

a. A brief introduction of raw experimental data generated (copy the raw data from the console and explain it)

Page    RTT(ms)PLT: no TFO (s)    PLT: TFO (s)    Improv.

<http://www.cplusplus.com>

200	11796.19	1587.475	86.5424768506
100	1429.944	945.42	33.8841241335
20	653.813	501.418	23.308652474

<http://puredata.info>

200	3407.497	2097.391	38.4477521183
100	2027.251	1295.141	36.1134363727
20	1018.975	785.499	22.9128290684

<http://www.nhc.noaa.gov>

200	11981.176	4381.843	63.4272712462
100	4083.327	2587.843	36.624154764
20	2207.562	2061.467	6.61793417354

We can find from the above raw data that using TFO substantially decrease network latency by 6%-86%. We also can find that the efficiency improves more for large RTT parameters.

b. Your analysis should answer the following questions for each URL you specified:

<http://www.cplusplus.com/>

**i What effect does TFO have on the timing?**

TFO improves the timing by a large amount, ranging from 23% to 86%.

**ii How does the RTT value affect these results?**

The improvements are more substantial when the RTT is high. For 20ms RTT, the improvement is 23% while for 200ms RTT, the improvement is 86%. When the RTT is low, network delay only take a small part of PLT, thus the improvement is small.

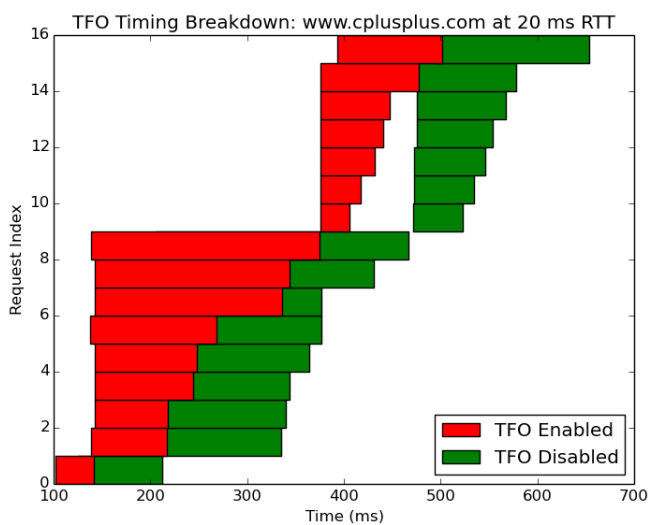
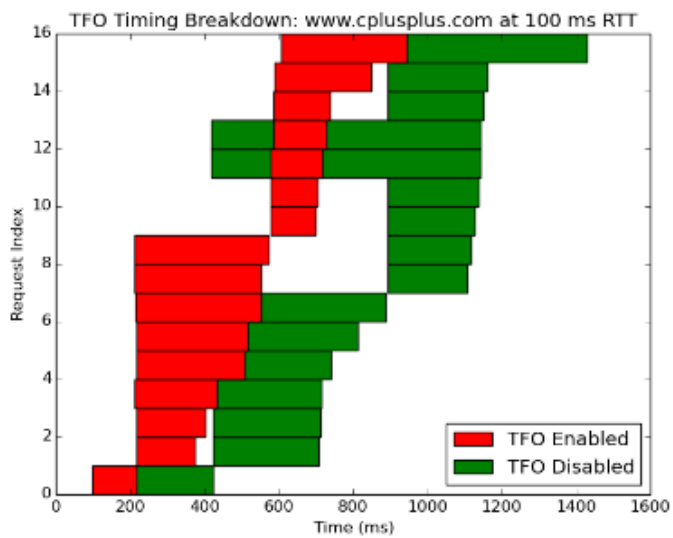
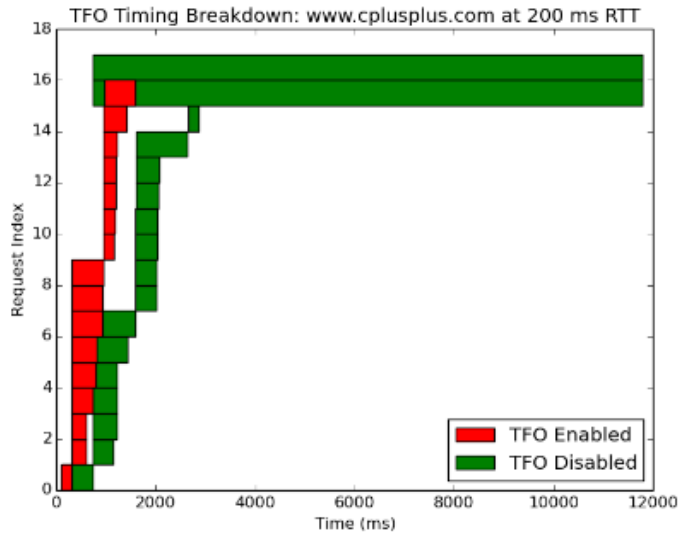
**iii Does the particular content available at this URL lend itself to performance enhancements provided by TFO?**

The page is a very simple page, which means more time is spent on network transfer. Therefore, TFO make significant improvement for this situation.

