山东大学 计算机科学与技术 学院

新兴网络技术与实践 课程实验报告

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实验题目：Wireshark DNS		
实验学时：2	实验日期：2025/3/19	
实验目的：了解 DNS		

实验结果：

1. Run nslookup to obtain the IP address of a Web server in Asia. What is the IP address of that server?

```
C:\Users\23676>nslookup sdu.edu.cn
Server:  UnKnown
Address:  192.168.254.245

Name:    sdu.edu.cn
Addresses:  211.86.56.247
          202.194.14.6
          202.194.15.6


C:\Users\23676>
```

从图中可以看出 www.sdu.edu.cn 的服务器 ip 地址对应了三个值，分别是 211.86.56.247、202.194.14.6、202.194.15.6

2. Run nslookup to determine the authoritative DNS servers for a university in Europe.

```
C:\Users\23676>nslookup -type=NS ox.ac.uk
Server:  UnKnown
Address:  192.168.254.245

Non-authoritative answer:
ox.ac.uk        nameserver = auth5.dns.ox.ac.uk
ox.ac.uk        nameserver = dns1.ox.ac.uk
ox.ac.uk        nameserver = auth4.dns.ox.ac.uk
ox.ac.uk        nameserver = auth6.dns.ox.ac.uk
ox.ac.uk        nameserver = dns0.ox.ac.uk
ox.ac.uk        nameserver = dns2.ox.ac.uk

dns0.ox.ac.uk   internet address = 129.67.1.190
dns1.ox.ac.uk   internet address = 129.67.1.191
dns2.ox.ac.uk   internet address = 163.1.2.190
auth5.dns.ox.ac.uk      AAAA IPv6 address = 2a00:1098:0:80:1000::10
auth6.dns.ox.ac.uk      internet address = 185.24.221.32

C:\Users\23676>
```

可以看出牛津大学的权威 DNS 服务器有 auth5.dns.ox.ac.uk、dns1.ox.ac.uk 、 auth4.dns.ox.ac.uk 、 auth6.dns.ox.ac.uk 、dns0.ox.ac.uk、dns2.ox.ac.uk

3. Run nslookup so that one of the DNS servers obtained in Question 2 is queried for the mail servers for Yahoo! mail. What is its IP address?

很不幸牛津大学的权威 DNS 不允许我们使用它来解析域名：

```
C:\Users\23676>nslookup mail.yahoo.com auth4.dns.ox.ac.uk
Server:  UnKnown
Address:  45.33.127.156

*** UnKnown can't find mail.yahoo.com: Query refused
```

但是公共 DNS 解析的结果为：

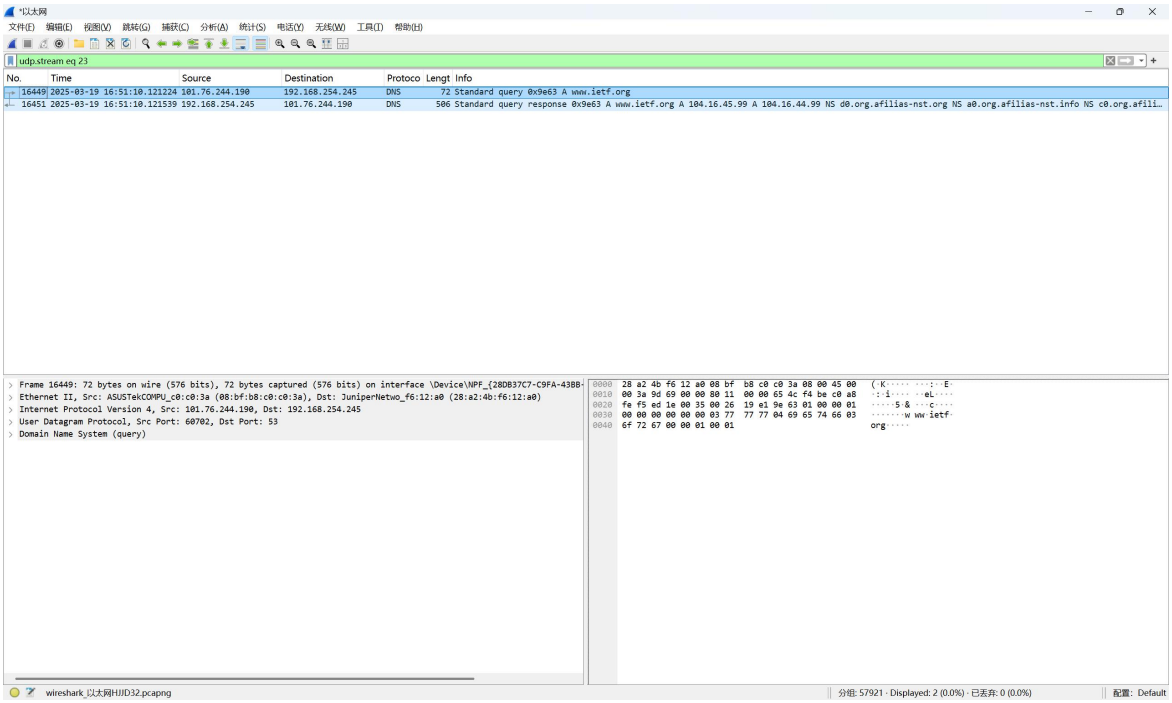
```
C:\Users\23676>nslookup mail.yahoo.com 8.8.8.8
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
Name:    edge.gycpi.b.yahoodns.net
Addresses:  2406:2000:a8:800::e6
          2406:2000:a8:800::e7
          180.222.116.12
          180.222.116.11
Aliases:  mail.yahoo.com
```

