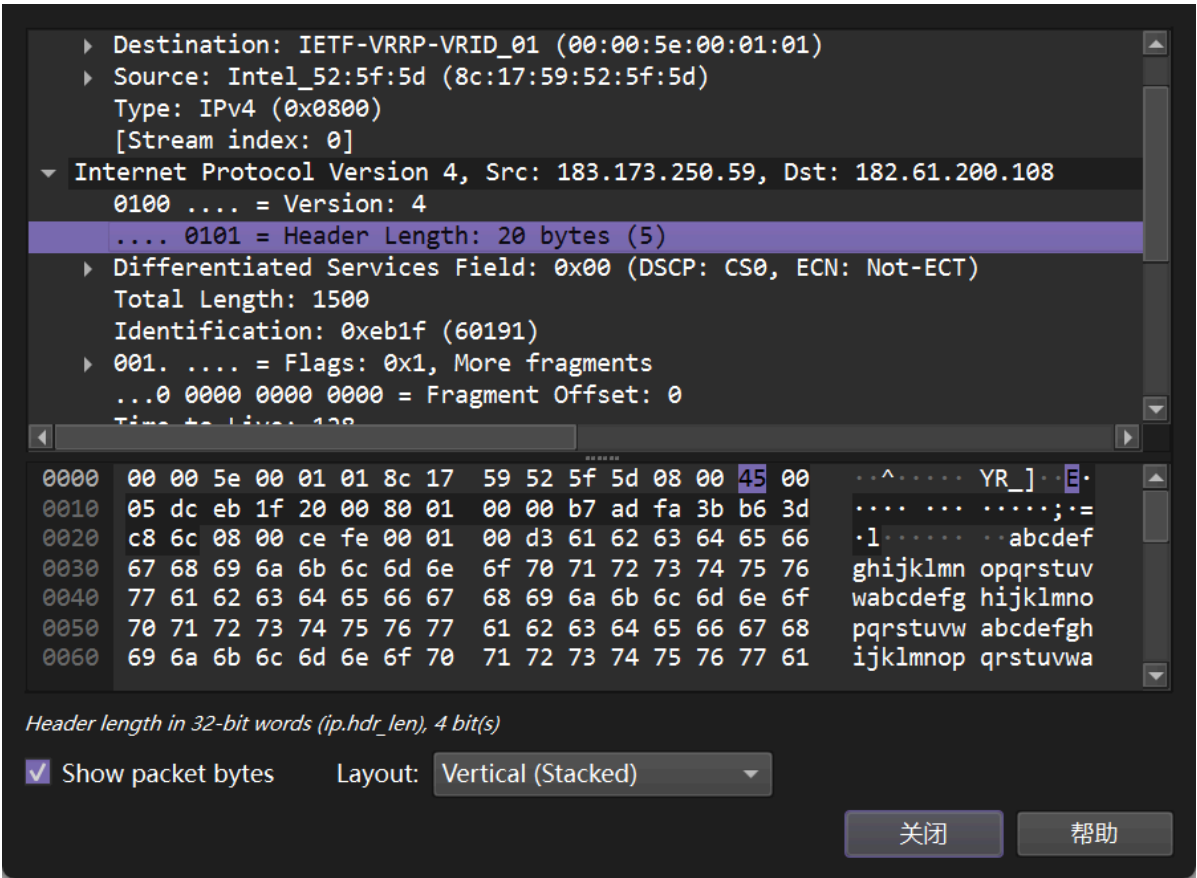


# 第三次实验报告

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## 实验一

(1) Version字段的值是多少？ IHL字段的值一般是多少？ 结合 IPv4 分组头部格式可以看出 IHL 的单位是什么？



version: 4

IHL: 5, 单位为32位 (4字节)

