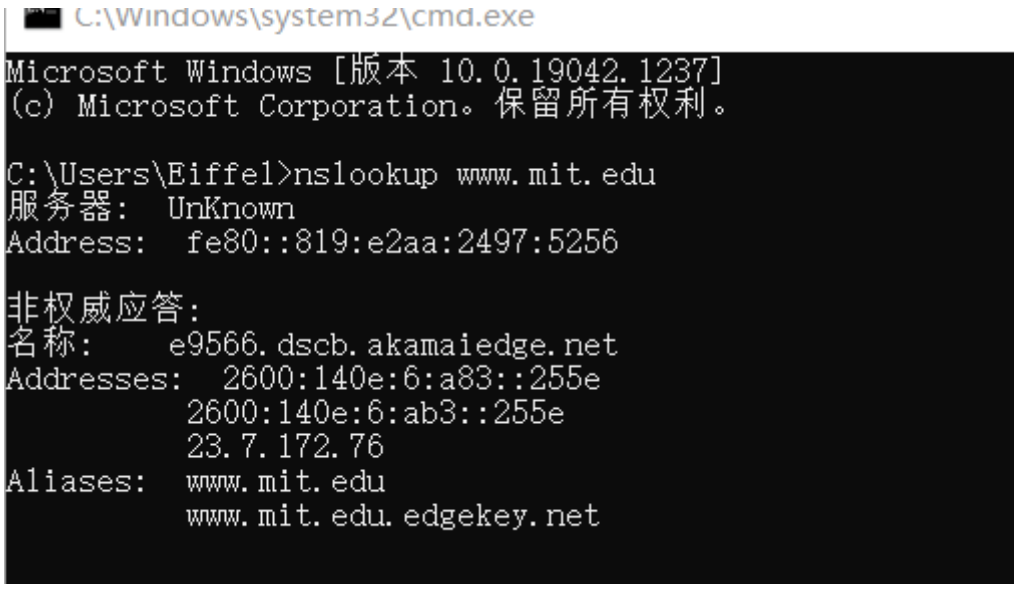
实验步骤

由于DNS协议是运行在UDP之上的，故可用nslookup进行查询网站来抓包

1.清除浏览器等的缓存

2.打开Wireshark，开始捕获

3.进入命令窗口，输入nslookup www.mit.edu

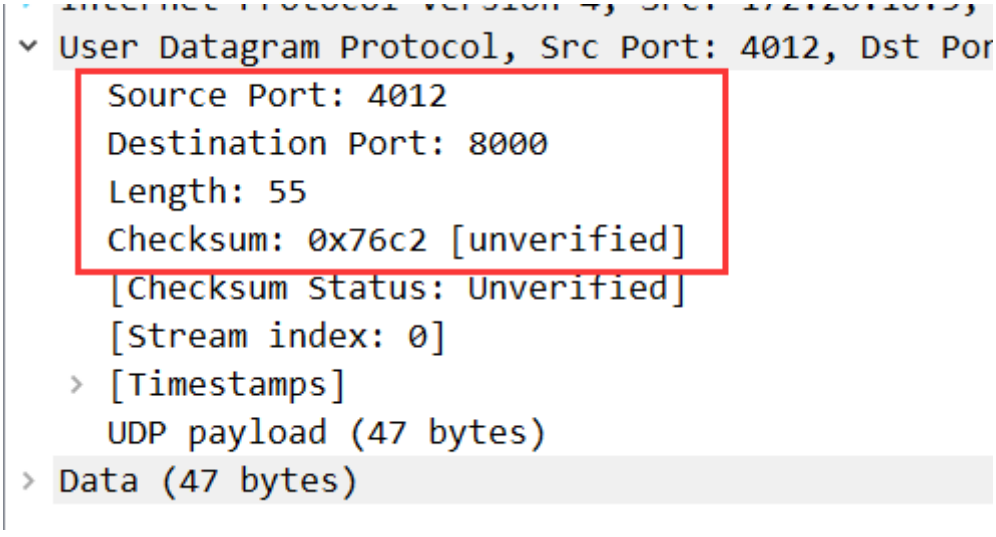


4.停止捕获

题目

1. **Select one UDP packet from your trace. From this packet, determine how many fields there are in the UDP header. (You shouldn't look in the textbook! Answer these questions directly from what you observe in the packet trace.) Name these fields.**