可以看出雅虎邮箱的 IP 地址为图中的四个，2406:2000:a8:800::e6、2406:2000:a8:800::e6、180

.222.116.12、180.222.116.11

4. Locate the DNS query and response messages. Are then sent over UDP or TCP?



通过追踪流的方式，我们可以得知为我们服务的这个 DNS 是使用的 UDP 协议。

5. What is the destination port for the DNS query message? What is the source port of DNS response message?

```
> Frame 16451: 506 bytes on wire (4048 bits), 506 bytes captured (4048 bits) on interface \Device\NPF_{28DB37C7-C9FA-4
> Ethernet II, Src: JuniperNetwo_f6:12:a0 (28:a2:4b:f6:12:a0), Dst: ASUSTekCOMPU_c0:c0:3a (08:bf:b8:c0:c0:3a)
> Internet Protocol Version 4, Src: 192.168.254.245, Dst: 101.76.244.190
> User Datagram Protocol, Src Port: 53, Dst Port: 60702
> Domain Name System (response)
```

从这里的信息可以看出，源端口号是 53，目的端口号是 60702

6. To what IP address is the DNS query message sent? Use ipconfig to determine the IP address of your local DNS server. Are these two IP addresses the same?

).	Time	Source	Destination	Protoco	Lengt	I
16449	2025-03-19 16:51:10.121224	101.76.244.190	192.168.254.245	DNS	72	S
16451	2025-03-19 16:51:10.121539	192.168.254.245	101.76.244.190	DNS	506	S

从上图中可以看出 DNS query 信息被发送到了 192.168.254.245 这个 ip 地址，这与上文图中我们的本地 DNS 服务器地址是一致的。

7. Examine the DNS query message. What "Type" of DNS query is it? Does the query message contain any "answers"?

```
v Flags: 0x8180 Standard query response, No error
      1... .... .... .... = Response: Message is a response
      .000 0... .... .... = Opcode: Standard query (0)
      .... .0.. .... .... = Authoritative: Server is not an authority for domain
      .... ..0. .... .... = Truncated: Message is not truncated
      .... ...1 .... .... = Recursion desired: Do query recursively
      .... .... 1... .... = Recursion available: Server can do recursive queries
      .... .... .0.. .... = Z: reserved (0)
      .... .... ..0. .... = Answer authenticated: Answer/authority portion was not authenticated by the server
      .... .... ...0 .... = Non-authenticated data: Unacceptable
      .... .... .... 0000 = Reply code: No error (0)
    Questions: 1
    Answer RRs: 2
    Authority RRs: 6
    Additional RRs: 12
v Queries
```

