Andrew Park (yp285) & Soorim Kim (sk2065)

Collaboration: Who did you collaborate with on this project? What resources and references did you consult? Please also specify on what aspect of the project you collaborated or consulted.

- https://docs.python.org/3/library/select.html
    - This was used in order for us to understand what was happening with the select call that we utilized in our rs
- https://www.tutorialspoint.com/python/python_command_line_arguments.htm
    - This was used in order for us refresh on how command line arguments work
- We also referenced the lecture and recitation slides

Discuss how you implemented the RS functionality that tracks which TS responded to a given query or timing out if neither TS responded. Please be clear and specific.

- We were able to implement the RS functionality that tracks which TS responded to a given query or timing out if neither TS responded by utilizing the system call select() as recommended to us in the project instructions. We sent in both the ts1 socket and the ts2 socket through the select() call while also implementing a 5 second timeout. We learned that select as 3 return values readable, writable, and exceptional and set it as such. We also learned that if a time-out is reached without a file descriptor becoming ready, 3 empty lists are returned. With this information after the select system call, we initialized ts_msg as the decoded received message from the client + " - TIMED OUT". This would be updated to the correctly decoded message from the respective ts1 or ts2 servers if the readable return from the select call was found to be from the ts1 socket or the ts2 socket.

Is there any portion of your code that does not work as required in the description above? Please explain.

- To our understanding, our code does exactly what the instructions intend for us to do!

Did you encounter any difficulties? If so, explain.

- Our biggest difficulty came from truly understanding how the select call works. We knew that the select call would return 3 lists of objects (readable, writable, exceptional) but did not truly know what those lists would consist of. It took a few trials and errors for us to be able to code effectively a way to distinguish between if ts1 has sent us the confirmation or if ts2 had sent us the confirmation
- We also initially struggled with trying to figure out a data structure to implement our DNS table within our ts1 and ts2 files. Soorim and I recently went over dictionaries in our CS210 class and thought that it might be best fit in order for quick access through its key and value functionalities.

What did you learn from working on this project? Add any interesting observations not otherwise covered in the questions above. Be specific and technical in your response.

- We learned how to implement load balancing across servers which is the process of sending something to two separate servers and choosing one that comes first. This was

mainly through the select() call. We also learned to design our load balancing program with a fixed timeout in the case that our DNS servers receive no response preventing it from running on forever.

- We also learned how to connect our root server (RS) to multiple different ports such as the client, ts1, and ts2.