# (2) 三个分组的 Identification 值是多少？是否相等？

ip.version == 4 and ip.src == 183.173.250.59 and ip.dst == 182.61.200.108

No.	Time	Source	Destination	Protocol	Length	Info
5673	48.165636	183.173.250.59	182.61.200.108	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=eb1f) [Reassembled in #5675]
5674	48.165636	183.173.250.59	182.61.200.108	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=eb1f) [Reassembled in #5675]
5675	48.165636	183.173.250.59	182.61.200.108	ICMP	82	Echo (ping) request id=0x0001, seq=211/54016, ttl=128 (no response found!)
8311	53.079267	183.173.250.59	182.61.200.108	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=eb20) [Reassembled in #8313]
8312	53.079267	183.173.250.59	182.61.200.108	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=eb20) [Reassembled in #8313]
8313	53.079267	183.173.250.59	182.61.200.108	ICMP	82	Echo (ping) request id=0x0001, seq=212/54272, ttl=128 (no response found!)
8407	58.094558	183.173.250.59	182.61.200.108	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=eb21) [Reassembled in #8409]
8408	58.094558	183.173.250.59	182.61.200.108	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=eb21) [Reassembled in #8409]
8409	58.094558	183.173.250.59	182.61.200.108	ICMP	82	Echo (ping) request id=0x0001, seq=213/54528, ttl=128 (no response found!)

Source: Intel\_52:5f:5d (8c:17:59:52:5f:5d)  
Type: IPv4 (0x0800)  
[Stream index: 0]

Internet Protocol Version 4, Src: 183.173.250.59, Dst: 182.61.200.108

0100 .... = Version: 4  
.... 0101 = Header Length: 20 bytes (5)

Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)  
Total Length: 1500  
Identification: 0xeb1f (60191)

001. .... = Flags: 0x1, More fragments  
...0 0000 0000 0000 = Fragment Offset: 0  
Time to Live: 128  
Protocol: ICMP (1)

0000	00 00 5e 00 01 01 8c 17	59 52 5f 5d 08 00 45 00	..^.....YR_]..E.
0010	05 dc eb 1f 20 00 80 01	00 00 b7 ad fa 3b b6 3d	.....;.=
0020	c8 6c 08 00 ce fe 00 01	00 d3 61 62 63 64 65 66	.l.....abcdef
0030	67 68 69 6a 6b 6c 6d 6e	6f 70 71 72 73 74 75 76	ghijklmn opqrstuv
0040	77 61 62 63 64 65 66 67	68 69 6a 6b 6c 6d 6e 6f	wabcdefg hijklmno
0050	70 71 72 73 74 75 76 77	61 62 63 64 65 66 67 68	pqrstuvw abcdefgh
0060	69 6a 6b 6c 6d 6e 6f 70	71 72 73 74 75 76 77 61	ijklmnop qrstuvw

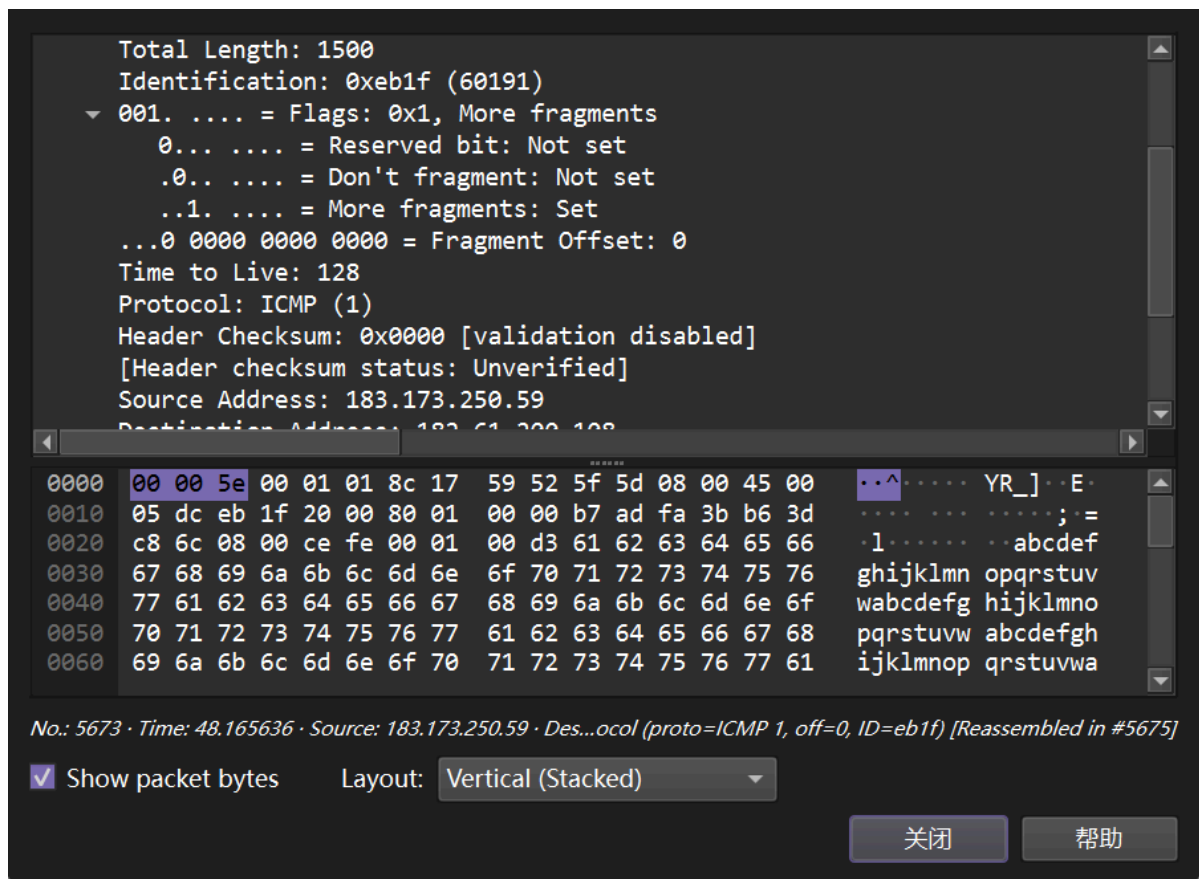
No.: 5673 · Time: 48.165636 · Source: 183.173.250.59 · Des...ocol (proto=ICMP 1, off=0, ID=eb1f) [Reassembled in #5675]