这个 DNS query 的类型是 Standard query response, No error

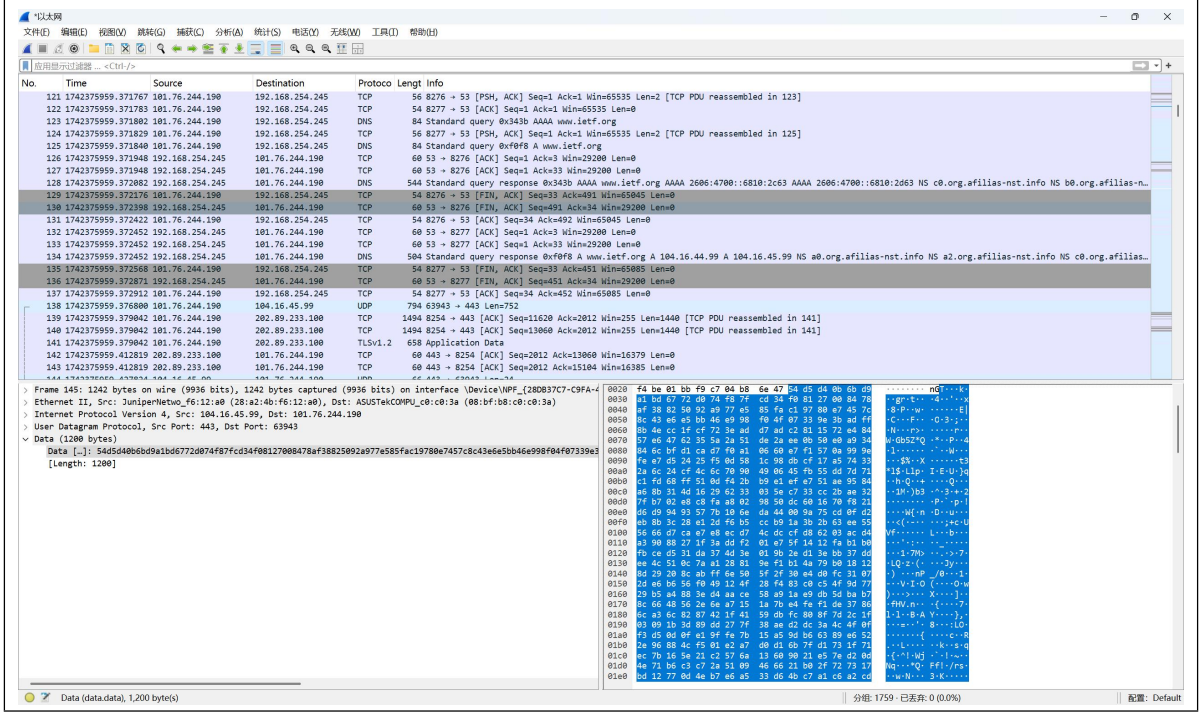
Answers 为

```
Answers
  www.ietf.org: type A, class IN, addr 104.16.45.99
      Name: www.ietf.org
      Type: A (1) (Host Address)
      Class: IN (0x0001)
      Time to live: 56367 (15 hours, 39 minutes, 27 seconds)
      Data length: 4
      Address: 104.16.45.99
  www.ietf.org: type A, class IN, addr 104.16.44.99
      Name: www.ietf.org
      Type: A (1) (Host Address)
      Class: IN (0x0001)
      Time to live: 56367 (15 hours, 39 minutes, 27 seconds)
      Data length: 4
      Address: 104.16.44.99
```

8. Examine the DNS response message. How many "answers" are provided? What do each of these answers contain?

如上图，一共两个回复，每个回复包括域名、类型、类别、time to live、数据长度、域名解析出的地址。

9. Consider the subsequent TCP SYN packet sent by your host. Does the destination IP address of the SYN packet correspond to any of the IP addresses provided in the DNS response message?

