

计算机网络实验一

一. 实验目的

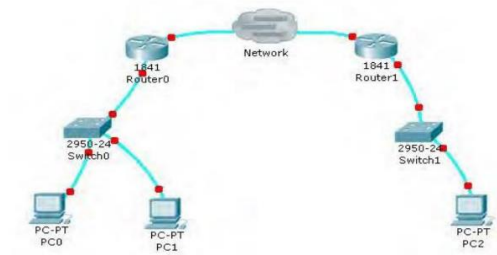
- 1. 熟悉基本网络工具集的使用
- 2. 初步了解 PDU 观测工具 Wireshark
- 3. 加深对子网、子网掩码、网关、路由器、交换机等网络概念的理解
- 4. 学习路由规则，体会“下一跳”的概念，理解数据包传送过程的转发机制
- 5. 进一步学习虚拟机、linux 平台以及使用命令行

二. 拓扑结构搭建

VMware Workstation 提供了七个虚拟交换机，选取其中的三个 vmnet2、vmnet3、vmnet4 作为本次实验的虚拟交换机，在设置中给虚拟交换机自动分配了 ip 如下

| 名称 | 类型 | 外部连接 | 主机连接 | DHCP | 子网地址 |
|--------|--------|--------|------|------|---------------|
| VMnet1 | 仅主机... | - | 已连接 | 已启用 | 192.168.224.0 |
| VMnet2 | 仅主机... | - | 已连接 | 已启用 | 192.168.174.0 |
| VMnet3 | 仅主机... | - | 已连接 | 已启用 | 192.168.57.0 |
| VMnet4 | 仅主机... | - | 已连接 | 已启用 | 192.168.84.0 |
| VMnet8 | NAT 模式 | NAT 模式 | 已连接 | 已启用 | 192.168.177.0 |

然后根据拓扑结构图如下



设 net1 和 net1_clone 为路由器，net2、net2_clone1、net2_clone2 为终端，设置网络适配器如下图

net1

继续运行此虚拟机
编辑虚拟机设置

设备

- 内存: 2 GB
- 处理器: 1
- 硬盘(SCSI): 15 GB
- CD/DVD (SATA): 自动检测
- 网络适配器: 自定义(VMnet2)
- 网络适配器 2: 自定义(VMnet3)
- USB 控制器: 存在
- 声卡: 自动检测
- 打印机: 存在
- 显示器: 自动检测

net1_clone

继续运行此虚拟机
编辑虚拟机设置

设备

- 内存: 2 GB
- 处理器: 1
- 硬盘(SCSI): 15 GB
- CD/DVD (SATA): 自动检测
- 网络适配器: 自定义(VMnet2)
- 网络适配器 2: 自定义(VMnet4)
- USB 控制器: 存在
- 声卡: 自动检测
- 打印机: 存在
- 显示器: 自动检测

net2

继续运行此虚拟机
编辑虚拟机设置

设备

- 内存: 1 GB
- 处理器: 1
- 硬盘(SCSI): 15 GB
- CD/DVD (SATA): 自动检测
- 网络适配器: 自定义(VMnet3)
- USB 控制器: 存在
- 声卡: 自动检测
- 打印机: 存在
- 显示器: 自动检测

net2_clone1

继续运行此虚拟机
编辑虚拟机设置

设备

- 内存: 1 GB
- 处理器: 1
- 硬盘(SCSI): 15 GB
- CD/DVD (SATA): 自动检测
- 网络适配器: 自定义(VMnet3)
- USB 控制器: 存在
- 声卡: 自动检测
- 打印机: 存在
- 显示器: 自动检测

net2_clone2

继续运行此虚拟机
编辑虚拟机设置

设备

- 内存: 1 GB
- 处理器: 1
- 硬盘(SCSI): 15 GB
- CD/DVD (SATA): 自动检测
- 网络适配器: 自定义(VMnet4)
- USB 控制器: 存在
- 声卡: 自动检测
- 打印机: 存在
- 显示器: 自动检测

三. 网络拓扑配置

| 节点名 | 虚拟设备名 | ip | netmask |
|---------|-------------|---------------------|---------------|
| Router0 | net1 | ens33:192.168.174.1 | 255.255.255.0 |
| | | ens38:192.168.57.1 | 255.255.255.0 |
| Router1 | net1_clone | ens33:192.168.174.2 | 255.255.255.0 |
| | | ens38:192.168.84.1 | 255.255.255.0 |
| PC1 | net2 | ens33:192.168.57.2 | 255.255.255.0 |
| PC2 | net2_clone1 | ens33:192.168.57.3 | 255.255.255.0 |
| PC3 | net2_clone2 | ens33:192.168.84.2 | 255.255.255.0 |

