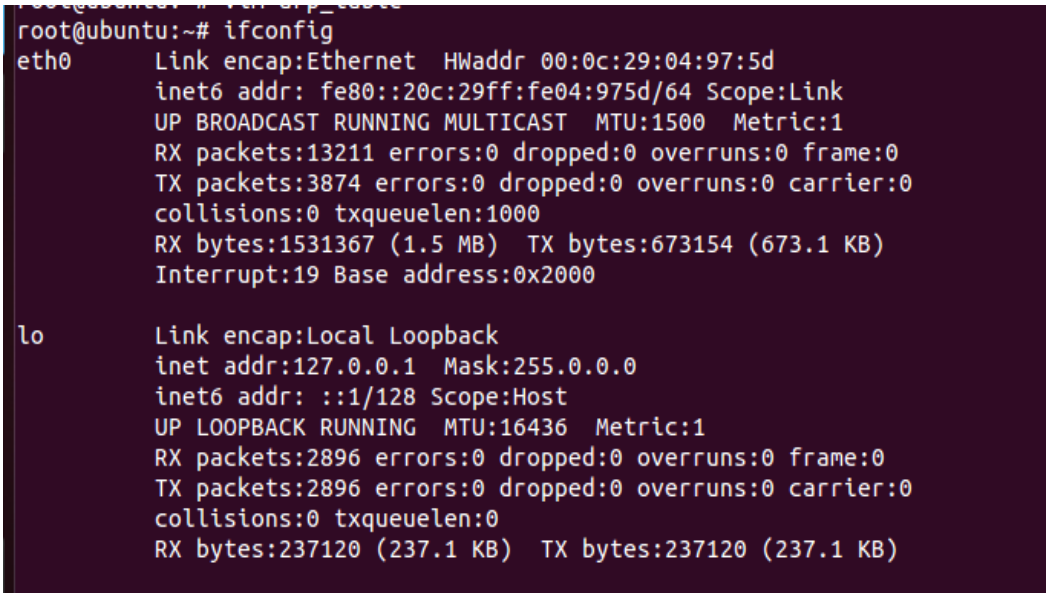
实验目的	本实验主要目的设计和实现一个简单的静态路由机制，用以取代 Linux 实现的静态路由方式，进而加深对二三层协议衔接及静态路由的理解。
数据结构说明	**//the information of the static routing table** **struct route_item** **{** **Char dest [16];** **Char gw[16];** **Char netmask[16];** **Char interface[16];** **}route_info[MAX_ROUTE_INFO];** **int route_item_index=0; // the sum of the items in the route table** **//the informaiton of the " my arp_table"** **struct arp_table_item** **{** **char ip [16];** **char mac [18];** **}arp_table[MAX_ARP_SIZE];** **int arp_item_index =0// the sum of the items in the arp_table**

	// the informaiton of the " my device" struct device_item { char interface[14]; char mac [18]; }device[MAX_DEVICE]; int device_index=0; // the sum of the interface
配置文件说明	//route_info Destination gw netmask interface Eg. 192.168.2.0 192.168.2.1 255.255.255.0 eth0 //device Interface mac Eg. Eth0 00:0c:29:04:97:5d //arp_table Ip mac Eg. 192.168.2.1 00:0c:29:e2:71:02
程序	//PC1

设计的思路以及运行流程	**Init_arp_table();//初始化 arp_table，从 arp_table 文件中读取数据到 arp_table 中** **Init_device();//初始化 device，从 device 文件中读取数据到 device 中** **While(1)** **Sendpacket();** **/*先将目的地址与 arp_table 中数据进行匹配，找到目的 MAC 地址，填入 sendpacket，源 MAC 地址可以从 device 中获得，然后继续在 sendpacket 中填写其他数据，最后发送数据包，并且记录发送时间*/** **Recvpacket();** **/*接受数据包，记录收包时间，并且计算时间差,打印相关信息*/** **//Route** **Init_route_info();//初始化 route_info，从 route_info 中读取数据到 route_info 中** **Init_arp_table();//初始化 arp_table,从 arp_table 中读取数据到 arp_table 中** **Init_device();//初始化 device，从 device 中读取数据到 device 中** **While(1)** **Recv_packet();**

