CS315 : Computer Networks Lab

Assignment 4

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1 Part-1: nslookup

1. Run nslookup to obtain the IP address of the web server for the Indian Institute of Technology Dharwad, India: www.iitdh.ac.in. What is the IP address of www.iitdh.ac.in

IP address : 203.129.219.164 or 14.139.150.68

```
~ $ nslookup www.iitdh.ac.in
Server:         192.168.67.111
Address:        192.168.67.111#53

Non-authoritative answer:
Name:   www.iitdh.ac.in
Address: 203.129.219.164
Name:   www.iitdh.ac.in
Address: 14.139.150.68
```

2. Run nslookup to determine the DNS servers for google.com.

ns3.google.com, ns4.google.com, ns1.google.com, ns2.google.com

```
~ $ nslookup -type=NS google.com
Server:         192.168.67.111
Address:        192.168.67.111#53

Non-authoritative answer:
google.com      nameserver = ns3.google.com.
google.com      nameserver = ns4.google.com.
google.com      nameserver = ns1.google.com.
google.com      nameserver = ns2.google.com.

Authoritative answers can be found from:
ns3.google.com  internet address = 216.239.36.10
ns3.google.com  has AAAA address 2001:4860:4802:36::a
ns4.google.com  internet address = 216.239.38.10
ns4.google.com  has AAAA address 2001:4860:4802:38::a
ns1.google.com  internet address = 216.239.32.10
ns1.google.com  has AAAA address 2001:4860:4802:32::a
ns2.google.com  internet address = 216.239.34.10
ns2.google.com  has AAAA address 2001:4860:4802:34::a
```

3. Run nslookup so that one of the DNS servers obtained in Question2 is queried for gmail.com. What is its IP address?

IP address : 142.250.67.197

```
~ $ nslookup gmail.com ns3.google.com
Server:         ns3.google.com
Address:        216.239.36.10#53

Name:   gmail.com
Address: 142.250.67.197
```

2 Part-2: The DNS cache on your computer

Clearing DNS resolver cache (for Mac)

```
~ $ sudo killall -HUP mDNSResponder
Password:
~ $
```

3 Part-3: Tracing DNS with Wireshark

1. Locate the DNS query and response messages. Are they sent over UDP or TCP?

They are sent over UDP (User Datagram Protocol).

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

Destination port for DNS query message : 53
Source port for DNS response message : 53

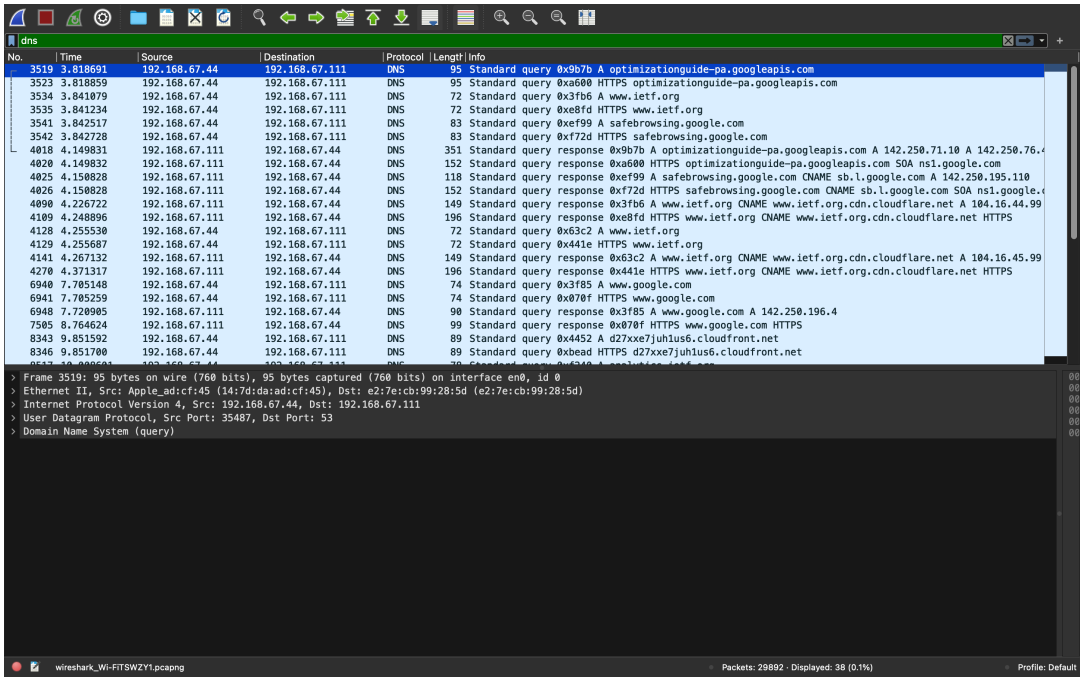
3. To what IP address is the DNS query message sent? Use ipconfig(Windows)/dig(Linux) to determine the IP address of your local DNS server. Are these two IP addresses the same?

