

Short-term periodicity of TCP traffic

When designing data communication networks or devices for such networks, it is important to understand the nature of the traffic such networks carry. To a large extent, the traffic in the network core is essentially random, being the result of the independent activities of many individual users. Still, some structure can be discerned in this randomness. For example, experiments have shown that the traffic is “self-similar”: it looks roughly the same at different timescales. Furthermore, there are obvious 24-hour and 7-day periodicities.

Besides those long-term periodicities, a simple experiment reveals that there are also many short-term periodicities, with periods on the order of seconds or fractions of seconds. Possible causes of such periodicities include network effects (such as round-trip times of connections), and application behaviour.

In an earlier project, the short-term periodicity of UDP traffic in the UT internet traffic repository has been studied. TCP traffic was not yet studied in this earlier project. However, TCP is probably more interesting than UDP, since the majority of internet traffic is TCP, and because its acknowledgement mechanism should make network-related timing effects more important.

The goal of the present assignment is therefore to extend the work to TCP. As in the UDP project, both techniques from signal analysis (like the Fourier transform) and tools from network trace analysis (like the Wireshark software) will be used. The signal-analysis part, however, should require only trivial modifications to the software already developed for UDP, so the emphasis in this assignment will be on the interpretation of the data.

In particular, the following questions should be considered:

- Literature search: what previous results on short-term periodicity of TCP are available?
- How much of the TCP traffic is essentially periodic?
- What typically causes the periodicities? Network effects or application behaviour?
- What periods are common? Are any particular periods very common, e.g. due to behaviour of certain popular application programs?

For more information, please contact Pieter-Tjerk de Boer, ptdeboer@cs.utwente.nl, Zi-5016