

I . Comparison of ISPs' performance

After completing the project, you will learn

- How to diagnose network issues using Wireshark, ping, and other tools.
- How to measure network performance of two ISPs and to gain understanding of the Internet performance, and to analyze the routes and the ISPs' performance.

Students in the XMU campus may access Internet from different ISPs, for example, CERNET (in the library) , China Telecom and China Mobile (in your residential home or your dormitory). Please use two notebooks which running Wireshark and Traceroute to measure Internet performance for two days (one working day and one weekend). The dataset (traceroutes and network path performance) will be made available for data analysis. Each team will analyze and visualize the data to obtain patterns about the network performance data and answer questions, such as

- Which ISP seems to stand out in terms of performance? What are your performance metrics?
- Do you observe any serious performance degradation? (e.g. in rush hours)
- Any service differentiation for overseas routes? (e.g. visit oversea websites)
- How many router hops are involved in your applications? (You may consider different applications.)
- How (dis)similar are the routes used by different ISPs?

The report should detail the findings obtained from the data analysis using appropriate graphs and tables. You should explain how you analyze the data and include any scripts that you have written.

II. Linux server speeds up by TCP BBR congestion control

[TCP BBR](#) was reported to significantly increase throughput and reduce latency on Google's internal backbone networks. And many researchers demonstrated [the benefits of using BBR congestion control](#) and illustrated [how easy it is adopted in Linux OS](#).

Please carry out some experiments in your Linux server and observe the

advantages of TCP BBR compared with the traditional TCP version (e.g. TCP Vegas or TCP Reno). Each team will use network testing tools (e.g. iperf, tcpdump or Wireshark) or commands (e.g. wget) to measure the network throughput and analyze TCP streams. And then analyze and visualize the performance metrics (e.g. throughput and delay) under typical applications (e.g. WWW and FTP) with or without TCP BBR. Do you observe any significant performance improvement due to BBR? Could you explain the reasons?

The report should detail the findings obtained from the data analysis using appropriate graphs and tables. You should explain how you analyze the data and include any scripts that you have written.

III. Encrypted BBS with secure server

Your goal is to develop a Bulletin Board System (BBS) with good security guarantees. Once logged in, the user can perform functions such as uploading and downloading files, reading news and bulletins, and exchanging messages with other users through public message boards. Please design some schemes to satisfy some security requirements, such as information Confidentiality, Integrity and Non-Repudiation.

The BBS product of this project shall implement all/partial functions and satisfy all/partial security requirements mentioned above. You can implement your prototype in any language you want. You can decide how the BBS client and server should be run.

Hints:

- ✓ Socket programming is recommended.
- ✓ A scheme for distributed PKI certificates is suggested to allow mutual authentication without leaking user interactions.
- ✓ One reasonable design would be to have the BBS client provide a minimal shell environment that allows users to perform the operations described in the above requirements.