☒ Show packet bytes      Layout: Vertical (Stacked)

关闭      帮助

identification：0xeb1f(60191)，相等。

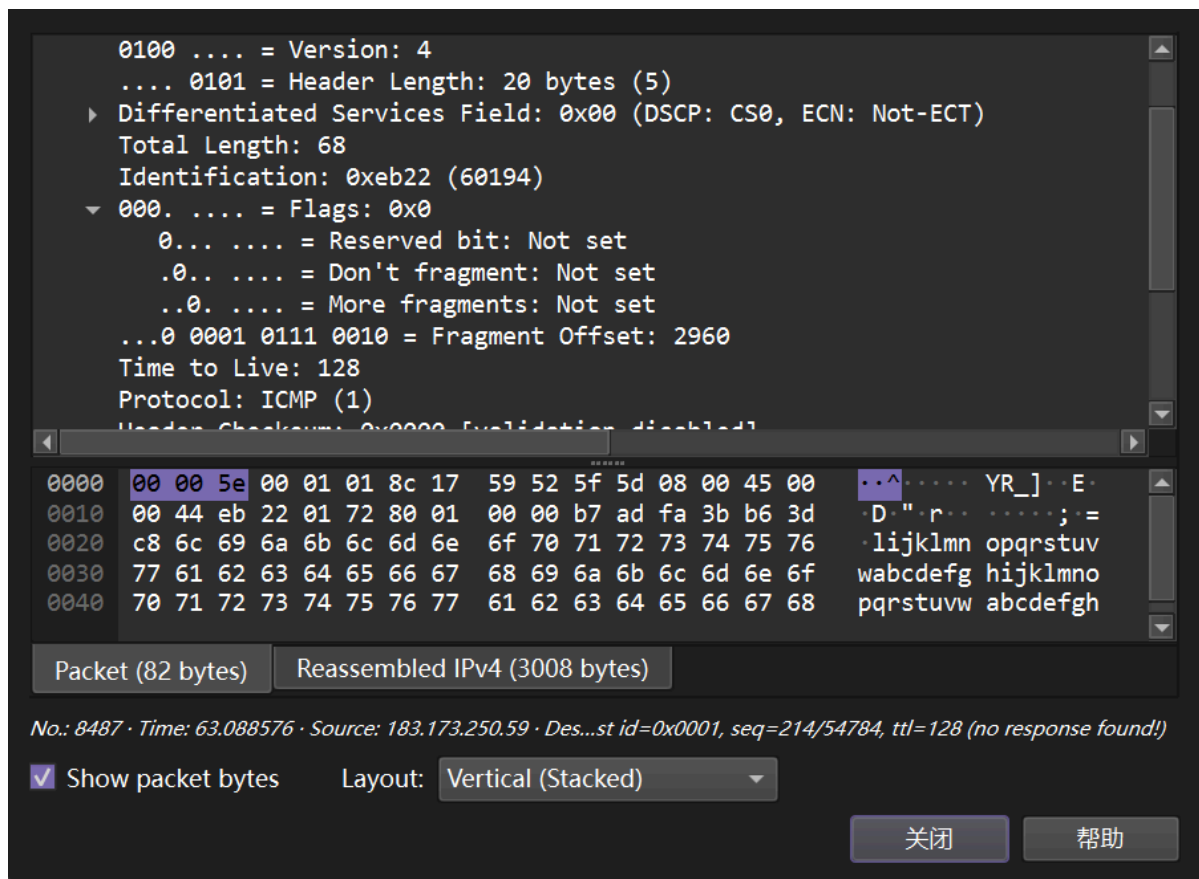
### (3) 前两个分组的Flag字段，DF和MF的值分别是？表示什么意思？



DF:0,not set, 禁止分片置零，表允许分片

MF:1,set, 该分段后还有分片

#### (4) 第三个分组的Flag字段，DF和MF的值分别是？表示什么意思？



DF:0,允许分片