三. 路由规则配置

(1) 通过 `ifconfig -a|less` 查看虚拟机的网络设备

(2) 然后设置 ip:

net1:

```
sudo ifconfig ens33 192.168.174.1 netmask 255.255.255.0
sudo ifconfig ens38 192.168.57.1 netmask 255.255.255.0
```

net1_clone:

```
sudo ifconfig ens33 192.168.174.2 netmask 255.255.255.0
sudo ifconfig ens38 192.168.84.1 netmask 255.255.255.0
```

net2:

```
sudo ifconfig ens33 192.168.57.2 netmask 255.255.255.0
```

net2_clone1:

```
sudo ifconfig ens33 192.168.57.3 netmask 255.255.255.0
```

net2_clone2:

```
sudo ifconfig ens33 192.168.84.2 netmask 255.255.255.0
```

(3) 其次需要设置终端的网关

net2:

```
sudo route add default gw 192.168.57.1
```

net2_clone1:

```
sudo route add default gw 192.168.57.1
```

net2_clone2:

```
sudo route add default gw 192.168.84.1
```

(4) 最后设置路由器的路由规则并允许转发

net1:

```
sudo ip route add 192.168.84.0/24 via 192.168.174.2
```

```

sudo su
echo 1 > /proc/sys/net/ipv4/ip_forward
exit

net1_clone:
sudo ip route add 192.168.57.0/24 via 192.168.174.1
sudo su
echo 1 > /proc/sys/net/ipv4/ip_forward
exit

```

然后在终端如 net2: ping 192.168.84.2
然后在路由器 net1: sudo wireshark 即可抓包

四. 数据包截图

两条记录分别是 net2 发送到 net2_clone2 的数据包、从 net2_clone2 返回应答的数据包

The screenshot shows a Wireshark capture on interface 0. The packet list pane shows several ICMPv6 messages, with packet 703 selected. The packet details pane shows the structure of the selected packet: Ethernet II, Internet Protocol Version 4, and ICMP Echo (ping) request. The packet bytes pane shows the raw hex and ASCII data of the packet.

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|--------------|------------------------|--------------|----------|--------|---|
| 694 | 83.990756934 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Leave group 224.0.0.252 |
| 695 | 83.923801482 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 696 | 83.923900781 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 697 | 83.923979676 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.252 for any sources |
| 698 | 83.924139932 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.251 for any sources |
| 699 | 83.925854745 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 700 | 83.925866300 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Leave group 224.0.0.251 |
| 701 | 83.953254192 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 702 | 83.953420719 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.251 for any sources |
| 703 | 83.999194783 | 192.168.57.2 | 192.168.84.2 | ICMP | 98 | Echo (ping) request id=8x06e8, seq=76/19456, ttl=63 (reply in 704) |
| 704 | 83.999412622 | 192.168.84.2 | 192.168.57.2 | ICMP | 98 | Echo (ping) reply id=8x06e8, seq=76/19456, ttl=63 (request in 703) |
| 705 | 84.342144762 | fe80::9c1d:9595:d53... | ff02::1:3 | LLMNR | 95 | Standard query 0x6960 ANY LAPTOP-90R0SS1Q |
| 706 | 84.342332241 | 192.168.174.1 | 224.0.0.252 | LLMNR | 75 | Standard query 0x6960 ANY LAPTOP-90R0SS1Q |
| 707 | 84.384020275 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 62 | Membership Report / Join group 224.0.0.252 for any sources / Join group 224.0.0.251 for any sources |
| 708 | 84.384145761 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 110 | Multicast Listener Report Message v2 |

Frame 703: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0
Ethernet II, Src: Vmware_5d:92:da (00:0c:29:5d:92:da), Dst: Vmware_ad:53:af (00:0c:29:ad:53:af)
 Destination: Vmware_ad:53:af (00:0c:29:ad:53:af)
 Address: Vmware_ad:53:af (00:0c:29:ad:53:af)
0. = IG bit: Globally unique address (factory default)
0. = IG bit: Individual address (unicast)
 Source: Vmware_5d:92:da (00:0c:29:5d:92:da)
 Address: Vmware_5d:92:da (00:0c:29:5d:92:da)
0. = IG bit: Globally unique address (factory default)
0. = IG bit: Individual address (unicast)
 Type: IPv4 (0x0000)
 Internet Protocol Version 4, Src: 192.168.57.2, Dst: 192.168.84.2
 0100 = Version: 4
0101 = Header Length: 20 bytes (5)
 Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 0000 00.. = Differentiated Services Codepoint: Default (0)
00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
 0000 00 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..)S...]]...E
 0010 00 54 17 36 40 00 3f 01 16 1e c8 a8 39 02 c0 a8 T00? ...9..
 0020 54 02 00 00 ff 07 00 e0 00 4c b5 76 06 5c 00 00 T.....L.v..
 0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15
 0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25!%\$%
 0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 ..()*+.../012345
 0060 36 37 ..