**iv Were these results surprising in any way?**

It is surprising because it offers a more significant improvement (86%) than the highest improvement in the paper. This might because the page is even simpler than Wikipedia in the paper.

**v Include all graphs from the output-figures folder (images do not count toward your two page limit).**



<http://puredata.info/>

i What effect does TFO have on the timing?

We can find huge improvement on PLT, ranging from 23% to 38%.

**ii How does the RTT value affect these results?**

Similar to the last page, higher RTT improves the PLT for larger percent.

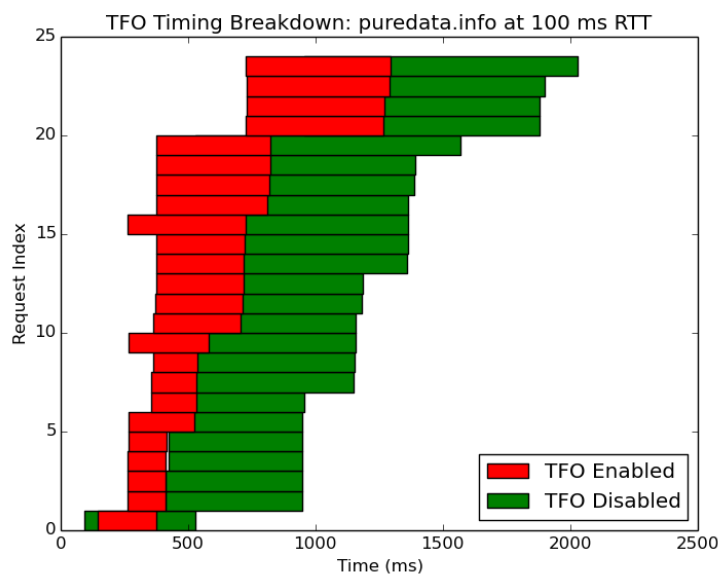
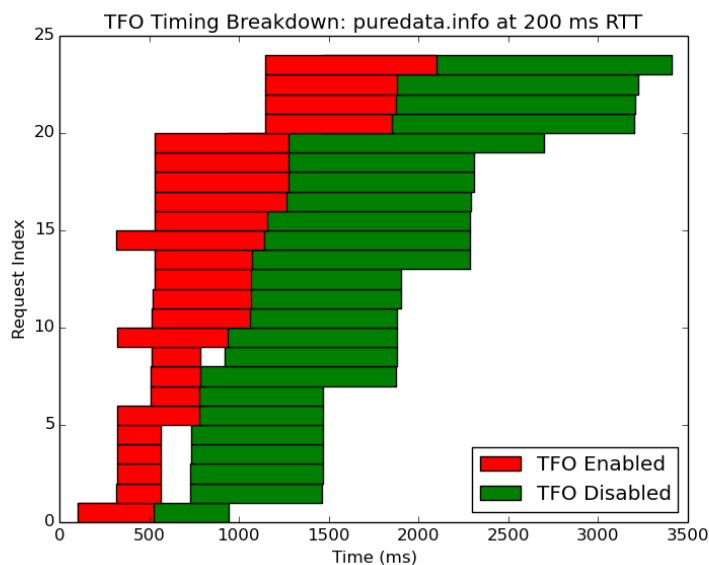
**iii Does the particular content available at this URL lend itself to performance enhancements provided by TFO?**

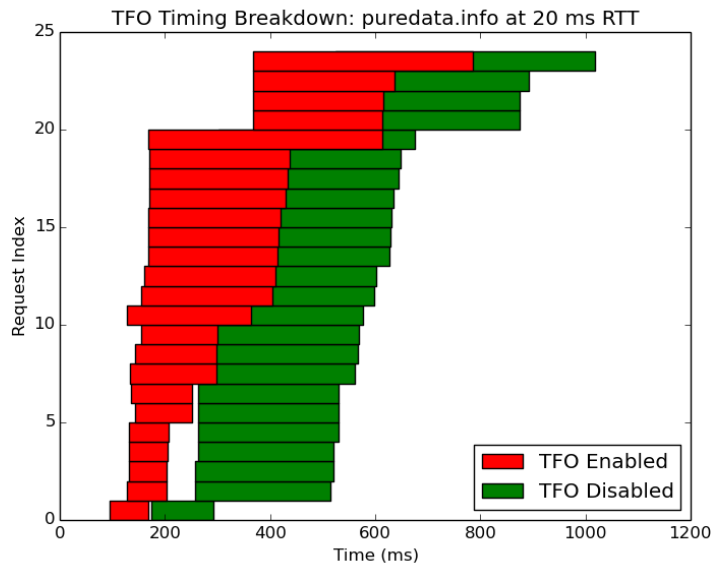
This web page is more complex than cplusplus.com, there the performance enhancement is lower than cplusplus.