IP address is the DNS query message sent : 192.168.67.111
IP address of your local DNS server : 192.168.67.111
Yes, they will be the same.

```
~ $ cat /etc/resolv.conf
#
# macOS Notice
#
# This file is not consulted for DNS hostname resolution, address
# resolution, or the DNS query routing mechanism used by most
# processes on this system.
#
# To view the DNS configuration used by this system, use:
#   scutil --dns
#
# SEE ALSO
#   dns-sd(1), scutil(8)
#
# This file is automatically generated.
#
nameserver 192.168.67.111
~ $
```

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

For some of the queries it is a `type A` Standard Query and for some of them it is HTTPS and it doesn't contain any answers.



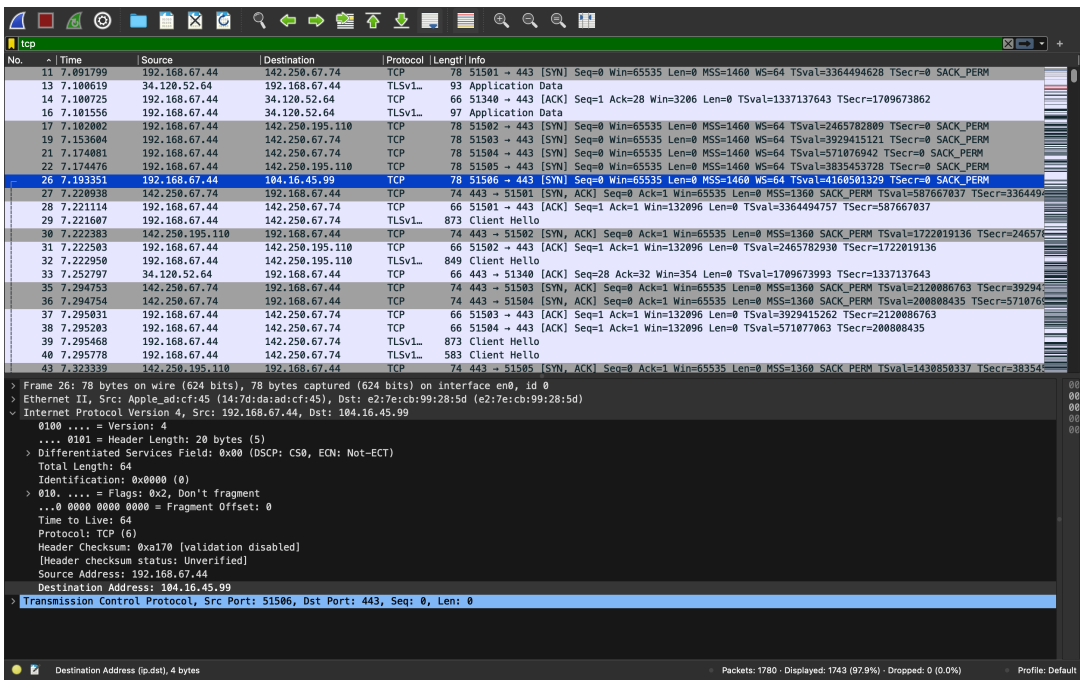
5. Examine the DNS response message. How many "answers" are provided? What do each of these answers contain?