| No. | Time | Source | Destination | Protocol | Length | Info |
|---|---|------------------------|--------------|----------|--------|---|
| 694 | 83.890756934 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Leave group 224.0.0.252 |
| 695 | 83.923801482 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 696 | 83.923900781 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 697 | 83.923979676 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.252 for any sources |
| 698 | 83.924139932 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.251 for any sources |
| 699 | 83.925854745 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 700 | 83.925866300 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Leave group 224.0.0.251 |
| 701 | 83.953254102 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 702 | 83.953420719 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.251 for any sources |
| 703 | 83.999019473 | 192.168.57.2 | 192.168.84.2 | ICMP | 98 | Echo (ping) request id=0x06e8, seq=76/19456, ttl=63 (reply in 704) |
| 704 | 83.999412622 | 192.168.84.2 | 192.168.57.2 | ICMP | 98 | Echo (ping) reply id=0x06e8, seq=76/19456, ttl=63 (request in 703) |
| 705 | 84.342144762 | fe80::9c1d:9595:d53... | ff02::1:3 | LLMNR | 95 | Standard query 0x6960 ANY LAPTOP-90R8551Q |
| 706 | 84.342333241 | 192.168.174.1 | 224.0.0.252 | LLMNR | 75 | Standard query 0x6960 ANY LAPTOP-90R8551Q |
| 707 | 84.384029275 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 62 | Membership Report / Join group 224.0.0.252 for any sources / Join group 224.0.0.251 for any sources |
| 708 | 84.384145761 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 110 | Multicast Listener Report Message v2 |
| Frame 704: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0 | | | | | | |
| Ethernet II, Src: Vmware_ad:53:af (00:0c:29:ad:53:af), Dst: Vmware_5d:92:da (00:0c:29:5d:92:da) | | | | | | |
| Destination: Vmware_5d:92:da (00:0c:29:5d:92:da) | | | | | | |
| Address: Vmware_5d:92:da (00:0c:29:5d:92:da) | | | | | | |
|0..... = IG bit: Globally unique address (factory default) | | | | | | |
|0..... = IG bit: Individual address (unicast) | | | | | | |
| Source: Vmware_ad:53:af (00:0c:29:ad:53:af) | | | | | | |
| Address: Vmware_ad:53:af (00:0c:29:ad:53:af) | | | | | | |
|0..... = IG bit: Globally unique address (factory default) | | | | | | |
|0..... = IG bit: Individual address (unicast) | | | | | | |
| Type: IPv4 (0x0800) | | | | | | |
| Internet Protocol Version 4, Src: 192.168.57.2, Dst: 192.168.57.2 | | | | | | |
| 0100 = Version: 4 | | | | | | |
|0101 = Header Length: 20 bytes (5) | | | | | | |
| Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT) | | | | | | |
| 0000 00.. = Differentiated Services Codepoint: Default (0) | | | | | | |
|00 = Explicit Congestion Notification: Not ECN-Capable Transport (0) | | | | | | |
| 0000 | 30 0c 29 5d 92 da 00 0c 29 ad 53 af 08 00 45 00 | [...].S....]]....E.. | | | | |
| 0010 | 00 54 17 36 40 00 3f 01 a0 8a c0 a8 54 02 c0 a8 | .T.00?....9... .. | | | | |
| 0020 | 50 02 00 00 07 07 06 e8 00 4c b5 76 86 5c 00 00 | T.....L.v\... | | | | |
| 0030 | 00 00 0e 1e 00 00 00 00 00 00 10 11 12 13 14 15 | T..... | | | | |
| 0040 | 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 |!"#% | | | | |
| 0050 | 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 | &'()*+,-./012345 | | | | |
| 0060 | 36 37 | 67 | | | | |

五. 协议报文分析

接下来以 net2 to net2_clone2 为例，对抓取的数据包进行字段分析：

| No. | Time | Source | Destination | Protocol | Length | Info |
|---|---|------------------------|--------------|----------|--------|---|
| 694 | 83.890756934 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Leave group 224.0.0.252 |
| 695 | 83.923801482 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 696 | 83.923900781 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 697 | 83.923979676 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.252 for any sources |
| 698 | 83.924139932 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.251 for any sources |
| 699 | 83.925854745 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 700 | 83.925866300 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Leave group 224.0.0.251 |
| 701 | 83.953254102 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 90 | Multicast Listener Report Message v2 |
| 702 | 83.953420719 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 60 | Membership Report / Join group 224.0.0.251 for any sources |
| 703 | 83.999019473 | 192.168.57.2 | 192.168.84.2 | ICMP | 98 | Echo (ping) request id=0x06e8, seq=76/19456, ttl=63 (reply in 704) |
| 704 | 83.999412622 | 192.168.84.2 | 192.168.57.2 | ICMP | 98 | Echo (ping) reply id=0x06e8, seq=76/19456, ttl=63 (request in 703) |
| 705 | 84.342144762 | fe80::9c1d:9595:d53... | ff02::1:3 | LLMNR | 95 | Standard query 0x6960 ANY LAPTOP-90R8551Q |
| 706 | 84.342333241 | 192.168.174.1 | 224.0.0.252 | LLMNR | 75 | Standard query 0x6960 ANY LAPTOP-90R8551Q |
| 707 | 84.384029275 | 192.168.174.1 | 224.0.0.22 | IGMPv3 | 62 | Membership Report / Join group 224.0.0.252 for any sources / Join group 224.0.0.251 for any sources |
| 708 | 84.384145761 | fe80::9c1d:9595:d53... | ff02::16 | ICMPv6 | 110 | Multicast Listener Report Message v2 |
| Frame 703: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0 | | | | | | |
| Ethernet II, Src: Vmware_5d:92:da (00:0c:29:5d:92:da), Dst: Vmware_ad:53:af (00:0c:29:ad:53:af) | | | | | | |
| Internet Protocol Version 4, Src: 192.168.57.2, Dst: 192.168.84.2 | | | | | | |
| Internet Control Message Protocol | | | | | | |
| 0000 | 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 | [...].S....]]....E.. | | | | |
| 0010 | 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 | .T.00?....9... .. | | | | |
| 0020 | 50 02 00 00 07 06 e8 00 4c b5 76 86 5c 00 00 | T.....L.v\... | | | | |
| 0030 | 00 00 0e 1e 00 00 00 00 00 00 10 11 12 13 14 15 | T..... | | | | |
| 0040 | 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 |!"#% | | | | |
| 0050 | 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 | &'()*+,-./012345 | | | | |
| 0060 | 36 37 | 67 | | | | |