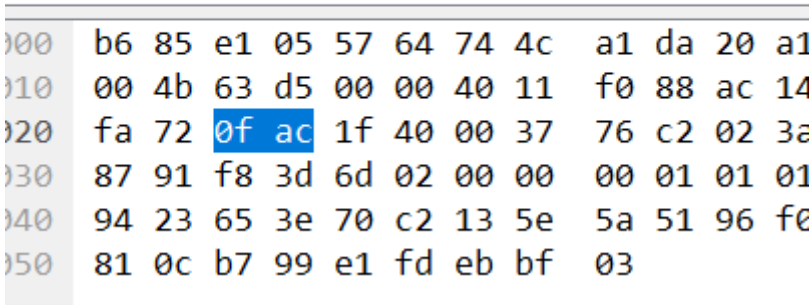
   4 个：源端口号、目的端口号、长度、检验和

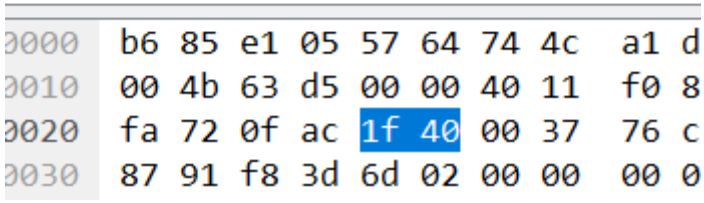


2. **By consulting the displayed information in Wireshark's packet content field for this packet, determine the length (in bytes) of each of the UDP header fields.**

每个UDP头部都为2字节，见如下图所示。

```
User Datagram Protocol, Src Port: 4012,
   Source Port: 4012
   Destination Port: 8000
   Length: 55
   Checksum: 0x76c2 [unverified]
   [Checksum Status: Unverified]
   [Stream index: 0]
 > [Timestamps]
   UDP payload (47 bytes)
Data (47 bytes)
```





```
Internet Protocol Version 4, Src: 172.20.
User Datagram Protocol, Src Port: 4012, D
    Source Port: 4012
    Destination Port: 8000
    Length: 55
    Checksum: 0x76c2 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 0]
  > [Timestamps]
    UDP payload (47 bytes)
> Data (47 bytes)
```

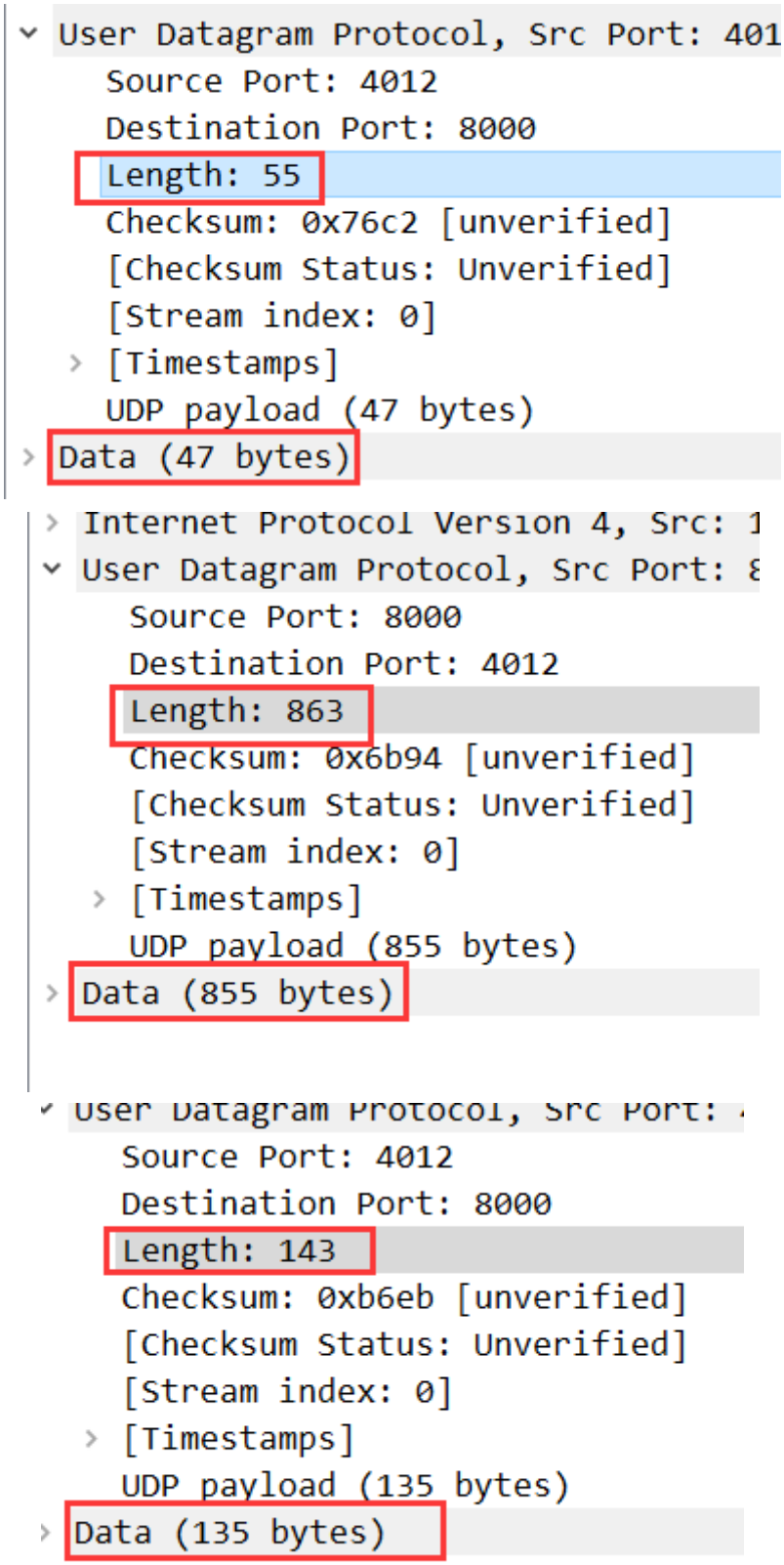
```
0000  b6 85 e1 05 57 64 74 4c  a1 da 20 a1
0010  00 4b 63 d5 00 00 40 11  f0 88 ac 14
0020  fa 72 0f ac 1f 40 00 37  76 c2 02 3a
0030  87 91 f8 3d 6d 02 00 00  00 01 01 01
0040  94 23 65 3e 70 c2 13 5e  5a 51 96 f0
0050  81 0c b7 99 e1 fd eb bf  03
```

```
> Frame 7: 89 bytes on wire (712 bits), 89 byt
> Ethernet II, Src: LiteonTe_da:20:a1 (74:4c:a
> Internet Protocol Version 4, Src: 172.20.10.
v User Datagram Protocol, Src Port: 4012, Dst
    Source Port: 4012
    Destination Port: 8000
    Length: 55
    Checksum: 0x76c2 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 0]
  > [Timestamps]
    UDP payload (47 bytes)
> Data (47 bytes)
```

```
0000  b6 85 e1 05 57 64 74 4c  a1 da 20 a1 08
0010  00 4b 63 d5 00 00 40 11  f0 88 ac 14 0a
0020  fa 72 0f ac 1f 40 00 37  76 c2 02 3a 21
0030  87 91 f8 3d 6d 02 00 00  00 01 01 01 00
0040  94 23 65 3e 70 c2 13 5e  5a 51 96 f0 55
0050  81 0c b7 99 e1 fd eb bf  03
```

