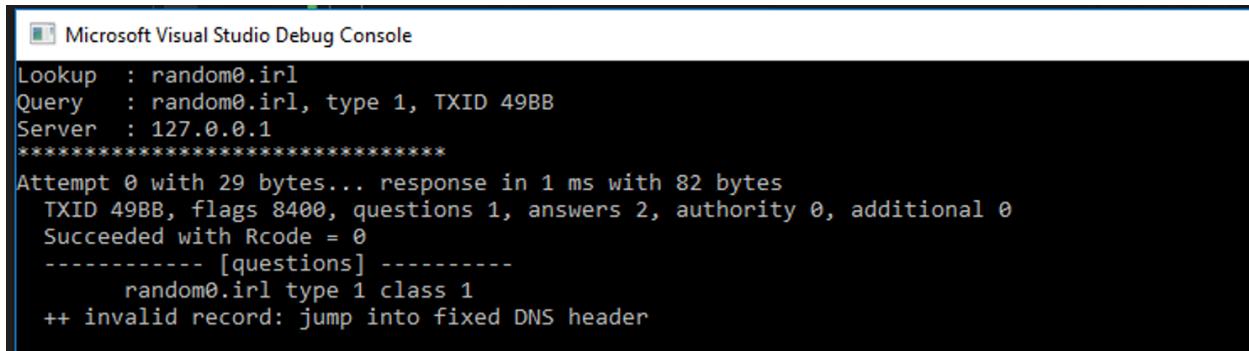


HW 2: DNS Resolver

Question 1 Case1

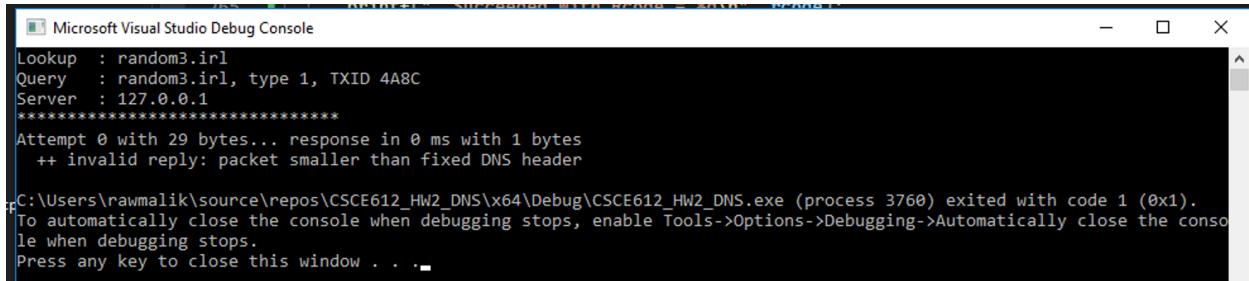
random0.irl: ++ invalid record: jump into fixed DNS header



```
Microsoft Visual Studio Debug Console
Lookup : random0.irl
Query  : random0.irl, type 1, TXID 49BB
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 1 ms with 82 bytes
TXID 49BB, flags 8400, questions 1, answers 2, authority 0, additional 0
Succeeded with Rcode = 0
----- [questions] -----
    random0.irl type 1 class 1
++ invalid record: jump into fixed DNS header
```

In random0.irl, the custom DNS server returns a packet that has jump to the fixed DNS header portion of the packet when parsing the compressed names in the answers.

Random3.irl: ++ invalid reply: packet smaller than fixed DNS header



```
Microsoft Visual Studio Debug Console
Lookup : random3.irl
Query  : random3.irl, type 1, TXID 4A8C
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 0 ms with 1 bytes
++ invalid reply: packet smaller than fixed DNS header

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 3760) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

In random3.irl the custom DNS server returns a packet that is of size less than 12 bytes needed for the fixed dns header.

random5.irl: ++ invalid record: jump beyond packet boundary

```
Microsoft Visual Studio Debug Console
=====
Lookup : random5.irl
Query  : random5.irl, type 1, TXID 4B36
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 1 ms with 71 bytes
  TXID 4B36, flags 8400, questions 1, answers 2, authority 0, additional 0
  Succeeded with Rcode = 0
  ----- [questions] -----
    random5.irl type 1 class 1
++ invalid record: jump beyond packet boundary (new_offset = 285, response_size = 71)