There were 3 answers containing information about the name of the host, the type of address, class, time to live, the data length and the IP address. (Screenshot Provided)

6. 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?

Yes, the SYN packet was sent to 104.16.45.99, which corresponds to the destination IP address provided in the DNS response message.

```
Answers
  www.ietf.org: type CNAME, class IN, cname www.ietf.org.cdn.cloudflare.net
    Name: www.ietf.org
    Type: CNAME (Canonical NAME for an alias) (5)
    Class: IN (0x0001)
    Time to live: 1800 (30 minutes)
    Data length: 33
    CNAME: www.ietf.org.cdn.cloudflare.net
  www.ietf.org.cdn.cloudflare.net: type A, class IN, addr 104.16.44.99
    Name: www.ietf.org.cdn.cloudflare.net
    Type: A (Host Address) (1)
    Class: IN (0x0001)
    Time to live: 300 (5 minutes)
    Data length: 4
    Address: 104.16.44.99
  www.ietf.org.cdn.cloudflare.net: type A, class IN, addr 104.16.45.99
    Name: www.ietf.org.cdn.cloudflare.net
    Type: A (Host Address) (1)
    Class: IN (0x0001)
    Time to live: 300 (5 minutes)
    Data length: 4
    Address: 104.16.45.99
  [Request In: 3534]
  [Time: 0.385643000 seconds]
```



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

No, it doesn't.

4 Part-4: Wireshark and nslookup

For `nslookup www.mit.edu`

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

Destination port for DNS query message : 53
Source port for DNS response message : 53

```
~ $ nslookup www.mit.edu
Server:         192.168.67.111
Address:        192.168.67.111#53

Non-authoritative answer:
www.mit.edu     canonical name = www.mit.edu.edgekey.net.
www.mit.edu.edgekey.net canonical name = e9566.dscb.akamaiedge.net.
Name:   e9566.dscb.akamaiedge.net
Address: 23.35.92.23

~ $
```

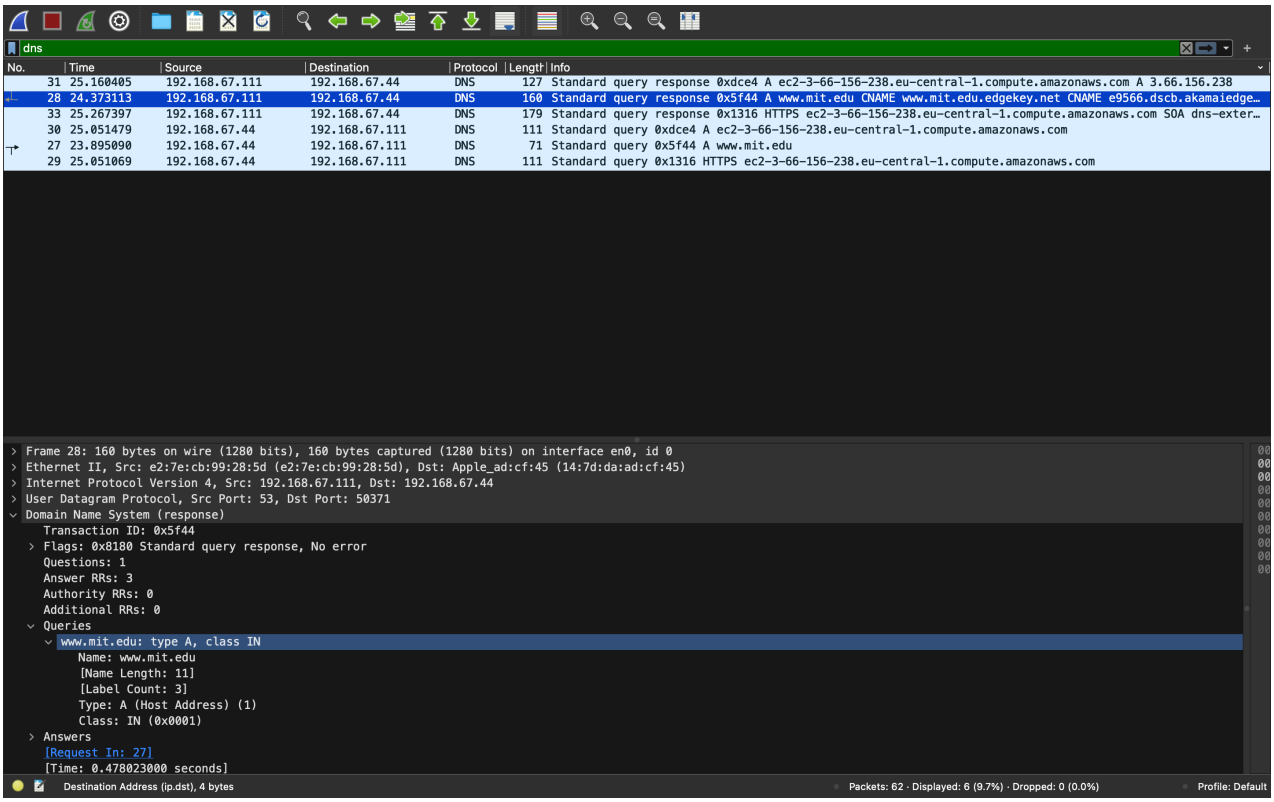
2. To what IP address is the DNS query message sent? Is this the IP address of your default local DNS server?