3. **The value in the Length field is the length of what? (You can consult the text for this answer). Verify your claim with your captured UDP packet.**

   UDP报文段中的字节数。从下图可知，Length中的值为数据的字节数加8，其中，8为UDP报文首部的字节数，故可知Length为UDP报文段的字节数。



4. **What is the maximum number of bytes that can be included in a UDP payload? (Hint: the answer to this question can be determined by your answer to 2. above)**

UDP报文的首部有2 byte 用于记录报文的长度，2 byte = 16 bit，2^{16}-1=65535，除去首部的8 byte，则应用数据所占的字节数为 65535 - 8 = 65527。

5. **What is the largest possible source port number? (Hint: see the hint in 4.)**

   源端口号为 2 byte，即16 bit，2^{16}-1 = 65535，故最大端口号为65535。

6. **What is the protocol number for UDP? Give your answer in both hexadecimal and decimal notation. To answer this question, you'll need to look into the Protocol field of the IP datagram containing this UDP segment (see Figure 4.13 in the text, and the discussion of IP header fields).**

   十六进制：0x11

   十进制：17

   ```
   Total Length: 163
   Identification: 0x63dc (25564)
   Flags: 0x00
   ...0 0000 0000 0000 = Fragment Offset: 0
   Time to Live: 64
   Protocol: UDP (17)
   Header Checksum: 0xf029 [validation disable
   [Header checksum status: Unverified]
   Source Address: 172.20.10.5
   ```

7. **Examine a pair of UDP packets in which your host sends the first UDP packet and the second UDP packet is a reply to this first UDP packet. (Hint: for a second packet to be sent in response to a first packet, the sender of the first packet should be the destination of the second packet). Describe the relationship between the port numbers in the two packets.**

   第一个UDP报文的源端口（源端口号为4012）是第二个UDP报文的目的端口，而第一个UDP报文的目的端口（目的端口号为8000）则是第二个UDP报文的源端口。

4	2021-10-10 09:36:05.651145	172.20.10.5	117.184.250.114	OICQ	89	OICQ Protocol
5	2021-10-10 09:36:05.651289	172.20.10.5	117.184.250.114	OICQ	81	OICQ Protocol
7	2021-10-10 09:36:05.671563	172.20.10.5	117.184.250.114	UDP	89	4012 → 8000 Len=47
8	2021-10-10 09:36:05.752662	117.184.250.114	172.20.10.5	OICQ	873	OICQ Protocol
9	2021-10-10 09:36:05.752804	117.184.250.114	172.20.10.5	OICQ	913	OICQ Protocol
10	2021-10-10 09:36:05.752804	117.184.250.114	172.20.10.5	UDP	897	8000 → 4012 Len=855
11	2021-10-10 09:36:05.753559	172.20.10.5	117.184.250.114	OICQ	89	OICQ Protocol
12	2021-10-10 09:36:05.753675	172.20.10.5	117.184.250.114	OICQ	81	OICQ Protocol