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 8484) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

In random5.irl the custom DNS server returns a packet that includes a jump to a location outside the size of the packet length when reading the names of the DNS answers.

random6.irl: ++ invalid record: jump loop

```
Microsoft Visual Studio Debug Console
=====
Lookup : random6.irl
Query  : random6.irl, type 1, TXID 4DAF
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 1 ms with 59 bytes
  TXID 4DAF, flags 8400, questions 1, answers 2, authority 0, additional 0
  Succeeded with Rcode = 0
  ----- [questions] -----
    random6.irl type 1 class 1
++ invalid record: jump loop
```

In random6.irl, one of the answer records has a jump loop when parsing one of the compressed names. This jump loop was found using a set that stores the last indexes visited when parsing a name.

Question 2 Case 2

2. Random1.irl: ++ invalid section: not enough records

```
Microsoft Visual Studio Debug Console
=====
Lookup : random1.irl
Query  : random1.irl, type 1, TXID 5669
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 2 ms with 468 bytes
  TXID 5669, flags 8600, questions 1, answers 1, authority 0, additional 65535
  Succeeded with Rcode = 0
  ----- [questions] -----
    random1.irl type 1 class 1
++ invalid section: not enough records

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 3524) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

In random1.irl the custom DNS server returns a packet that declares more records than it contains. This was found by attempting to parse the records but there was not a record present since the cur pointer pointed at the end of the packet.

Question 3 Case 3

3. random7.irl: ++ invalid record: truncated jump offset

```
Microsoft Visual Studio Debug Console

Lookup : random7.irl
Query  : random7.irl, type 1, TXID 5751
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 1 ms with 42 bytes
  TXID 5751, flags 8400, questions 1, answers 2, authority 0, additional 0
  Succeeded with Rcode = 0
  ----- [questions] -----
    random7.irl type 1 class 1
    ++ invalid record: truncated jump offset

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 9812) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

In random7.irl the returned packet includes a compressed name value but is at the end of the packet. In other words, when the byte 0xC0 is seen when reading the name, the subsequent byte which specifies the offset is outside the packet boundary.

Question 4 Case 4

random4.irl: ++ invalid record: truncated RR answer header

```
Select Microsoft Visual Studio Debug Console

Lookup : random4.irl
Query  : random4.irl, type 1, TXID 5AEA
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 0 ms with 286 bytes
  TXID 5AEA, flags 8400, questions 1, answers 1, authority 0, additional 11
  Succeeded with Rcode = 0
  ----- [questions] -----
    random4.irl type 1 class 1
    ++ invalid record: truncated RR answer header

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 9180) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

random4.irl: ++ invalid record: truncated name.

```
Microsoft Visual Studio Debug Console
Lookup : random4.irl
Query  : random4.irl, type 1, TXID 5C4A
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 1 ms with 89 bytes
TXID 5C4A, flags 8400, questions 1, answers 1, authority 0, additional 11
Succeeded with Rcode = 0
----- [questions] -----
    random4.irl type 1 class 1
++ invalid record: truncated name

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 3052) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

