

CNT 4713 – Project 2

Overview:

The goal of this project is to master UDP socket programming and the Domain Name System (DNS) protocol, by developing a simplified DNS resolver client. The SDN resolver must be able to *iteratively* interact with the DNS servers on the Internet to resolve given domain names. You must write your own code and cannot use any existing DNS library. You may write your program on Windows, Linux, or Mac OS, and use Python, Java, or C++/C as the programming language. *This is an independent project.*

Instructions:

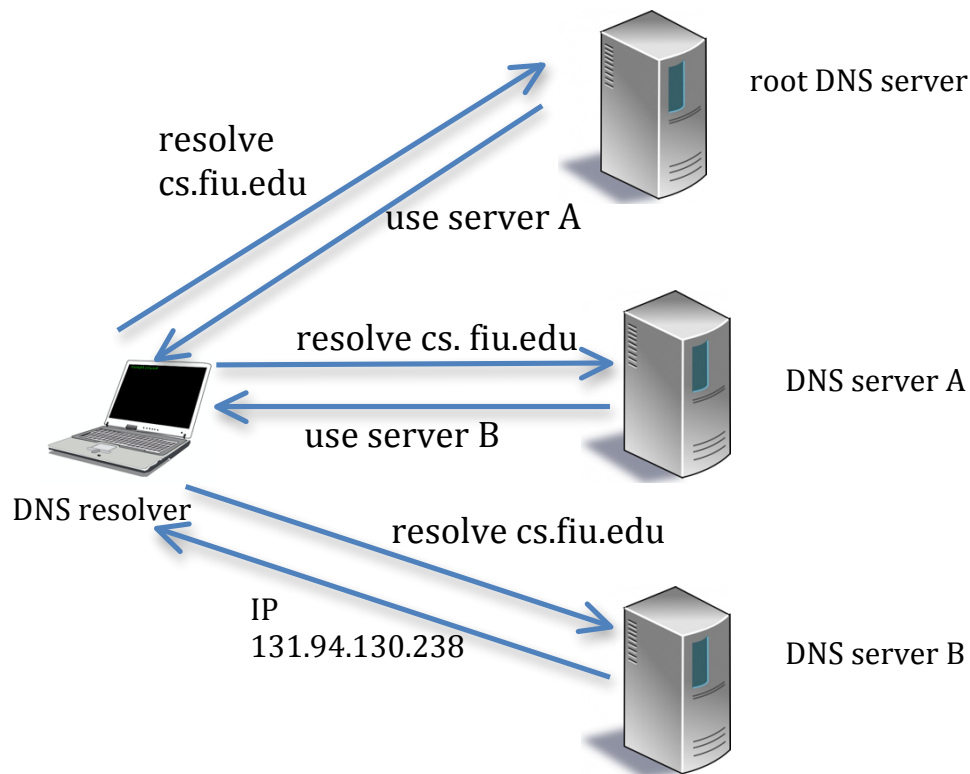
Start your DNS resolver by typing the following command:

```
dns_resolver server_ip domain_name
```

where `server_ip` is the IP address of a **root** DNS server on the Internet, and `domain_name` is the name (e.g., `cs.fiu.edu`, `cnn.com`) to be resolved. Please note that since your DNS resolver works in the iterative manner, it will have to start from querying a root DNS server. The list of current root DNS servers can be found at: <https://www.iana.org/domains/root/servers>. Simply choose one to use.

Your DNS resolver should then query the specified root DNS server, which will return one or more intermediate DNS servers (in the *Authority* and *Additional Information* sections of the reply). Your DNS resolver must **automatically** pick one intermediate server and query it. This process should continue until one or more IP address of the specified domain name is obtained (the IPs are in the *Answers* section of the reply). Then your DNS resolver should stop.

This iterative resolution process is illustrated below:



To simplify the programming task, your DNS resolver only needs to understand two types of resource records in the reply:

- *NS*, which means the record contains an intermediate name server for the domain name being queried; in this case your DNS resolver must also check the *Additional Information* section to find out the IP of the intermediate name server, in order to send a query to the server. If multiple intermediate name servers are included, your DNS resolver only needs to pick one to query.
- *A*, which means the record contains the IP of the domain name being queried; your DNS resolver can stop once such a reply is received.

On-screen output: For each iterative step, your DNS resolver must clearly display the content of the reply message, and the DNS server chosen to query next. Refer to the attached sample output for illustration.

References:

- DNS RFC, <http://www.ietf.org/rfc/rfc1035.txt>
- DNS message format definition in C (attached).
- Sample on-screen output (attached).