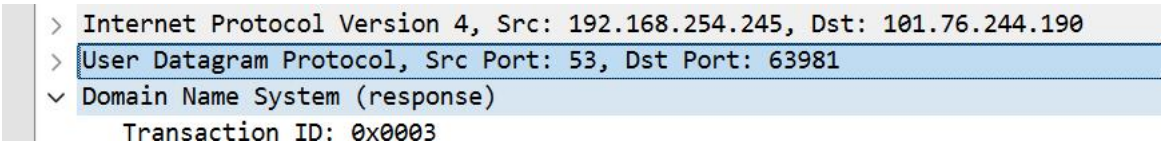


根据结果，TCP SYN 并没有发生在主机与 www.ietf.org 之间，而是在主机与本地 DNS 服务器之间。

10. This web page contains images. Before retrieving each image, does your host issue new DNS queries?

我们的主机在获取到图片之前，并没有在发出 DNS 事务。

11. What is the destination port for the DNS query message? What is the source port of DNS response message?



从这里的信息可以看出，源端口号是 53，目的端口号是 63981

12. To what IP address is the DNS query message sent? Is this the IP address of your default local DNS server?

No.	Time	Source	Destination	Protoco	Lengt	Info
933	1742376962.115025	101.76.244.190	192.168.254.245	DNS	88	Standard query 0x0001 PTR 245.254.168.192.in-addr.arpa
934	1742376962.115642	192.168.254.245	101.76.244.190	DNS	123	Standard query response 0x0001 No such name PTR 245.254.168.192.in-addr.arpa SOA 168.192.i
935	1742376962.116943	101.76.244.190	192.168.254.245	DNS	71	Standard query 0x0002 A www.mit.edu
936	1742376962.127862	192.168.254.245	101.76.244.190	DNS	160	Standard query response 0x0002 A www.mit.edu CNAME www.mit.edu.edgekey.net CNAME e9566.dscb
937	1742376962.130299	101.76.244.190	192.168.254.245	DNS	71	Standard query 0x0003 AAAA www.mit.edu
950	1742376962.323019	192.168.254.245	101.76.244.190	DNS	200	Standard query response 0x0003 AAAA www.mit.edu CNAME www.mit.edu.edgekey.net CNAME e9566.c
1054	1742376964.203571	101.76.244.190	192.168.254.245	DNS	80	Standard query 0xd005 AAAA otheve.beacon.qq.com
1055	1742376964.203677	101.76.244.190	192.168.254.245	DNS	80	Standard query 0x09a2 A otheve.beacon.qq.com
1056	1742376964.203746	101.76.244.190	192.168.254.245	DNS	80	Standard query 0x5520 HTTPS otheve.beacon.qq.com
1059	1742376964.203934	192.168.254.245	101.76.244.190	DNS	184	Standard query response 0xd005 AAAA otheve.beacon.qq.com CNAME ins-u4xprfqu.ias.tencent-clo
1060	1742376964.203934	192.168.254.245	101.76.244.190	DNS	160	Standard query response 0x09a2 A otheve.beacon.qq.com CNAME ins-u4xprfqu.ias.tencent-cloud.
1064	1742376964.204192	192.168.254.245	101.76.244.190	DNS	128	Standard query response 0x5520 HTTPS otheve.beacon.qq.com CNAME ins-u4xprfqu.ias.tencent-cl

如图，这个 192.168.254.245 和我们本地的 DNS 服务器的 IP 是一致的。

13. Examine the DNS query message. What “Type” of DNS query is it? Does the query message contain any “answers”?

```
> User Datagram Protocol, Src Port: 53, Dst Port: 63981
v Domain Name System (response)
    Transaction ID: 0x0003
  v Flags: 0x8180 Standard query response, No error
      1... .... .... .... = Response: Message is a response
      .000 0... .... .... = Opcode: Standard query (0)
      .... .0.. .... .... = Authoritative: Server is not an authority for domain
      .... ..0. .... .... = Truncated: Message is not truncated
      .... ...1 .... .... = Recursion desired: Do query recursively
      .... .... 1... .... = Recursion available: Server can do recursive queries
      .... .... .0.. .... = Z: reserved (0)
      .... .... ..0. .... = Answer authenticated: Answer/authority portion was not authenticated by the server
      .... .... ...0 .... = Non-authenticated data: Unacceptable
      .... .... .... 0000 = Reply code: No error (0)
    Questions: 1
    Answer RRs: 4
    Authority RRs: 0
    Additional RRs: 0
  v Queries
    v www.mit.edu: type AAAA, class IN
        Name: www.mit.edu
        [Name Length: 11]
        [Label Count: 3]
```

这个 DNS query 的类型是 Standard query response, No error

Answers 为

```
v Answers
  v www.mit.edu: type CNAME, class IN, cname www.mit.edu.edgekey.net
      Name: www.mit.edu
      Type: CNAME (5) (Canonical NAME for an alias)
      Class: IN (0x0001)
      Time to live: 1166 (19 minutes, 26 seconds)
      Data length: 25
      CNAME: www.mit.edu.edgekey.net
  v www.mit.edu.edgekey.net: type CNAME, class IN, cname e9566.dscb.akamaiedge.net
      Name: www.mit.edu.edgekey.net
      Type: CNAME (5) (Canonical NAME for an alias)
      Class: IN (0x0001)
      Time to live: 60 (1 minute)
      Data length: 24
      CNAME: e9566.dscb.akamaiedge.net
  v e9566.dscb.akamaiedge.net: type AAAA, class IN, addr 2600:1417:8400:286::255e
      Name: e9566.dscb.akamaiedge.net
      Type: AAAA (28) (IP6 Address)
      Class: IN (0x0001)
      Time to live: 60 (1 minute)
      Data length: 16
      AAAA Address: 2600:1417:8400:286::255e
  v e9566.dscb.akamaiedge.net: type AAAA, class IN, addr 2600:1417:8400:28a::255e
      Name: e9566.dscb.akamaiedge.net
      Type: AAAA (28) (IP6 Address)
      Class: IN (0x0001)
      Time to live: 60 (1 minute)
      Data length: 16
      AAAA Address: 2600:1417:8400:28a::255e
  [Request In: 937]
  [Time: 0.192720000 seconds]
```

14. Examine the DNS response message. How many “answers” are

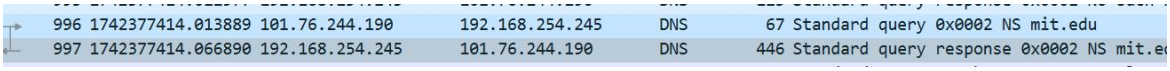
provided? What do each of these answers contain?