Frame:所抓的包为一个帧，帧号为 703，帧大小为 98bytes

Ethernet:以太网，有线局域网技术，属于链路层

Internet protocol: IP 协议，网络层，ipv4，源 ip 为 192.168.57.2，目的 ip 为 192.168.84.2

```

▼ Ethernet II, Src: Vmware_5d:92:da (00:0c:29:5d:92:da), Dst: Vmware_ad:53:af (00:0c:29:ad:53:af)
  ▼ Destination: Vmware_ad:53:af (00:0c:29:ad:53:af)
    Address: Vmware_ad:53:af (00:0c:29:ad:53:af)
    ....0. .... = LG bit: Globally unique address (factory default)
    ....0. .... = IG bit: Individual address (unicast)
  ▼ Source: Vmware_5d:92:da (00:0c:29:5d:92:da)
    Address: Vmware_5d:92:da (00:0c:29:5d:92:da)
    ....0. .... = LG bit: Globally unique address (factory default)
    ....0. .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
0000 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S...)]...E.
0010 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?.....9...
0020 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v.\..
0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 .....
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 .....!""#$%
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345
0060 36 37 67

```

目的地的 MAC 地址: 00: 0c:29:ad:53:af

```

▼ Ethernet II, Src: Vmware_5d:92:da (00:0c:29:5d:92:da), Dst: Vmware_ad:53:af (00:0c:29:ad:53:af)
  ▼ Destination: Vmware_ad:53:af (00:0c:29:ad:53:af)
    Address: Vmware_ad:53:af (00:0c:29:ad:53:af)
    ....0. .... = LG bit: Globally unique address (factory default)
    ....0. .... = IG bit: Individual address (unicast)
  ▼ Source: Vmware_5d:92:da (00:0c:29:5d:92:da)
    Address: Vmware_5d:92:da (00:0c:29:5d:92:da)
    ....0. .... = LG bit: Globally unique address (factory default)
    ....0. .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
0000 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S...)]...E.
0010 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?.....9...
0020 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v.\..
0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 .....
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 .....!""#$%
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345
0060 36 37 67

```

源 MAC 地址:00: 0c:29:5d:92:da

```

[Coloring Rule String: icmp || icmpv6]
▼ Ethernet II, Src: Vmware_5d:92:da (00:0c:29:5d:92:da), Dst: Vmware_ad:53:af (00:0c:29:ad:53:af)
  ▼ Destination: Vmware_ad:53:af (00:0c:29:ad:53:af)
    Address: Vmware_ad:53:af (00:0c:29:ad:53:af)
    ....0. .... = LG bit: Globally unique address (factory default)
    ....0. .... = IG bit: Individual address (unicast)
  ▼ Source: Vmware_5d:92:da (00:0c:29:5d:92:da)
    Address: Vmware_5d:92:da (00:0c:29:5d:92:da)
    ....0. .... = LG bit: Globally unique address (factory default)
    ....0. .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
▼ Internet Protocol Version 4, Src: 192.168.57.2, Dst: 192.168.84.2
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  ▼ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    0000 00.. = Differentiated Services Codepoint: Default (0)
    .... 00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
0000 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S...)]...E.
0010 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?.....9...
0020 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v.\..
0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 .....
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 .....!""#$%
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345
0060 36 37 67

```

协议类型为 ipv4 (0x0800)

```

Type: IPv4 (0x0800)
▼ Internet Protocol Version 4, Src: 192.168.57.2, Dst: 192.168.84.2
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  ▼ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    0000 00.. = Differentiated Services Codepoint: Default (0)
    .... 00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
  Total Length: 84
0000 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S...)]...E.
0010 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?.....9...
0020 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v.\..
0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 .....
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 .....!""#$%
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345
0060 36 37 67

```

Ip 协议版本 4, 20 bytes(5)

| | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|-------------------------|-------------------|
| ▼ Internet Protocol Version 4, Src: 192.168.57.2, Dst: 192.168.84.2 | | | | | | | | | | |
| 0100 = Version: 4 | | | | | | | | | | |
| 0101 = Header Length: 20 bytes (5) | | | | | | | | | | |
| ▼ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT) | | | | | | | | | | |
| 0000 00.. = Differentiated Services Codepoint: Default (0) | | | | | | | | | | |
|00 = Explicit Congestion Notification: Not ECN-Capable Transport (0) | | | | | | | | | | |
| Total Length: 84 | | | | | | | | | | |
| 0000 | 00 | 0c | 29 | ad | 53 | af | 00 | 0c | 29 5d 92 da 08 00 45 00 | ..).S...)]....E. |
| 0010 | 00 | 54 | 17 | 36 | 40 | 00 | 3f | 01 | 16 1e c0 a8 39 02 c0 a8 | .T.6@.?.9... |
| 0020 | 54 | 02 | 08 | 00 | df | 07 | 06 | e8 | 00 4c b5 76 86 5c 00 00 | T.....L.v.\... |
| 0030 | 00 | 00 | 0e | 1e | 09 | 00 | 00 | 00 | 00 00 10 11 12 13 14 15 | |
| 0040 | 16 | 17 | 18 | 19 | 1a | 1b | 1c | 1d | 1e 1f 20 21 22 23 24 25 | !"#\$\$% |
| 0050 | 26 | 27 | 28 | 29 | 2a | 2b | 2c | 2d | 2e 2f 30 31 32 33 34 35 | &'()*+,- ./012345 |
| 0060 | 36 | 37 | | | | | | | | 67 |