Submission Guide:

Submit a readme.txt file, the source code file, and a Makefile if you have one. Please include the following information in the readme.txt file.

Student name and ID: xxx

Operating system: Windows/Linux/Mac OS

Programming language: Python/Java/C++/C

Compiling instructions: xxx

Running instructions: xxx

The code must be well-documented.

Grading Criteria:

Item	Percentage
Successful compilation	10%
Receive reply from root DNS server	20%
Display reply content	20%
Extract the intermediate server IP	15%
Receive reply from intermediate servers	20%
Obtain the IP for the domain name	15%
<i>Implementation of timeout and re-query mechanism (to deal with UDP packet loss)</i>	<i>Extra 15%</i>

Plagiarism will be reported to the university for academic dishonesty.

Sample On-Screen Output of the DNS Resolver:

\$./dns_resolver 202.12.27.33 cs.fiu.edu

DNS server to query: 202.12.27.33

Reply received. Content overview:

0 Answers.

6 Intermediate Name Servers.

7 Additional Information Records.

Answers section:

Authoritative Section:

Name : edu Name Server: l.edu-servers.net

Name : edu Name Server: a.edu-servers.net

Name : edu Name Server: f.edu-servers.net

Name : edu Name Server: c.edu-servers.net

Name : edu Name Server: g.edu-servers.net

Name : edu Name Server: d.edu-servers.net

Additional Information Section:

Name : a.edu-servers.net IP : 192.5.6.30

Name : c.edu-servers.net IP : 192.26.92.30

Name : d.edu-servers.net IP : 192.31.80.30

Name : f.edu-servers.net IP : 192.35.51.30

Name : g.edu-servers.net IP : 192.42.93.30

Name : l.edu-servers.net IP : 192.41.162.30

Name : g.edu-servers.net

DNS server to query: 192.5.6.30

Reply received. Content overview:

0 Answers.

5 Intermediate Name Servers.

5 Additional Information Records.

Answers section:

Authoritative Section:

Name : fiu.edu Name Server: ns.fiu.edu

Name : fiu.edu Name Server: ns3.fiu.edu

Name : fiu.edu Name Server: ns1.fiu.edu

Name : fiu.edu Name Server: drdns.fiu.edu

Name : fiu.edu Name Server: ns4.fiu.edu

Additional Information Section:

Name : ns.fiu.edu IP : 131.94.205.10

Name : ns3.fiu.edu IP : 131.94.226.10

Name : ns1.fiu.edu IP : 131.94.7.220
Name : drdns.fiu.edu IP : 131.94.69.36
Name : ns4.fiu.edu IP : 131.95.205.12

DNS server to query: 131.94.205.10

Reply received. Content overview:

0 Answers.
4 Intermediate Name Servers.
4 Additional Information Records.

Answers section:

Authoritative Section:

Name : cs.fiu.edu Name Server: goedel.cs.fiu.edu
Name : cs.fiu.edu Name Server: sagwa-ns.cs.fiu.edu
Name : cs.fiu.edu Name Server: offsite.cs.fiu.edu
Name : cs.fiu.edu Name Server: zorba-ns.cs.fiu.edu

Additional Information Section:

Name : offsite.cs.fiu.edu IP : 131.94.68.228
Name : sagwa-ns.cs.fiu.edu IP : 131.94.134.129
Name : zorba-ns.cs.fiu.edu IP : 131.94.134.130
Name : goedel.cs.fiu.edu IP : 131.94.133.43

DNS server to query: 131.94.68.228

Reply received. Content overview:

1 Answers.
6 Intermediate Name Servers.
4 Additional Information Records.

Answers section:

Name : cs.fiu.edu IP: 131.94.130.238

Authoritative Section:

Name : cs.fiu.edu Name Server: zorba-ns.v6.cs.fiu.edu
Name : cs.fiu.edu Name Server: goedel.cs.fiu.edu
Name : cs.fiu.edu Name Server: offsite.cs.fiu.edu
Name : cs.fiu.edu Name Server: sagwa-ns.cs.fiu.edu
Name : cs.fiu.edu Name Server: sagwa-ns.v6.cs.fiu.edu
Name : cs.fiu.edu Name Server: zorba-ns.cs.fiu.edu

Additional Information Section:

Name : goedel.cs.fiu.edu IP : 131.94.133.43
Name : offsite.cs.fiu.edu IP : 131.94.68.228
Name : sagwa-ns.cs.fiu.edu IP : 131.94.134.129
Name : zorba-ns.cs.fiu.edu IP : 131.94.134.130