	/*提取数据包中目的 ip 地址，将其& route_info 中的 destation，再与 route_info 中 destation 进行匹配，若找到匹配项，则通过匹配项的 interface 在 device 中匹配，找到源 MAC 地址，并更换数据包源 MAC 地址；再用目的 ip 在 arp_table 中查找匹配项，找到目的 MAC 地址，并更换数据包目的 MAC 地址，最后发送数据包*/ //PC2 While(1) Recv_packet(); /*将数据包中的源 Mac 和目的 MAC 交换，,并且交换源 ip 与目的 ip，然后发出数据包*/
运行结果截图	PC1 截图： 

```
root@ubuntu:~# ./ping 192.168.2.1
64 bytes from 192.168.2.1: icmp_seq=0 ttl=64 time=221.700000 ms
64 bytes from 192.168.2.1: icmp_seq=1 ttl=64 time=235.300000 ms
64 bytes from 192.168.2.1: icmp_seq=2 ttl=64 time=142.400000 ms
64 bytes from 192.168.2.1: icmp_seq=3 ttl=64 time=1.100000 ms
64 bytes from 192.168.2.1: icmp_seq=4 ttl=64 time=483048.800000 ms
64 bytes from 192.168.2.1: icmp_seq=5 ttl=64 time=0.700000 ms
64 bytes from 192.168.2.1: icmp_seq=6 ttl=64 time=0.600000 ms
64 bytes from 192.168.2.1: icmp_seq=7 ttl=64 time=0.700000 ms
64 bytes from 192.168.2.1: icmp_seq=8 ttl=64 time=0.700000 ms
64 bytes from 192.168.2.1: icmp_seq=9 ttl=64 time=0.600000 ms
64 bytes from 192.168.2.1: icmp_seq=10 ttl=64 time=0.500000 ms
64 bytes from 192.168.2.1: icmp_seq=11 ttl=64 time=0.600000 ms
```

1692	689.308500	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply id=0x0000, seq=0/0, ttl=64
1693	689.310887	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply id=0x0000, seq=0/0, ttl=64
1694	689.625330	fe80::20c:29ff:fe04:9	ff02::fb	MDNS	323	Standard query response PTR _udisks-ssh._tcp.local PTR
1695	689.819586	192.168.83.1	192.168.83.255	NBNS	92	Name query NB 055<00>
1696	689.829362	fe80::20c:29ff:fe04:9	ff02::2	ICMPv6	70	Router Solicitation from 00:0c:29:04:97:5d
1697	690.294393	fe80::20c:29ff:fe04:9	ff02::fb	MDNS	353	Standard query response TXT, cache flush AAAA, cache f
1698	690.309388	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply id=0x0000, seq=0/0, ttl=64
1699	690.310378	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply id=0x0000, seq=0/0, ttl=64

Router 截图：

```
root@ubuntu:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0c:29:e2:71:02
          inet6 addr: fe80::20c:29ff:fee2:7102/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:14098 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2829 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1577329 (1.5 MB)  TX bytes:578508 (578.5 KB)
          Interrupt:19 Base address:0x2000

eth1      Link encap:Ethernet  HWaddr 00:0c:29:e2:71:0c
          inet6 addr: fe80::20c:29ff:fee2:710c/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:9735 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2330 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1212918 (1.2 MB)  TX bytes:441686 (441.6 KB)
          Interrupt:19 Base address:0x2080

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:2896 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2896 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:237120 (237.1 KB)  TX bytes:237120 (237.1 KB)
```

Trash

```
root@ubuntu:~# ./ping
192.168.1.1==>192.168.2.1
192.168.2.1==>192.168.1.1
192.168.1.1==>192.168.2.1
192.168.2.1==>192.168.1.1
192.168.1.1==>192.168.2.1
192.168.2.1==>192.168.1.1
^C
```

1303	529.838921	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1304	529.839879	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1305	530.839796	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1306	530.840396	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1307	531.840822	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1308	531.841840	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1309	532.841671	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1310	532.842845	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1311	533.842620	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1312	533.843799	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1313	534.843655	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1314	534.844788	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
1315	535.844754	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64

PC2 截图：

```
root@ubuntu:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0c:29:93:8b:04
          inet6 addr: fe80::20c:29ff:fe93:8b04/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:12922 errors:0 dropped:1 overruns:0 frame:0
          TX packets:12563 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1425340 (1.4 MB)  TX bytes:1501318 (1.5 MB)
          Interrupt:19 Base address:0x2000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:2976 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2976 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:243648 (243.6 KB)  TX bytes:243648 (243.6 KB)
```

279	41.180869	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
280	41.181030	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
281	42.181526	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
282	42.181636	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
283	43.182554	192.168.1.1	192.168.2.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64
284	43.182708	192.168.2.1	192.168.1.1	ICMP	94	Echo (ping) reply	id=0x0000, seq=0/0, ttl=64

相关参考资

http://www.cnblogs.com/NeilHappy/archive/2012/12/08/2808417.html （计算时间差）

料	https://www.oschina.net/code/snippet_80184_1511 （模拟 ping 程序） http://blog.csdn.net/sinat_27261621/article/details/52709443 （sockaddr_ll 结构体介绍） http://www.cnblogs.com/uvsjoh/archive/2012/12/31/2840883.html （linux raw_socket 介绍）
对比样例程序	无
代码个人创新以及思考	无