IP address is the DNS query message sent : 192.168.67.111
IP address of your local DNS server : 192.168.67.111
Yes, here both will be same.

```
~ $ cat /etc/resolv.conf
#
# macOS Notice
#
# This file is not consulted for DNS hostname resolution, address
# resolution, or the DNS query routing mechanism used by most
# processes on this system.
#
# To view the DNS configuration used by this system, use:
#   scutil --dns
#
# SEE ALSO
#   dns-sd(1), scutil(8)
#
# This file is automatically generated.
#
nameserver 192.168.67.111
~ $
```

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

For some of the queries it is a `type A` Standard Query and for some of them it is HTTPS and it doesn't contain any answers.

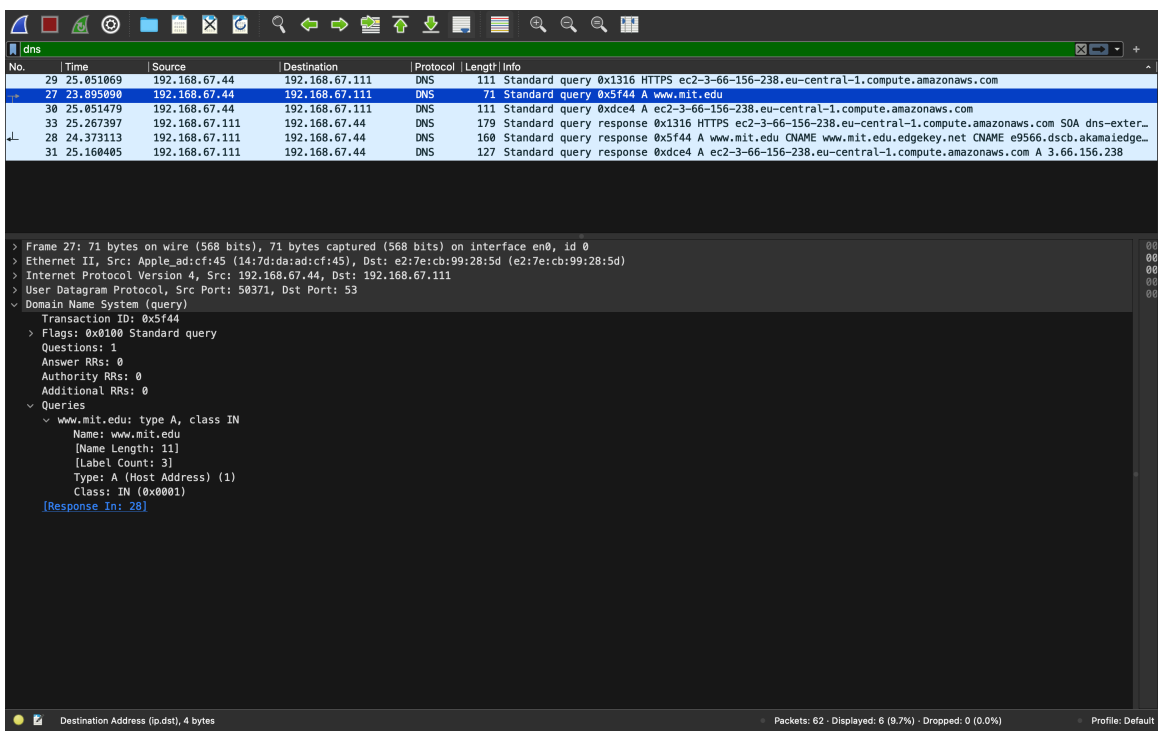


4. Examine the DNS response message. How many "answers" are provided? What do each of these answers contain?

There were 3 answers containing information about the name of the host, the type of address, class, time to live, the data length and the IP address.

```
Answers
  www.mit.edu: type CNAME, class IN, cname www.mit.edu.edgekey.net
    Name: www.mit.edu
    Type: CNAME (Canonical NAME for an alias) (5)
    Class: IN (0x0001)
    Time to live: 971 (16 minutes, 11 seconds)
    Data length: 25
    CNAME: www.mit.edu.edgekey.net