random4.irl: ++ invalid record: RR value length stretches the answer beyond packet.

```
Microsoft Visual Studio Debug Console
Lookup : random4.irl
Query  : random4.irl, type 1, TXID 7F14
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 1 ms with 147 bytes
TXID 7F14, flags 8400, questions 1, answers 1, authority 0, additional 11
Succeeded with Rcode = 0
----- [questions] -----
    random4.irl type 1 class 1
++ invalid record: RR value length stretches the answer beyond packet

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 9252) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

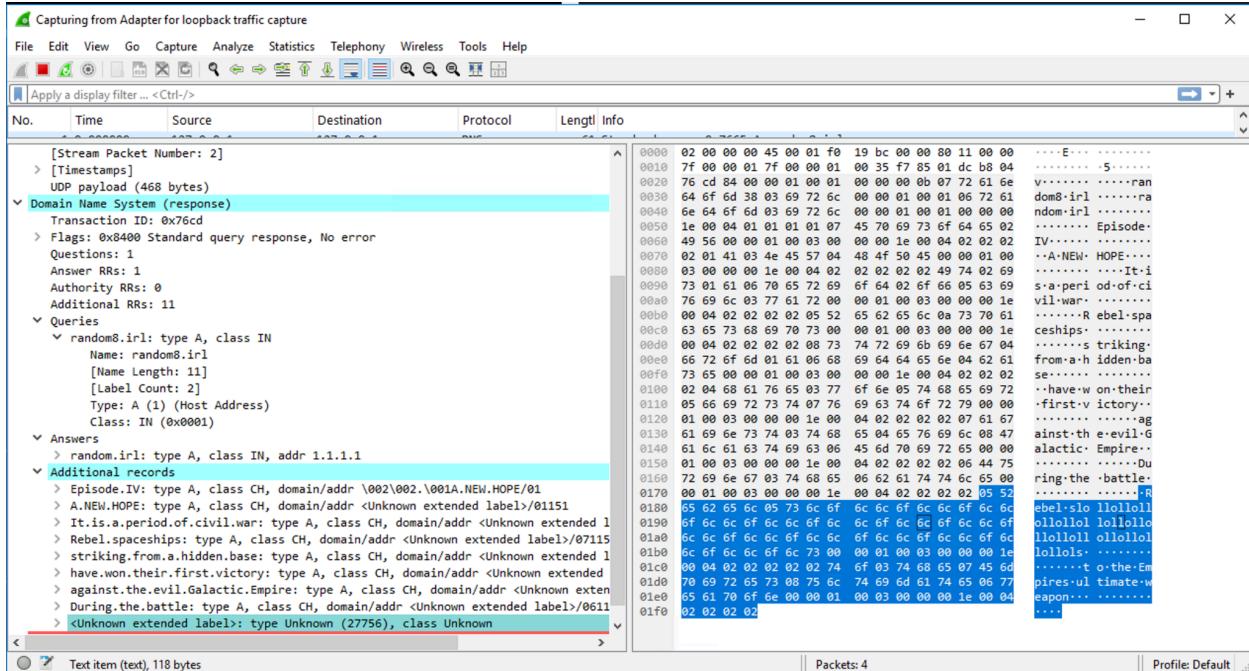
The custom DNS server responds with 3 distinct corruptions for random4.irl. The first is a truncated RR header. This means that the DNS answer header that specifies the type, ttl and data length is truncated by the end of the packet. The second error is a truncated name. This means that while reading the name from a DNS answer, the packet reaches the end. The third error is that the data length in the DNS answer header specifies a data length that is beyond the size of the packet.

Question 5 Case 5 Bonus

From analyzing the outputs below from the program as well as the packets themselves in wireshark, it seems that the custom DNS server returns a packet filled with “IoL” repeating characters at some random segment of the packet (see wireshark screenshot below). Hence an algorithm for another person to replicate this packet response on their DNS server would be to:

1. Initialize some random length repeating sequence of the characters “IoL” that is less than the MAX DNS PACKET SIZE - the size of the fixed dns header.
2. Place the repeating character sequence in a random position AFTER the DNS fixed size header.

The DNS fixed answer header stays in tact.



```
Microsoft Visual Studio Debug Console

Lookup : random8.irl
Query  : random8.irl, type 1, TXID 1658
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 0 ms with 468 bytes
TXID 1658, flags 8400, questions 1, answers 1, authority 0, additional 11
Succeeded with Rcode = 0
----- [questions] -----
    random8.irl type 1 class 1
++ invalid section: not enough records

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 5380) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

```
Microsoft Visual Studio Debug Console

Lookup : random8.irl
Query  : random8.irl, type 1, TXID 205B
Server  : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 0 ms with 468 bytes
TXID 205B, flags 8400, questions 1, answers 1, authority 0, additional 11
Succeeded with Rcode = 0
----- [questions] -----
    random8.irl type 1 class 1
++ invalid record: truncated name

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 4824) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

```
Microsoft Visual Studio Debug Console
-
Query : random8.irl, type 1, TXID 20A3
Server : 127.0.0.1
*****
Attempt 0 with 29 bytes... response in 1 ms with 468 bytes
TXID 20A3, flags 8400, questions 1, answers 1, authority 0, additional 11
Succeeded with Rcode = 0
----- [questions] -----
random8.irl type 1 class 1
++ invalid record: RR value length stretches the answer beyond packet

C:\Users\rawmalik\source\repos\CSCE612_HW2_DNS\x64\Debug\CSCE612_HW2_DNS.exe (process 8048) exited with code 1 (0x1).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```