1. Should we follow the input arguments in the order specified? What if an extra argument is given? What if an argument is missing?

- For consistency and grading, please follow the input argument order as mentioned above. Reiterating it here
  - Server: java Iperfer -s -p <listen port>
  - Client: java Iperfer -c -h <server hostname> -p <server port> -t <time>
- Any other order of input arguments (client & server) is invalid which should be notified in the error message. Same error message should be displayed if there is an extra or missing argument. Re-iterating the error message format here.
  - Error: invalid arguments

2. Can we use external libraries for parsing command line arguments?

- Yes, you can. If you are using external libraries, make sure you add them while writing your Makefile and include them in your submission tar file. But, since we have input arguments to be in a specific order, simple command line argument parsing is enough.

3. Which java version to use? Any specific env requirements?

- Use at least Java 8 (JDK & JRE version 8). This is supported by the MIninet VM we suggested.

4. What rules should we validate for hostname?

- There are specific rules that determine if the hostnames are valid or not. However, for the assignment add basic validations which you think are reasonable. State your assumption as comments in the code. You should ensure that your tool should not crash for any reason.

5. What format should the output be?

- You are expected to follow a specific output format mentioned above. Reiterating the output format here
  Server: sent=xxxx KB rate=yy.zzz Mbps
  Client: received=xxxx KB rate=yy.zzz Mbps
  Error Message: Error: <reason>
- Note: Have 3 decimal places. Lengths of the integer part (xxxx and yy) need not be fixed.

6. How to measure time on the server side?

- Time taken between 1st byte of data and last byte of data.

7. Should we use char '0' or byte 0x0 for data?

- You are expected to send 1000 bytes of 0x0 from client to server.

8. On the server side, should we handle simultaneous client connections?

- You need not handle simultaneous client connections on the server side. There won't be any test cases for such a scenario. Also, after a single connection server is expected to close the socket and shutdown the service.

9. Is it possible that more bytes will be received than sent?

- If you observe this issue, then there is something wrong in your code. Don't count the number of times read() call returns. Instead try to check the number of bytes returned by read() call.

10. My mininet VM seems broken. Commands which were working are not working now. What should I do?

- Try clearing the mininet using sudo mn -c after exiting from mininet. Create topology again and test the commands again. If the issue is still seen, contact TA.

11. How to measure latency of a link (between switches) in the given topology?

- To measure the latency / bandwidth of a link, use the host endpoints (instead of switches). Open xterm for each host machine and run the required commands.

12. How to measure bandwidth between multiple hosts simultaneously?

- Open terminals for each host from mininet using the following command.
  xterm <hostname>
- Then run required java commands in the respective host terminals.
- Note: For more accurate results, you can try parallel-ssh utility (https://code.google.com/archive/p/parallel-ssh/)

13. I see significant differences between outputs while running Iperfer in VMs. Is this an issue with my VM?

- The issue could be due to some background processes not getting killed from any previous mininet instances. You could run sudo mn -c to clear any running mininet instances and try testing again. If the CPU usage is still high (verify using top command) - over 80%, you should kill some processes or come to any TA office hours to get this corrected.

14. In Part 3, what are the latency and bandwidth between a host and the switch it connects to?

- Such links are assumed to have negligible latency and large enough bandwidth.