00 表示 explicit congestion notification: not ecn-capable transport
即明确的阻塞指示

| | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|-------------------------|-------------------|
| 0101 = Header Length: 20 bytes (5) | | | | | | | | | | |
| ▼ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT) | | | | | | | | | | |
| 0000 00.. = Differentiated Services Codepoint: Default (0) | | | | | | | | | | |
|00 = Explicit Congestion Notification: Not ECN-Capable Transport (0) | | | | | | | | | | |
| Total Length: 84 | | | | | | | | | | |
| Identification: 0x1736 (5942) | | | | | | | | | | |
| ▼ Flags: 0x4000, Don't fragment | | | | | | | | | | |
| 0000 | 00 | 0c | 29 | ad | 53 | af | 00 | 0c | 29 5d 92 da 08 00 45 00 | ..).S...)]....E. |
| 0010 | 00 | 54 | 17 | 36 | 40 | 00 | 3f | 01 | 16 1e c0 a8 39 02 c0 a8 | .T.6@.?.9... |
| 0020 | 54 | 02 | 08 | 00 | df | 07 | 06 | e8 | 00 4c b5 76 86 5c 00 00 | T.....L.v.\... |
| 0030 | 00 | 00 | 0e | 1e | 09 | 00 | 00 | 00 | 00 00 10 11 12 13 14 15 | |
| 0040 | 16 | 17 | 18 | 19 | 1a | 1b | 1c | 1d | 1e 1f 20 21 22 23 24 25 | !"#\$\$% |
| 0050 | 26 | 27 | 28 | 29 | 2a | 2b | 2c | 2d | 2e 2f 30 31 32 33 34 35 | &'()*+,- ./012345 |
| 0060 | 36 | 37 | | | | | | | | 67 |

总长度为 0x54

| | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|-------------------------|-------------------|
| 0101 = Header Length: 20 bytes (5) | | | | | | | | | | |
| ▼ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT) | | | | | | | | | | |
| 0000 00.. = Differentiated Services Codepoint: Default (0) | | | | | | | | | | |
|00 = Explicit Congestion Notification: Not ECN-Capable Transport (0) | | | | | | | | | | |
| Total Length: 84 | | | | | | | | | | |
| Identification: 0x1736 (5942) | | | | | | | | | | |
| ▼ Flags: 0x4000, Don't fragment | | | | | | | | | | |
| 0000 | 00 | 0c | 29 | ad | 53 | af | 00 | 0c | 29 5d 92 da 08 00 45 00 | ..).S...)]....E. |
| 0010 | 00 | 54 | 17 | 36 | 40 | 00 | 3f | 01 | 16 1e c0 a8 39 02 c0 a8 | .T.6@.?.9... |
| 0020 | 54 | 02 | 08 | 00 | df | 07 | 06 | e8 | 00 4c b5 76 86 5c 00 00 | T.....L.v.\... |
| 0030 | 00 | 00 | 0e | 1e | 09 | 00 | 00 | 00 | 00 00 10 11 12 13 14 15 | |
| 0040 | 16 | 17 | 18 | 19 | 1a | 1b | 1c | 1d | 1e 1f 20 21 22 23 24 25 | !"#\$\$% |
| 0050 | 26 | 27 | 28 | 29 | 2a | 2b | 2c | 2d | 2e 2f 30 31 32 33 34 35 | &'()*+,- ./012345 |
| 0060 | 36 | 37 | | | | | | | | 67 |

鉴别号 0x1736


```

Identification: 0x1736 (5942)
▼ Flags: 0x4000, Don't fragment
  0... .. = Reserved bit: Not set
  .1... .. = Don't fragment: Set
  ..0... .. = More fragments: Not set
  ...0 0000 0000 0000 = Fragment offset: 0
Time to live: 63
0000 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S... )]....E.
0010 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?. ....9...
0020 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v.\..
0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 .....
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 ..... !"#$$%
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345
0060 36 37 67

```

标志 flag 为 0x4000

```

▼ Flags: 0x4000, Don't fragment
  0... .. = Reserved bit: Not set
  .1... .. = Don't fragment: Set
  ..0... .. = More fragments: Not set
  ...0 0000 0000 0000 = Fragment offset: 0
Time to live: 63
Protocol: ICMP (1)
Header checksum: 0x161e [validation disabled]
0000 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S... )]....E.
0010 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?. ....9...
0020 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v.\..
0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 .....
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 ..... !"#$$%
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345
0060 36 37 67

```

生存期为 0x3f

```

  ..0... .. = more fragments: Not set
  ...0 0000 0000 0000 = Fragment offset: 0
Time to live: 63
Protocol: ICMP (1)
Header checksum: 0x161e [validation disabled]
0000 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S... )]....E.
0010 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?. ....9...
0020 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v.\..
0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 .....
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 ..... !"#$$%
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345
0060 36 37 67

```

协议名称

```

  ...0 0000 0000 0000 = Fragment offset: 0
Time to live: 63
Protocol: ICMP (1)
Header checksum: 0x161e [validation disabled]
[Header checksum status: Unverified]
0000 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S... )]....E.
0010 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?. ....9...
0020 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v.\..
0030 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 .....
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 ..... !"#$$%
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345
0060 36 37 67