如上图，一共五个回复，每个回复包括域名、类型、类别、time to live、数据长度、域名别名、域名解析出的地址。

15. Provide a screenshot.

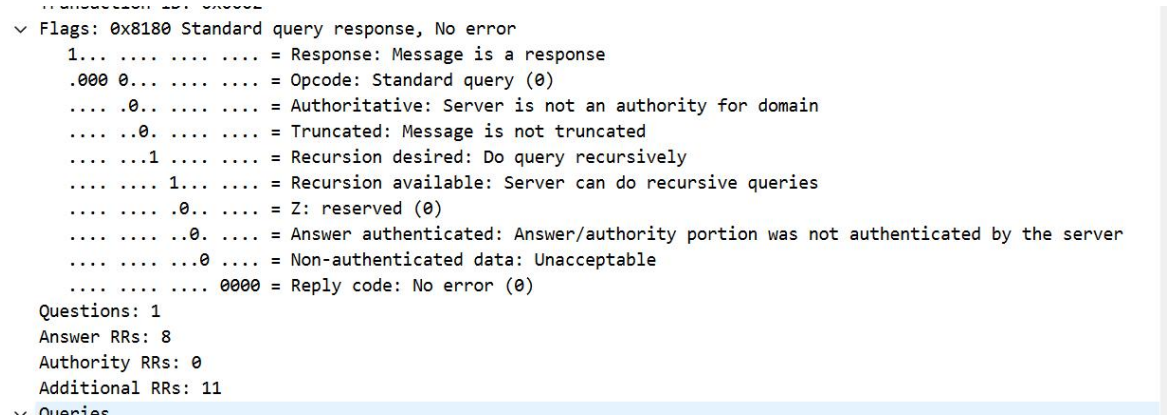
截图均在上文文中。

16. To what IP address is the DNS query message sent? Is this the IP address of your default local DNS server?



发送到了 192.168.254.245，和本地 DNS 是一致的。

17. Examine the DNS query message. What "Type" of DNS query is it? Does the query message contain any "answers"?



这个 DNS query 的类型是 Standard query response, No error

Answers 为

```
Answers
  mit.edu: type NS, class IN, ns ns1-173.akam.net
      Name: mit.edu
      Type: NS (2) (authoritative Name Server)
      Class: IN (0x0001)
      Time to live: 1800 (30 minutes)
      Data length: 18
      Name Server: ns1-173.akam.net
  mit.edu: type NS, class IN, ns usw2.akam.net
      Name: mit.edu
      Type: NS (2) (authoritative Name Server)
      Class: IN (0x0001)
      Time to live: 1800 (30 minutes)
      Data length: 7
      Name Server: usw2.akam.net
  mit.edu: type NS, class IN, ns ns1-37.akam.net
      Name: mit.edu
      Type: NS (2) (authoritative Name Server)
      Class: IN (0x0001)
      Time to live: 1800 (30 minutes)
      Data length: 9
      Name Server: ns1-37.akam.net
  mit.edu: type NS, class IN, ns use5.akam.net
      Name: mit.edu
      Type: NS (2) (authoritative Name Server)
      Class: IN (0x0001)
      Time to live: 1800 (30 minutes)
      Data length: 7
      Name Server: use5.akam.net
  mit.edu: type NS, class IN, ns asia1.akam.net
      Name: mit.edu
      Type: NS (2) (authoritative Name Server)
      Class: IN (0x0001)
      Time to live: 1800 (30 minutes)
      Data length: 8
      Name Server: asia1.akam.net
  mit.edu: type NS, class IN, ns eur5.akam.net
      Name: mit.edu
      Type: NS (2) (authoritative Name Server)
      Class: IN (0x0001)
      Time to live: 1800 (30 minutes)
      Data length: 7
      Name Server: eur5.akam.net
```

```
▽ mit.edu: type NS, class IN, ns asia2.akam.net
    Name: mit.edu
    Type: NS (2) (authoritative Name Server)
    Class: IN (0x0001)
    Time to live: 1800 (30 minutes)
    Data length: 8
    Name Server: asia2.akam.net
▽ mit.edu: type NS, class IN, ns use2.akam.net
    Name: mit.edu
    Type: NS (2) (authoritative Name Server)
    Class: IN (0x0001)
    Time to live: 1800 (30 minutes)
    Data length: 7
    Name Server: use2.akam.net
```

18. Examine the DNS response message. What MIT nameservers does the response message provide? Does this response message also provide the IP addresses of the MIT namesers?

