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Part A Report

1. Describe in detail the DNS request and response header format in your implementation. (5 points)

For the request header, I randomly generated two bytes transaction ID. Set the 'QR' to 0 that specifies the message is a query. Set the 'RD' to 1 that expected a recursion from the DNS resolver. Set the 'QDCOUNT' to 1 since the query only have one question. And set all other fields to 0 as default. For the response header, the Transaction ID is same as the request header. 'QR' is 1 that specifies the message is a response. 'ANCOUNT' is one since the message contains one answer. All other fields are same as the request header.

2. Compute the RTT between your DNS client to each of the public DNS resolvers. Do you notice any meaningful differences across different DNS resolvers? Explain. (5 points)

Iran: 0.3912229537963867s

USA: 0.014936685562133789s

Canada: 0.0629804134368896s

It appears that the farther my physical location is from the DNS resolver, the longer the RTT is. Because the throughput of the network is fixed, the farther from the server means the farther the packet has to travel resulting in a larger RTT.

3. Compute the RTT between your HTTP client to the HTTP server of the resolved hostname. (5 points)

1.026336908340454s

Part B Report

1. Compute the RTT from your local DNS server to each of the DNS servers including the root name server, the TLD name server, and the authoritative DNS server of tmz.com. (10 points)

   Root RTT: -0.022912263870239258

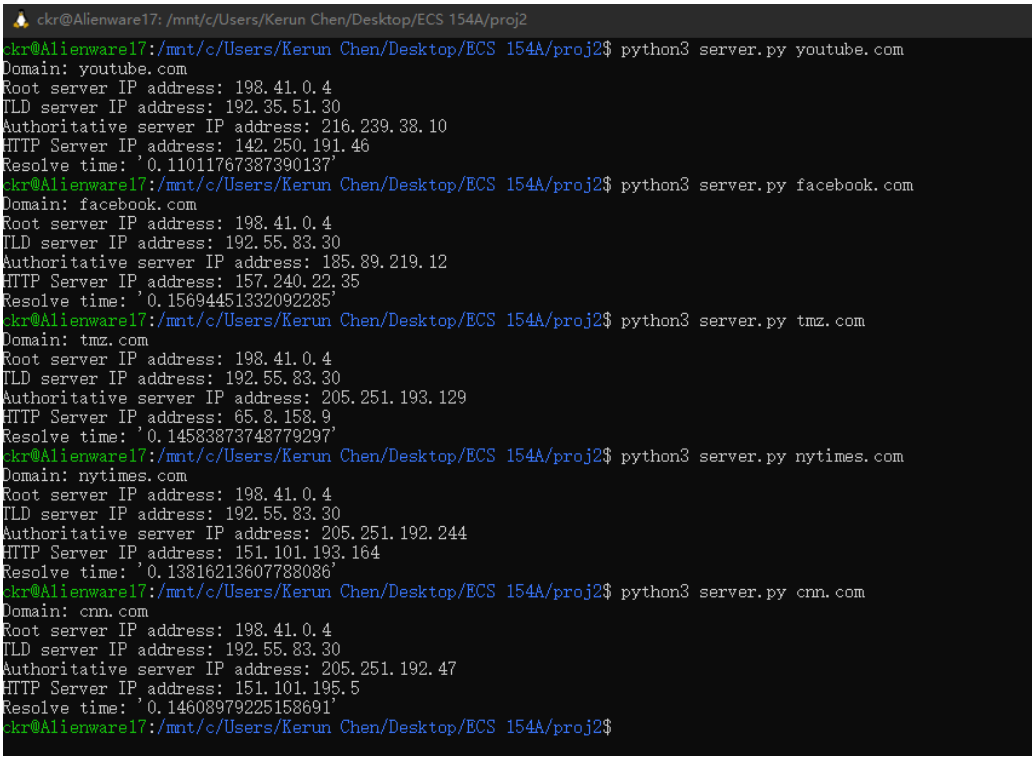
   TLD RTT: -0.09204626083374023

   Auth RTT: -0.03162574768066406

Part C Report

1. Report the time it takes to resolve each of these host names from your local DNS server. (5 points)

   - **youtube.com: 0.11011767387390137**
   - **facebook.com: 0.15694451332092285**
   - **tmz.com: 0.14583873748779297**
   - **nytimes.com: 0.13816213607788086**
   - **cnn.com:0.14608979225158691**



2. Report the TTL value in the DNS responses to each of these host names. (5 points)
   - **youtube.com: 2days**
   - **facebook.com: 2days**
   - **tmz.com: 2days**
   - **nytimes.com: 2days**
   - **cnn.com: 2days**

3. Report the time it takes to resolve each of these host names by your DNS client from your local DNS server when it did implement the cache (and the answers are already in the cache). (5 points)