```

头部校验和校验状态

| | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| PROTOCOL: ICMP (1) | | | | | | | | | | | | | | | |
| Header checksum: 0x161e [validation disabled] | | | | | | | | | | | | | | | |
| [Header checksum status: Unverified] | | | | | | | | | | | | | | | |
| Source: 192.168.57.2 | | | | | | | | | | | | | | | |
| Destination: 192.168.84.2 | | | | | | | | | | | | | | | |
| 0000 | 00 | 0c | 29 | ad | 53 | af | 00 | 0c | 29 | 5d | 92 | da | 08 | 00 | 45 00 |
| 0010 | 00 | 54 | 17 | 36 | 40 | 00 | 3f | 01 | 16 | 1e | c0 | a8 | 39 | 02 | c0 a8 |
| 0020 | 54 | 02 | 08 | 00 | df | 07 | 06 | e8 | 00 | 4c | b5 | 76 | 86 | 5c | 00 00 |
| 0030 | 00 | 00 | 0e | 1e | 09 | 00 | 00 | 00 | 00 | 00 | 10 | 11 | 12 | 13 | 14 15 |
| 0040 | 16 | 17 | 18 | 19 | 1a | 1b | 1c | 1d | 1e | 1f | 20 | 21 | 22 | 23 | 24 25 |
| 0050 | 26 | 27 | 28 | 29 | 2a | 2b | 2c | 2d | 2e | 2f | 30 | 31 | 32 | 33 | 34 35 |
| 0060 | 36 | 37 | | | | | | | | | | | | | 67 |

源 ip

| | | | | | | | | | | | | | | | |
|--------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| [Header checksum status: Unverified] | | | | | | | | | | | | | | | |
| Source: 192.168.57.2 | | | | | | | | | | | | | | | |
| Destination: 192.168.84.2 | | | | | | | | | | | | | | | |
| Internet Control Message Protocol | | | | | | | | | | | | | | | |
| 0000 | 00 | 0c | 29 | ad | 53 | af | 00 | 0c | 29 | 5d | 92 | da | 08 | 00 | 45 00 |
| 0010 | 00 | 54 | 17 | 36 | 40 | 00 | 3f | 01 | 16 | 1e | c0 | a8 | 39 | 02 | c0 a8 |
| 0020 | 54 | 02 | 08 | 00 | df | 07 | 06 | e8 | 00 | 4c | b5 | 76 | 86 | 5c | 00 00 |
| 0030 | 00 | 00 | 0e | 1e | 09 | 00 | 00 | 00 | 00 | 00 | 10 | 11 | 12 | 13 | 14 15 |
| 0040 | 16 | 17 | 18 | 19 | 1a | 1b | 1c | 1d | 1e | 1f | 20 | 21 | 22 | 23 | 24 25 |
| 0050 | 26 | 27 | 28 | 29 | 2a | 2b | 2c | 2d | 2e | 2f | 30 | 31 | 32 | 33 | 34 35 |
| 0060 | 36 | 37 | | | | | | | | | | | | | 67 |

目的 ip

| | | | | | | | | | | | | | | | |
|-----------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| Destination: 192.168.84.2 | | | | | | | | | | | | | | | |
| Internet Control Message Protocol | | | | | | | | | | | | | | | |
| Type: 8 (Echo (ping) request) | | | | | | | | | | | | | | | |
| Code: 0 | | | | | | | | | | | | | | | |
| Checksum: 0xdf07 [correct] | | | | | | | | | | | | | | | |
| 0000 | 00 | 0c | 29 | ad | 53 | af | 00 | 0c | 29 | 5d | 92 | da | 08 | 00 | 45 00 |
| 0010 | 00 | 54 | 17 | 36 | 40 | 00 | 3f | 01 | 16 | 1e | c0 | a8 | 39 | 02 | c0 a8 |
| 0020 | 54 | 02 | 08 | 00 | df | 07 | 06 | e8 | 00 | 4c | b5 | 76 | 86 | 5c | 00 00 |
| 0030 | 00 | 00 | 0e | 1e | 09 | 00 | 00 | 00 | 00 | 00 | 10 | 11 | 12 | 13 | 14 15 |
| 0040 | 16 | 17 | 18 | 19 | 1a | 1b | 1c | 1d | 1e | 1f | 20 | 21 | 22 | 23 | 24 25 |
| 0050 | 26 | 27 | 28 | 29 | 2a | 2b | 2c | 2d | 2e | 2f | 30 | 31 | 32 | 33 | 34 35 |
| 0060 | 36 | 37 | | | | | | | | | | | | | 67 |

类型: 8

| | | | | | | | | | | | | | | | |
|-----------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| Destination: 192.168.84.2 | | | | | | | | | | | | | | | |
| Internet Control Message Protocol | | | | | | | | | | | | | | | |
| Type: 8 (Echo (ping) request) | | | | | | | | | | | | | | | |
| Code: 0 | | | | | | | | | | | | | | | |
| Checksum: 0xdf07 [correct] | | | | | | | | | | | | | | | |
| 0000 | 00 | 0c | 29 | ad | 53 | af | 00 | 0c | 29 | 5d | 92 | da | 08 | 00 | 45 00 |
| 0010 | 00 | 54 | 17 | 36 | 40 | 00 | 3f | 01 | 16 | 1e | c0 | a8 | 39 | 02 | c0 a8 |
| 0020 | 54 | 02 | 08 | 00 | df | 07 | 06 | e8 | 00 | 4c | b5 | 76 | 86 | 5c | 00 00 |
| 0030 | 00 | 00 | 0e | 1e | 09 | 00 | 00 | 00 | 00 | 00 | 10 | 11 | 12 | 13 | 14 15 |
| 0040 | 16 | 17 | 18 | 19 | 1a | 1b | 1c | 1d | 1e | 1f | 20 | 21 | 22 | 23 | 24 25 |
| 0050 | 26 | 27 | 28 | 29 | 2a | 2b | 2c | 2d | 2e | 2f | 30 | 31 | 32 | 33 | 34 35 |
| 0060 | 36 | 37 | | | | | | | | | | | | | 67 |