  www.mit.edu.edgekey.net: type CNAME, class IN, cname e9566.dscb.akamaiedge.net
    Name: www.mit.edu.edgekey.net
    Type: CNAME (Canonical NAME for an alias) (5)
    Class: IN (0x0001)
    Time to live: 60 (1 minute)
    Data length: 24
    CNAME: e9566.dscb.akamaiedge.net
  e9566.dscb.akamaiedge.net: type A, class IN, addr 23.35.92.23
    Name: e9566.dscb.akamaiedge.net
    Type: A (Host Address) (1)
    Class: IN (0x0001)
    Time to live: 20 (20 seconds)
    Data length: 4
    Address: 23.35.92.23
  [Request In: 27]
  [Time: 0.478023000 seconds]
```

5. Provide a screenshot.



For `nslookup -type=NS mit.edu`

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

IP address is the DNS query message sent : 192.168.67.111
IP address of your local DNS server : 192.168.67.111
Yes, here both will be same.

```
~ $ cat /etc/resolv.conf
#
# macOS Notice
#
# This file is not consulted for DNS hostname resolution, address
# resolution, or the DNS query routing mechanism used by most
# processes on this system.
#
# To view the DNS configuration used by this system, use:
#   scutil --dns
#
# SEE ALSO
#   dns-sd(1), scutil(8)
#
# This file is automatically generated.
#
nameserver 192.168.67.111
~ $
```

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

It's a `type NS` DNS query that doesn't contain any answers.