由上图可知，提供了 ns1-173.akam.net 、 usw2.akam.net 、 ns1-37.akam.net、use5.akam.net、asia1.akam.net、eur5.akam.net、asia2.akam.net、use2.akam.net 这些 nameservers，且同时也在下文提供了这些 nameservers 的地址

```
Name Server: use2.akam.net
Additional records
  eur5.akam.net: type A, class IN, addr 23.74.25.64
      Name: eur5.akam.net
      Type: A (1) (Host Address)
      Class: IN (0x0001)
      Time to live: 33721 (9 hours, 22 minutes, 1 second)
      Data length: 4
      Address: 23.74.25.64
  use2.akam.net: type A, class IN, addr 96.7.49.64
      Name: use2.akam.net
      Type: A (1) (Host Address)
      Class: IN (0x0001)
      Time to live: 33718 (9 hours, 21 minutes, 58 seconds)
      Data length: 4
      Address: 96.7.49.64
  use5.akam.net: type A, class IN, addr 2.16.40.64
      Name: use5.akam.net
      Type: A (1) (Host Address)
      Class: IN (0x0001)
      Time to live: 34550 (9 hours, 35 minutes, 50 seconds)
      Data length: 4
      Address: 2.16.40.64
  use5.akam.net: type AAAA, class IN, addr 2600:1403:a::40
```

```
  use5.akam.net: type AAAA, class IN, addr 2600:1403:a::40
      Name: use5.akam.net
      Type: AAAA (28) (IP6 Address)
      Class: IN (0x0001)
      Time to live: 34550 (9 hours, 35 minutes, 50 seconds)
      Data length: 16
      AAAA Address: 2600:1403:a::40
  usw2.akam.net: type A, class IN, addr 184.26.161.64
      Name: usw2.akam.net
      Type: A (1) (Host Address)
      Class: IN (0x0001)
      Time to live: 35050 (9 hours, 44 minutes, 10 seconds)
      Data length: 4
      Address: 184.26.161.64
  asia1.akam.net: type A, class IN, addr 95.100.175.64
      Name: asia1.akam.net
      Type: A (1) (Host Address)
      Class: IN (0x0001)
      Time to live: 33724 (9 hours, 22 minutes, 4 seconds)
      Data length: 4
      Address: 95.100.175.64
  asia2.akam.net: type A, class IN, addr 95.101.36.64
```

```
    asia2.akam.net: type A, class IN, addr 95.101.36.64
        Name: asia2.akam.net
        Type: A (1) (Host Address)
        Class: IN (0x0001)
        Time to live: 52827 (14 hours, 40 minutes, 27 seconds)
        Data length: 4
        Address: 95.101.36.64
    ns1-37.akam.net: type A, class IN, addr 193.108.91.37
        Name: ns1-37.akam.net
        Type: A (1) (Host Address)
        Class: IN (0x0001)
        Time to live: 35050 (9 hours, 44 minutes, 10 seconds)
        Data length: 4
        Address: 193.108.91.37
    ns1-37.akam.net: type AAAA, class IN, addr 2600:1401:2::25
        Name: ns1-37.akam.net
        Type: AAAA (28) (IP6 Address)
        Class: IN (0x0001)
        Time to live: 35050 (9 hours, 44 minutes, 10 seconds)
        Data length: 16
        AAAA Address: 2600:1401:2::25

  ns1-37.akam.net: type AAAA, class IN, addr 2600:1401:2::25
      Name: ns1-37.akam.net
      Type: AAAA (28) (IP6 Address)
      Class: IN (0x0001)
      Time to live: 35050 (9 hours, 44 minutes, 10 seconds)
      Data length: 16
      AAAA Address: 2600:1401:2::25
  ns1-173.akam.net: type A, class IN, addr 193.108.91.173
      Name: ns1-173.akam.net
      Type: A (1) (Host Address)
      Class: IN (0x0001)
      Time to live: 35050 (9 hours, 44 minutes, 10 seconds)
      Data length: 4
      Address: 193.108.91.173
  ns1-173.akam.net: type AAAA, class IN, addr 2600:1401:2::ad
      Name: ns1-173.akam.net
      Type: AAAA (28) (IP6 Address)
      Class: IN (0x0001)
      Time to live: 35050 (9 hours, 44 minutes, 10 seconds)
      Data length: 16
      AAAA Address: 2600:1401:2::ad
  [Request In: 996]
  [Time: 0.053001000 seconds]
```