**iv Were these results surprising in any way?**

It is not surprising because the size of the page is small and has similar improvement with last page.

**v Include all graphs from the output-figures folder (images do not count toward your two page limit).**





<http://www.nhc.noaa.gov/>

**i What effect does TFO have on the timing?**

TFO still make great performance improvement of PLT.

**ii How does the RTT value affect these results?**

Still the RTT value are positively correlated with the improvements.

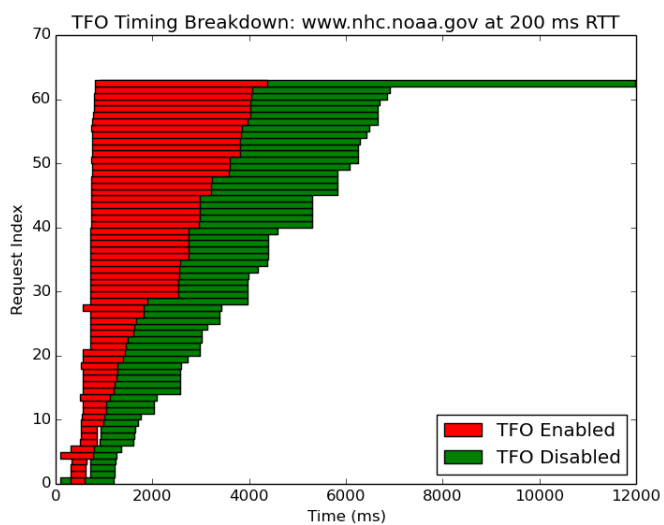
**iii Does the particular content available at this URL lend itself to performance enhancements provided by TFO?**

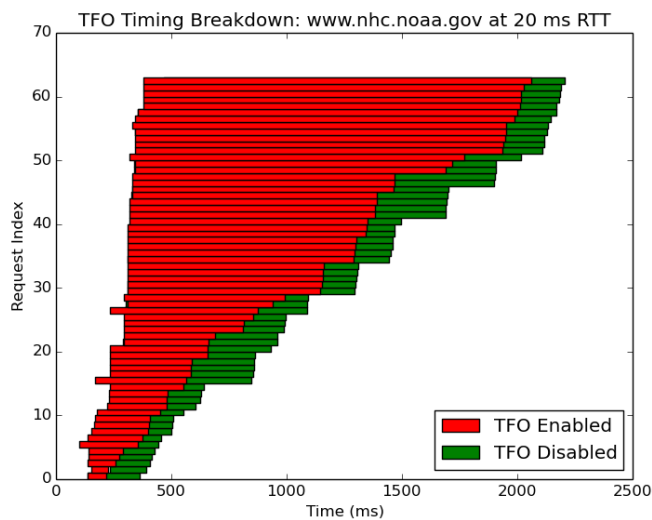
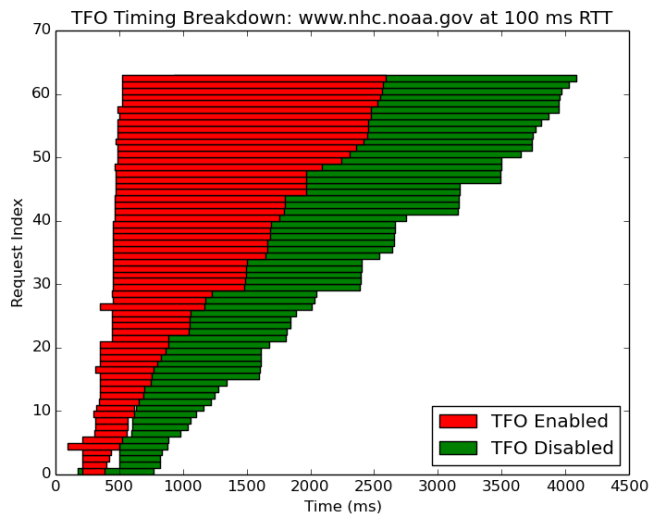
Most of the web page's contents are images, thus has less improvement by TFO.

**iv Were these results surprising in any way?**

No. Because we already see from the paper that more time is spent on processing the retrieved content, therefore the improvement is limited especially for low RTT value.

**v Include all graphs from the output-figures folder (images do not count toward your two page limit).**





c. Include a brief summary of your findings and state what conclusions you can draw based on the results of your experiment.

TFO can accelerate PLT for all web pages and experiments.

The improvement TFO provided are positively correlated with RTT value with a same page. This is because when RTT is small, large portion of time is spent on processing data rather than network, which limits the improvement of TFO.

d. Based on the reading and your experiment, in which of your website experiment scenarios do you see TCP Fast Open having the most performance gain over TCP? What about the worst?

For www.cplusplus.com, TCP Fast Open has the most performance gain. This is because the web page is quite small in size with fewer images. For www.nhc.noaa.gov, TCP Fast Open has the worst performance gain because the web page is complex with combination of many images and text.