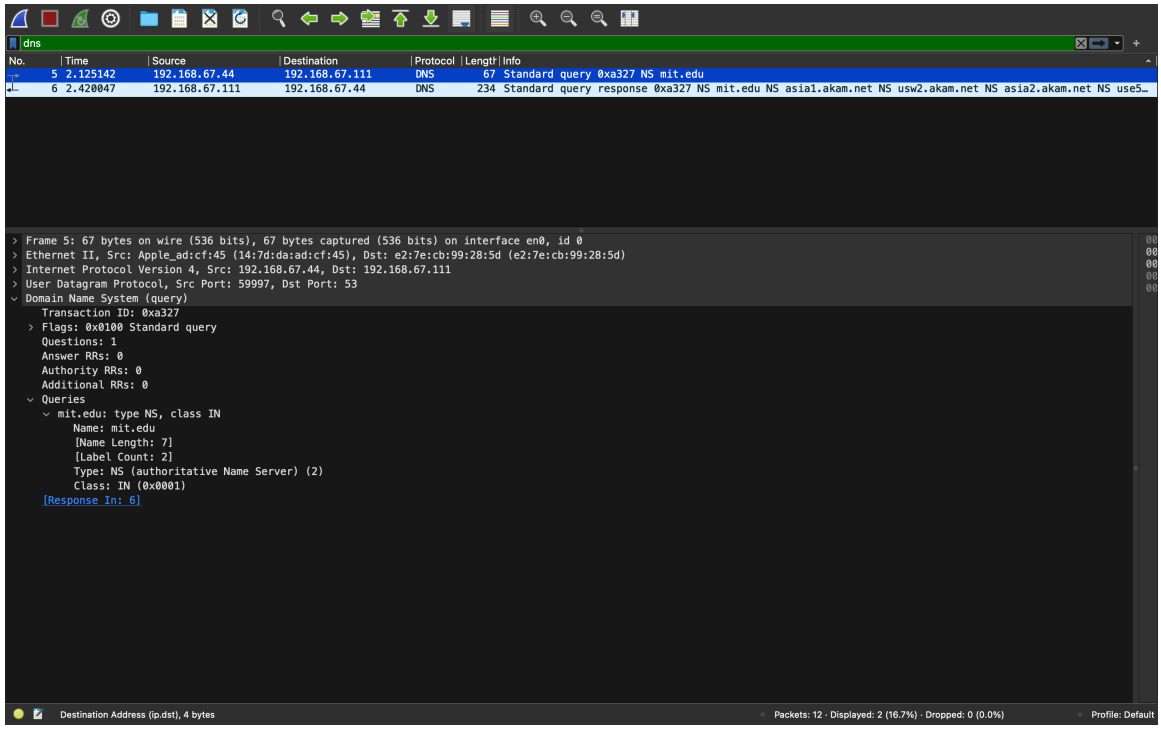
8. Examine the DNS response message. What MIT nameservers does the response message provide? Does this response message also provide the IP addresses of the MIT nameservers?

Following MIT nameservers were provided by response message :

1. asia2.akam.net
2. ns1-37.akam.net
3. use5.akam.net
4. ns1-173.akam.net
5. eur5.akam.net
6. asia1.akam.net
7. use2.akam.net
8. usw2.akam.net

No, the response message doesn't provide the IP addresses of the MIT nameservers. But we can have a look at the IP addresses by using `nplookup` command in terminal.

9. Provide a screenshot.



For `nslookup gmail.com ns3.google.com`

10. 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?

IP address is the DNS query message sent : 216.239.36.10
IP address of your local DNS server : 192.168.67.111

```
~ $ cat /etc/resolv.conf
#
# macOS Notice
#
# This file is not consulted for DNS hostname resolution, address
# resolution, or the DNS query routing mechanism used by most
# processes on this system.
#
# To view the DNS configuration used by this system, use:
#   scutil --dns
#
# SEE ALSO
#   dns-sd(1), scutil(8)
#
# This file is automatically generated.
#
nameserver 192.168.67.111
~ $
```

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

It's a `type A` DNS query that doesn't contain any answers.

12. Examine the DNS response message. How many “answers” are provided? What does each of these answers contain?

There is 1 answer containing information about the name of the host, the type of address, class, time to live, the data length and the IP address.

```
Domain Name System (response)
    Transaction ID: 0xa095
  > Flags: 0x8500 Standard query response, No error
    Questions: 1
    Answer RRs: 1
    Authority RRs: 0
    Additional RRs: 0
  v Queries
    v gmail.com: type A, class IN
        Name: gmail.com
        [Name Length: 9]
        [Label Count: 2]
        Type: A (Host Address) (1)
        Class: IN (0x0001)
  v Answers
    v gmail.com: type A, class IN, addr 142.250.67.197
        Name: gmail.com
        Type: A (Host Address) (1)
        Class: IN (0x0001)
        Time to live: 300 (5 minutes)
        Data length: 4
        Address: 142.250.67.197
    [Request In: 13]
    [Time: 0.199034000 seconds]
```

13. Provide a screenshot.