编码: 0

| | |
|-----------------------------------|---|
| Destination: 192.168.0.2 | |
| Internet Control Message Protocol | |
| Type: 8 (Echo (ping) request) | |
| Code: 0 | |
| Checksum: 0xdf07 [correct] | |
| [Checksum Status: Good] | |
| 0000 | 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S...)]....E. |
| 0010 | 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?.9... |
| 0020 | 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v\... |
| 0030 | 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 |
| 0040 | 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 |
| 0050 | 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345 |
| 0060 | 36 37 67 |

校验和为 0xdf07

| | |
|-----------------------------------|---|
| Checksum: 0xdf07 [correct] | |
| [Checksum Status: Good] | |
| Identifier (BE): 1768 (0x06e8) | |
| Identifier (LE): 59398 (0xe806) | |
| Sequence number (BE): 76 (0x004c) | |
| 000 | 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S...)]....E. |
| 010 | 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?.9... |
| 020 | 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v\... |
| 030 | 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 |
| 040 | 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 |
| 050 | 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345 |
| 060 | 36 37 67 |

校验者: 0xe806

| | |
|--------------------------------------|---|
| Sequence number (BE): 76 (0x004c) | |
| Sequence number (LE): 19456 (0x4c00) | |
| [Response frame: 704] | |
| 0000 | 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S...)]....E. |
| 0010 | 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?.9... |
| 0020 | 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v\... |
| 0030 | 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 |
| 0040 | 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 |
| 0050 | 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345 |
| 0060 | 36 37 67 |

Sequence number: 0x4c00

| | |
|---|---|
| Sequence number (LE): 19456 (0x4c00) | |
| [Response frame: 704] | |
| Timestamp from icmp data: Mar 11, 2019 07:54:45.000000000 PDT | |
| [Timestamp from icmp data (relative): 0.597435612 seconds] | |
| 000 | 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 ..).S...)]....E. |
| 010 | 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 .T.6@.?.9... |
| 020 | 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 T.....L.v\... |
| 030 | 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 |
| 040 | 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 |
| 050 | 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &'()*+,-./012345 |
| 060 | 36 37 67 |

Icmp 数据时间标记 3 月 11 日, 2019 年 7 点 54 分 45 秒

[Timestamp from icmp data (relative): 0.597435612 seconds]

▼ Data (48 bytes)

Data: 0e1e090000000000101112131415161718191a1b1c1d1e1f...

[Length: 48]

| | | |
|------|---|-------------------|
| 0000 | 00 0c 29 ad 53 af 00 0c 29 5d 92 da 08 00 45 00 | ..).S...)]]...E. |
| 0010 | 00 54 17 36 40 00 3f 01 16 1e c0 a8 39 02 c0 a8 | .T.6@.?.9... |
| 0020 | 54 02 08 00 df 07 06 e8 00 4c b5 76 86 5c 00 00 | T..... .L.v.\.. |
| 0030 | 00 00 0e 1e 09 00 00 00 00 00 10 11 12 13 14 15 | |
| 0040 | 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 | !"#\$% |
| 0050 | 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 | &'()*+,- ./012345 |
| 0060 | 36 37 | 67 |

数据包具体的内容

六. Ping 系主页

(1) ping cs.nju.edu.cn 的抓包截图

```
C:\Users\吴紫航>ping -t cs.nju.edu.cn
```

正在 Ping cs.nju.edu.cn [202.119.32.7] 具有 32 字节的数据:

来自 202.119.32.7 的回复: 字节=32 时间<1ms TTL=62

来自 202.119.32.7 的回复: 字节=32 时间=1ms TTL=62

来自 202.119.32.7 的回复: 字节=32 时间=1ms TTL=62

来自 202.119.32.7 的回复: 字节=32 时间<1ms TTL=62

来自 202.119.32.7 的回复: 字节=32 时间=1ms TTL=62

来自 202.119.32.7 的回复: 字节=32 时间=1ms TTL=62

来自 202.119.32.7 的回复: 字节=32 时间=1ms TTL=62

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|---------------|---------------|----------|--------|------------------------|
| 1 | 0.000000 | 172.26.90.70 | 202.119.32.7 | ICMP | 74 | Echo (ping) request id |
| 2 | 0.000761 | 202.119.32.7 | 172.26.90.70 | ICMP | 74 | Echo (ping) reply id |
| 3 | 1.015255 | 172.26.90.70 | 202.119.32.7 | ICMP | 74 | Echo (ping) request id |
| 4 | 1.016496 | 202.119.32.7 | 172.26.90.70 | ICMP | 74 | Echo (ping) reply id |
| 5 | 2.030500 | 172.26.90.70 | 202.119.32.7 | ICMP | 74 | Echo (ping) request id |
| 6 | 2.031386 | 202.119.32.7 | 172.26.90.70 | ICMP | 74 | Echo (ping) reply id |
| 7 | 2.370895 | 111.30.159.70 | 172.26.90.70 | OICQ | 137 | OICQ Protocol |
| 8 | 2.372049 | 172.26.90.70 | 111.30.159.70 | OICQ | 97 | OICQ Protocol |
| 9 | 3.045911 | 172.26.90.70 | 202.119.32.7 | ICMP | 74 | Echo (ping) request id |
| 10 | 3.047108 | 202.119.32.7 | 172.26.90.70 | ICMP | 74 | Echo (ping) reply id |
| 11 | 4.061352 | 172.26.90.70 | 202.119.32.7 | ICMP | 74 | Echo (ping) request id |