MF:0，该分片后无分片

#### (5) 三个分组Fragment offset的值依次为多少，以确保在乱序到达时也能正确重组出原来的分组？

...0 0000 0000 0000 = Fragment Offset: 0

...0 0000 1011 1001 = Fragment Offset: 1480

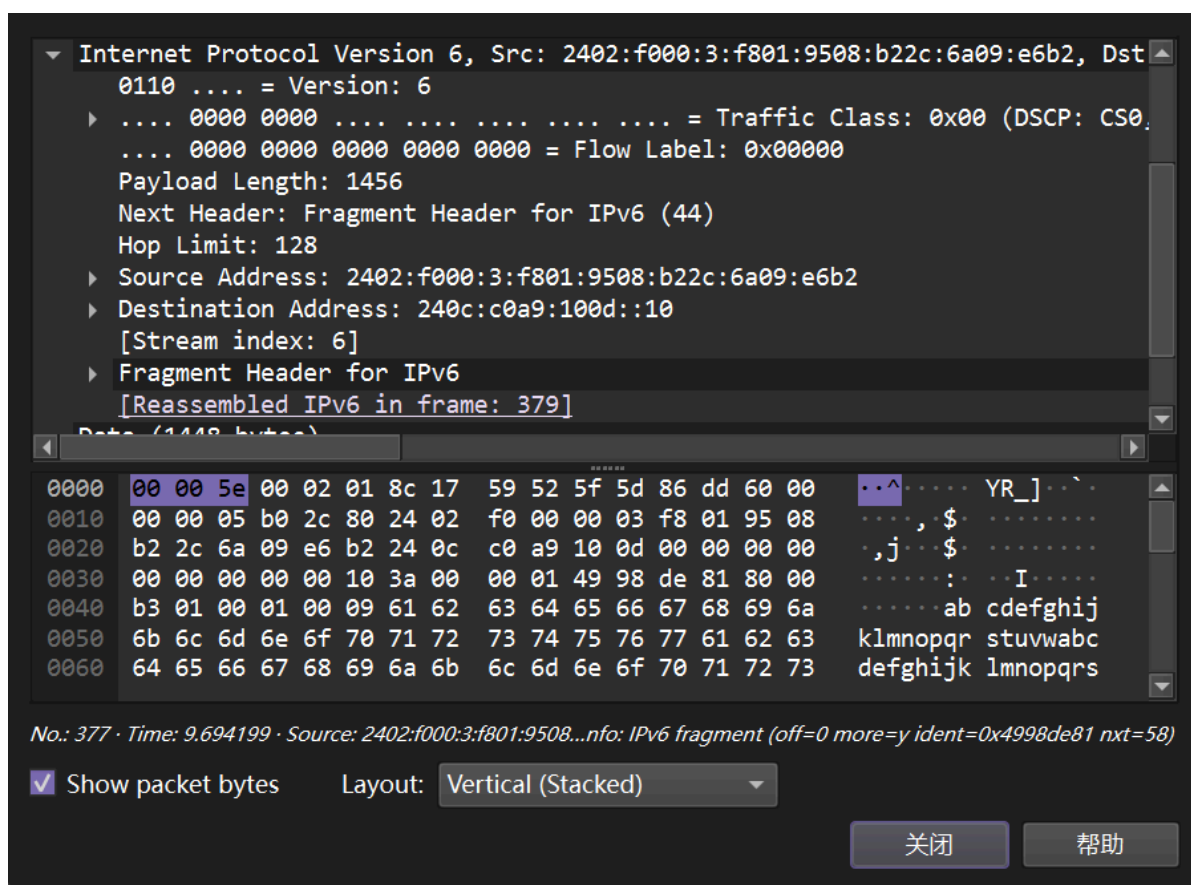
...0 0001 0111 0010 = Fragment Offset: 2960