19. Provide a screenshot.

截图均在上文文中。

20. To what IP address is the DNS query message sent? Is this the IP address of your default local DNS server? If not, what does the IP address correspond to?

```
  1 2007-07-23 22:08:44.221178 192.168.1.101    68.87.71.226     DNS       85 Standard query 0x0001 PTR 226.71.87.68.in-addr.arpa
  2 2007-07-23 22:08:44.233659 68.87.71.226     192.168.1.101    DNS      137 Standard query response 0x0001 PTR 226.71.87.68.in-addr.arpa PTR cns.chelmsfdrdc2.ma.boston.comcast.net
  3 2007-07-23 22:08:44.235410 192.168.1.101    68.87.71.226     DNS       91 Standard query 0x0002 A www.mit.edu.hsd1.ma.comcast.net
  4 2007-07-23 22:08:44.263819 68.87.71.226     192.168.1.101    DNS      171 Standard query response 0x0002 No such name A www.mit.edu.hsd1.ma.comcast.net SOA dns1.inflow.pa.bo.comcast.net
  5 2007-07-23 22:08:44.265356 192.168.1.101    68.87.71.226     DNS       86 Standard query 0x0003 A www.mit.edu.ma.comcast.net
  6 2007-07-23 22:08:44.280112 68.87.71.226     192.168.1.101    DNS       86 Standard query response 0x0003 Server failure A www.mit.edu.ma.comcast.net
  7 2007-07-23 22:08:44.281446 192.168.1.101    68.87.71.226     DNS       71 Standard query 0x0004 A www.mit.edu
  8 2007-07-23 22:08:44.296162 68.87.71.226     192.168.1.101    DNS       87 Standard query response 0x0004 A www.mit.edu A 18.7.22.83
 28 2007-07-23 22:09:24.003137 192.168.1.101    68.87.71.226     DNS       85 Standard query 0x0001 PTR 226.71.87.68.in-addr.arpa
 29 2007-07-23 22:09:24.016016 68.87.71.226     192.168.1.101    DNS      137 Standard query response 0x0001 PTR 226.71.87.68.in-addr.arpa PTR cns.chelmsfdrdc2.ma.boston.comcast.net
 30 2007-07-23 22:09:24.017955 192.168.1.101    68.87.71.226     DNS       87 Standard query 0x0002 NS mit.edu.hsd1.ma.comcast.net
 31 2007-07-23 22:09:24.044962 68.87.71.226     192.168.1.101    DNS      167 Standard query response 0x0002 No such name NS mit.edu.hsd1.ma.comcast.net SOA dns1.inflow.pa.bo.comcast.net
 32 2007-07-23 22:09:24.046353 192.168.1.101    68.87.71.226     DNS       82 Standard query 0x0003 NS mit.edu.ma.comcast.net
 33 2007-07-23 22:09:24.059551 68.87.71.226     192.168.1.101    DNS       82 Standard query response 0x0003 Server failure NS mit.edu.ma.comcast.net
 34 2007-07-23 22:09:24.060977 192.168.1.101    68.87.71.226     DNS       67 Standard query 0x0004 NS mit.edu
 35 2007-07-23 22:09:24.073413 68.87.71.226     192.168.1.101    DNS      176 Standard query response 0x0004 NS mit.edu NS W20NS.mit.edu NS BITSY.mit.edu NS STRAWB.mit.edu A 18.72.0.3 A 18.71.0.151 A 18.70.0.160
```