> Frame 1: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0

> Ethernet II, Src: Hewlett_3c:3e:94 (48:ba:4e:3c:3e:94), Dst: Huawei1e_1b:24:9f (10:51:72:1b:24:9f)

> Internet Protocol Version 4, Src: 172.26.90.70, Dst: 202.119.32.7

> Internet Control Message Protocol

| No. | Time | Source | Destination | Protocol | Length | Info |
|------|---|--------|-------------|-------------------------|--------|---|
| 0000 | 10 51 72 1b 24 9f 48 ba 4e 3c 3e 94 08 00 45 00 | | | 08 00 45 00 | 45 | 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |
| 0010 | 00 3c 58 f4 00 00 40 01 00 00 ac 1a 5a 46 ca 77 | | | 00 00 ac 1a 5a 46 ca 77 | 77 | 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |
| 0020 | 20 07 08 00 49 29 00 01 04 32 61 62 63 64 65 66 | | | 04 32 61 62 63 64 65 66 | 66 | 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |
| 0030 | 67 68 69 6a 6b 6c 6d 6e 6f 70 71 72 73 74 75 76 | | | 6f 70 71 72 73 74 75 76 | 76 | 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |
| 0040 | 77 61 62 63 64 65 66 67 68 69 | | | 68 69 | 69 | 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |

简要说明：帧号 1, 74 字节，以太网 II，源 MAC 为 48: ba:4e:3c:3e:94, 目的 MAC 为: 10: 51: 72: 1b:24:9f, 互联网协议版本 4, ipv4, 源 ip: 172.26.90.70 目的 ip: 202.119.32.7

(2) 登陆 www.nju.edu.cn 时候的抓包截图

| | | | | | |
|------|------------|----------------|----------------|-----|----------------------------------|
| 1668 | 121.116048 | 172.26.90.70 | 202.119.32.7 | TCP | 55 [TCP Keep-Alive] 58501 → |
| 1669 | 121.116987 | 202.119.32.7 | 172.26.90.70 | TCP | 60 [TCP Keep-Alive ACK] 80 → |
| 1670 | 125.145622 | 223.111.138.48 | 172.26.90.70 | TCP | 60 80 → 58189 [FIN, ACK] Seq=321 |
| 1671 | 125.145751 | 172.26.90.70 | 223.111.138.48 | TCP | 54 58189 → 80 [ACK] Seq=321 |
| 1672 | 125.165161 | 223.111.138.48 | 172.26.90.70 | TCP | 60 80 → 58191 [FIN, ACK] Seq=321 |
| 1673 | 125.165256 | 172.26.90.70 | 223.111.138.48 | TCP | 54 58191 → 80 [ACK] Seq=321 |
| 1674 | 125.169340 | 223.111.138.48 | 172.26.90.70 | TCP | 60 80 → 58190 [FIN, ACK] Seq=321 |
| 1675 | 125.169422 | 172.26.90.70 | 223.111.138.48 | TCP | 54 58190 → 80 [ACK] Seq=321 |
| 1676 | 125.226785 | 223.111.138.48 | 172.26.90.70 | TCP | 60 80 → 58192 [FIN, ACK] Seq=321 |
| 1677 | 125.226862 | 172.26.90.70 | 223.111.138.48 | TCP | 54 58192 → 80 [ACK] Seq=321 |

| | |
|---|---|
| > | Frame 1668: 55 bytes on wire (440 bits), 55 bytes captured (440 bits) on interface 0 |
| > | Ethernet II, Src: HewlettP_3c:3e:94 (48:ba:4e:3c:3e:94), Dst: HuaweiTe_1b:24:9f (10:51:72:1b:24:9f) |
| > | Internet Protocol Version 4, Src: 172.26.90.70, Dst: 202.119.32.7 |
| > | Transmission Control Protocol, Src Port: 58501, Dst Port: 80, Seq: 1, Ack: 1, Len: 1 |
| > | Data (1 byte) |

| | | |
|------|---|--------------------|
| 0000 | 10 51 72 1b 24 9f 48 ba 4e 3c 3e 94 08 00 45 00 | ·Qr·\$·H· N<>···E· |
| 0010 | 00 29 57 a8 40 00 80 06 00 00 ac 1a 5a 46 ca 77 | ·)W·@···· ···ZF·w |
| 0020 | 20 07 e4 85 00 50 34 46 5a ff 44 98 e1 ed 50 10 | ····P4F Z·D···P· |
| 0030 | 08 03 f0 fa 00 00 00 | ····· |

简要说明：帧号 1668，55 字节，以太网 2，源 MAC 为 48: ba:4e:3c:3e:94, 目的 MAC 为: 10: 51: 72: 1b:24:9f, 互联网协议版本 4, ipv4, 源 ip: 172.26.90.70 目的 ip: 202.119.32.7