

Project Proposal—Experimental evaluation of TCP performance

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TCP protocol is a core Internet protocol at transport layer. Most applications use the TCP protocol as their data transport protocol, and the performance of the TCP protocol affects the performance of applications. In this project, experiment evaluation is used to test the hypothesis:

- A single TCP flow is the best choice for a perfect channel or a channel where the source itself is a major contributor to congestion but
- A multitude of TCP sources is the best choice of a channel where packet drops (and possibly delays) are independent of the source (and thus may be modelled as random).

Tasks to do

1. Literature review on answers to the above hypotheses.
2. Experimental evaluation and analysis on the above hypotheses.

The experiment is performed in NS-3 (Network Simulator, <https://www.nsnam.org/>). You should write code in NS-3 with multiple sources and a single destination. The following figure shows a possible experiment setup.

```
S1      Source Link  ---|
S2      Source Link  ---|
...      |---Buffer --- Destination link ---/--- Destination
Sn-1    Source Link  ---|
Sn      Source Link  ---|
```

The source links should have high bandwidth, no delay and no drop. The buffer shall be able to act as “infinite” and “limited” (such that it would drop packets). The destination link shall have a possibly limiting bandwidth, some delay and packet loss all three of which should be tuneable. And it would be great if the bandwidth or the delay can vary “on the run”.

The sources use TCP to transmit individual files (or tuneable size) to the destination and the TCP version should be selectable.

Metrics of interest include the time to transmit B bytes in total and the time to transmit b new bytes, the number of lost packets and number of duplicate packets. The code should also produce results in terms of packet dumps at the destination marked “/” in the figure which would allow for further analyses.

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