**(6) 三个分段的总的数据长度为  
 $1500+1500+68-3*20=3008$ ，比 ping 命令  
中的参数 3000 多了 8，为什么？**

答：总数据长度 3008 包含了 ICMP 头部的 8 字节。

## 实验二

**(1) Version字段的值是多少？ 源地址和目  
标地址分别是什么， 占多少字节？**



version: 6

源地址: 2402:f000:3:f801:9508:b22c:6a09:e6b2

目的地址: 240c:c0a9:100d::10

占16字节

## (2) 观察并说明ipv6是如何进行分片的?

```
▼ Fragment Header for IPv6
  Next header: ICMPv6 (58)
  Reserved octet: 0x00
  0000 0000 0000 0... = Offset: 0 (0 bytes)
  .... .... .... .00. = Reserved bits: 0
  .... .... .... ...1 = More Fragments: Yes
  Identification: 0x4998de81
  [Reassembled IPv6 in frame: 379]
```

```
▼ Fragment Header for IPv6
  Next header: ICMPv6 (58)
  Reserved octet: 0x00
  0000 0101 1010 1... = Offset: 181 (1448 bytes)
  .... .... .... .00. = Reserved bits: 0
  .... .... .... ...1 = More Fragments: Yes
  Identification: 0x4998de81
  [Reassembled IPv6 in frame: 379]
```

```
▼ Fragment Header for IPv6
  Next header: ICMPv6 (58)
  Reserved octet: 0x00
  0000 1011 0101 0... = Offset: 362 (2896 bytes)
  .... .... .... .00. = Reserved bits: 0
  .... .... .... ...0 = More Fragments: No
  Identification: 0x4998de81
  ▶ [3 IPv6 Fragments (3008 bytes): #377(1448), #378(1448), #379(112)]
```

将含ICMP头的共3008bytes分为了1448、1448、112三片（前两段必须是8的倍数），identification相同，前两个MF为1表示后面还有分片，最后一个为0。

## (3) 观察ipv4与ipv6头部的不同点，比如前文提到的地址长度区别和分段方法区别，除此以外举出1个点辅以截图说明即可。

1.地址长度：IPv4地址长度为4字节，IPv6地址长度为16字节。

2.IPv6含Traffic class字段，

```
▼ Internet Protocol Version 6, Src: 2402:f000:3:f801:9508:b22c:6a09:e6b2, Dst: 240c:c0a9:100d::10
  0110 .... = Version: 6
  ▼ .... 0000 0000 .... = Traffic Class: 0x00 (DSCP: CS0, ECN: Not-ECT)
    .... 0000 00.. .... = Differentiated Services Codepoint: Default (0)
    .... .... ..00 .... = Explicit Congestion Notification: Not ECN-Capable Transport (0)
  .... 0000 0000 0000 0000 = Flow Label: 0x000000
  Payload Length: 1456
```

**DSCP (Differentiated Services Code Point)** : 占 Traffic Class 字段前 6 位, 用于给 IPv6 数据包分类, 标记服务优先级 (如语音、视频包优先转发), 让网络设备提供差异化 QoS (服务质量)。

**ECN (Explicit Congestion Notification)** : 占后 2 位, 用于显式传递网络拥塞状态, 路由器拥塞时无需丢包, 直接告知源主机调整发送速率, 优化传输效率。

3. IPv6 不含 DF 字段。分片规则与 IPv4 完全不同: IPv6 仅由源主机分片 (中间路由器不分片), 且源主机会通过 “路径 MTU 发现” 提前适配最大传输单元, 无需禁止分片; 同时移除 DF 位可简化 IPv6 头部设计, 提升路由器转发效率, 无需像 IPv4 那样用 DF 位限制路由器分片行为。