | | 3b | | 20 | | 41 | | 70 | | 61 | | 63 | | 68 | | 65 | | 3d | 31 | 32 |
| 32 | 2e | | 32 | | 32 | | 34 | | 2e | | 35 | | 32 | | 2e | | 31 | | 37 | | 5f | | 31 | | 35 | 30 | 38 |
| 38 | 31 | | 31 | | 37 | | 30 | | 38 | | 2e | | 34 | | 30 | | 32 | | 38 | | 33 | | 35 | | 3b | 20 | 55 |
| 4c | 56 | | 3d | | 31 | | 35 | | 30 | | 38 | | 38 | | 31 | | 31 | | 37 | | 30 | | 39 | | 35 | 37 | 33 |
| 3a | 31 | | 3a | | 31 | | 3a | | 31 | | 3a | | 31 | | 32 | | 32 | | 2e | | 32 | | 32 | | 34 | 2e | 35 |
| 32 | 2e | | 31 | | 37 | | 5f | | 31 | | 35 | | 30 | | 38 | | 38 | | 31 | | 31 | | 37 | | 30 | 38 | 2e |
| 34 | 30 | | 32 | | 38 | | 33 | | 35 | | 3a | | 0d | | 0a | | 43 | | 6f | | 6e | | 6e | | 65 | 63 | 74 |
| 69 | 6f | | 6e | | 3a | | 20 | | 6b | | 65 | | 65 | | 70 | | 2d | | 61 | | 6c | | 69 | | 76 | 65 | 0d |
| 0a | 55 | | 70 | | 67 | | 72 | | 61 | | 64 | | 65 | | 2d | | 49 | | 6e | | 73 | | 65 | | 63 | 75 | 72 |
| 65 | 2d | | 52 | | 65 | | 71 | | 75 | | 65 | | 73 | | 74 | | 73 | | 3a | | 20 | | 31 | | 0d | 0a | 0d |
| 0a |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  |  |  |
| 6 | 00 | 0e | | c6 | | c2 | | 79 | | 48 | | ec | | 6c | | 9f | | 05 | | 3e | | 5c | | 08 | | 00 | 45 | 00 |
| 00 | 28 | | a4 | | 26 | | 40 | | 00 | | 3a | | 06 | | 0e | | c8 | | db | | ee | | 04 | | 09 | ac | 10 |
| 01 | da | | 00 | | 50 | | c5 | | 3a | | 3c | | 44 | | 0c | | c3 | | 90 | | c6 | | f0 | | ef | 50 | 10 |
| 00 | 1f | | 91 | | 8b | | 00 | | 00 | | 00 | | 00 | | 00 | | 00 | | 00 | | 00 | |  | |  |  |  |

1. TCP端口号与套接字有什么区别？连接套接字（connected socket）与侦听套接字（listening socket）有什么区别？
2. 为什么TCP连接建立过程中需要使用三次握手机制？
3. 传输层的TCP连接与网络层的虚电路子网（virtual-circuit network）中建立的连接有什么不同？
4. TCP流量控制机制与拥塞控制机制各解决什么问题？
5. 数据链路层协议的差错控制与传输层协议的差错控制有什么不同之处？
6. NAT设备的作用？为什么存在NAT穿越（NAT traversal）的问题？
7. 防火墙（Firewall）的功能是什么？
8. 请描述从校园网中的一台主机访问校外某网站（例如，www.sohu.com）的过程中，会需要使用到哪些计算机网络协议？这些协议各有什么用途？