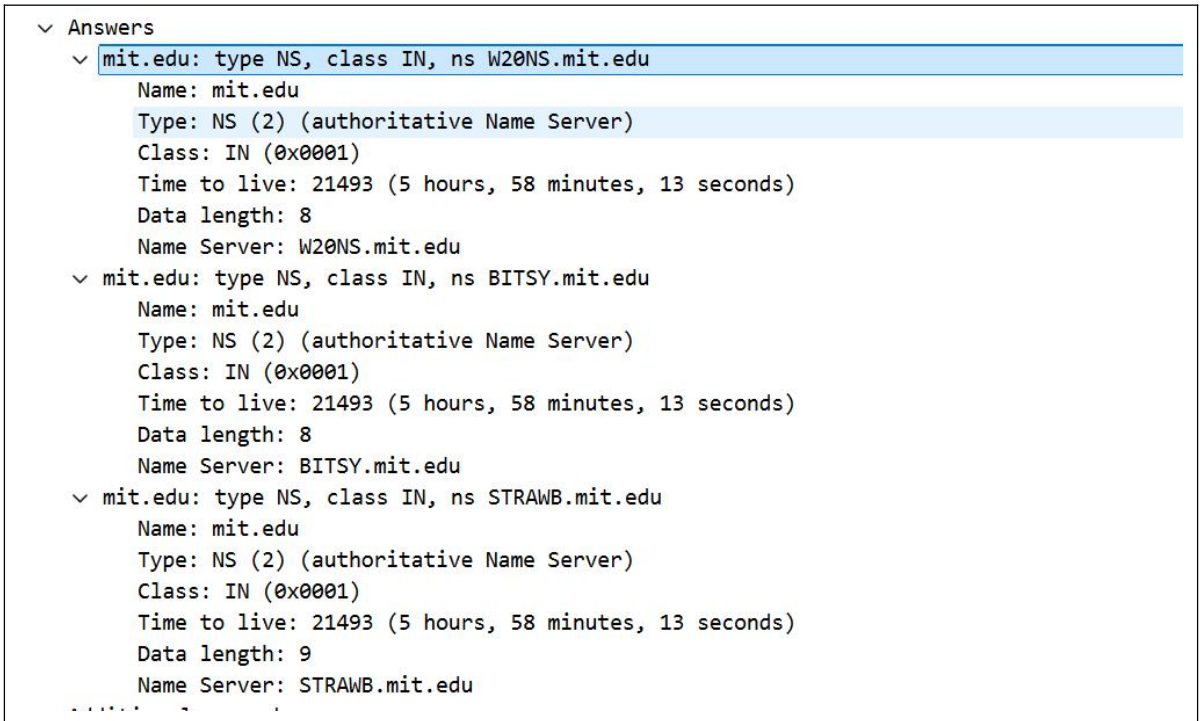
发到 68.87.71.226 了，这和我的本地 DNS 服务器是不一样的。他应该对应了 bitsy.mit.edu 的地址

21. Examine the DNS query message. What "Type" of DNS query is it? Does the query message contain any "answers"?

```
> Frame 35: 176 bytes on wire (1408 bits), 176 bytes captured (1408 bits)
> Ethernet II, Src: CiscoLinksys_f4:eb:a8 (00:16:b6:f4:eb:a8), Dst: Dell_4f:36:23 (00:08:74:4f:36:23)
> Internet Protocol Version 4, Src: 68.87.71.226, Dst: 192.168.1.101
> User Datagram Protocol, Src Port: 53, Dst Port: 4379
v Domain Name System (response)
    Transaction ID: 0x0004
  v Flags: 0x8180 Standard query response, No error
      1... .... .... .... = Response: Message is a response
      .000 0... .... .... = Opcode: Standard query (0)
      .... .0.. .... .... = Authoritative: Server is not an authority for domain
      .... ..0. .... .... = Truncated: Message is not truncated
      .... ...1 .... .... = Recursion desired: Do query recursively
      .... .... 1... .... = Recursion available: Server can do recursive queries
      .... .... .0.. .... = Z: reserved (0)
      .... .... ..0. .... = Answer authenticated: Answer/authority portion was not authenticated by the server
      .... .... ...0 .... = Non-authenticated data: Unacceptable
      .... .... .... 0000 = Reply code: No error (0)
    Questions: 1
    Answer RRs: 3
    Authority RRs: 0
    Additional RRs: 3
  v Queries
    v mit.edu: type NS, class IN
        Name: mit.edu
        [Name Length: 7]
```

这个 DNS query 的类型是 Standard query response, No error

Answers 为



22. Examine the DNS response message. How many "answers" are provided? What does each of these answers contain?

如上图，一共有 3 个 answers，每个回复包括域名、类型、类别、time to live、数据长度、Name Server.

23. Provide a screenshot.

截图均在上文文中。

问题及收获：

DNS 是互联网的核心基础设施之一，它的主要功能是将人类可读的域名转换为计算机可识别的 IP 地址。DNS 的存在使得互联网用户能够更方便、更高效地访问网络资源，而无需记住复杂的数字 IP 地址。并且也可以提供灵活性和可管理性，能够实现负载均衡、故障转移，增强了安全性和隐私保护，促进了全球互联网的互联互通。