



Bachelor Thesis:

“Tweaking Throughput on the Transport Layer”

This document describes the subject and the general time schedule of David Stolz’ bachelor thesis in the spring term 2011. Adaptations or changes can be agreed upon by the advisers.

Subject

The transport layer used in today’s internet supports two basic protocols, the Traffic Control Protocol (TCP) and the User Datagram Protocol (UDP). TCP provides a reliable, ordered delivery of a stream of bytes from one peer to another peer. Internet applications that rely on TCP typically include Client-Server HTTP traffic on the the World Wide Web, e-mail, and file transfer. On the other hand, UDP is a more lightweight, stateless protocol that uses less overhead, and thus exhibits less latency. As a trade-off, it does not guarantee a reliable data stream service between the two endpoints of a connection. With UDP, datagrams may arrive out of order, appear duplicated, or go missing without notice. A typical application where UDP is preferable to TCP are real-time systems such as video streaming because dropping packets is preferable to waiting for delayed packets. As the two protocols are designed to serve different purposes, network routers that relay packets between two endpoints do not treat UDP packets and TCP packets alike. ISPs are believed to commonly employ the practice that their routers treat TCP packets with higher priority than UDP packets. Thus, when they run into congestion they rather drop UDP packets than TCP packets. We believe that some practices employed by the routers, in combination with the primitives of UDP, TCP, leave enough leeway to increase the throughput of an individual Internet connection—potentially at the expense of other connections.

The task of this thesis is to investigate in the practices used by network routers by researching existing literature, or potentially by conducting own experiments to this purpose on the Internet. With this knowledge, David should try to come up with ways to improve the throughput of a bilateral connection in different traffic scenarios. The means to achieve such a speed-up may include an improper use of the UDP and/or the TCP packets, and predatory behavior in the sense that the speed-up is achieved at the expense of other connections that route through the same intermediate network parts. Such a predatory misuse of the transport layer could for instance be to disguise a TCP-like protocol within UDP traffic, or vice versa.

Outline of Work Plan

- Read existing work on the subject, investigate router practices.
- Potentially design an experiment to evaluate practices of intermediate routers.
- Come up with possible protocol variants that might increase the throughput under specific network scenarios, and discuss protocols that adapt to the changing traffic situation in the network.
- Implement, and evaluate one or more of the proposed protocols.
- (If enough time) Integrate the protocol into our Bitthief-client
- Write the report, and prepare the final presentation.

Duties of the Student

- Regular meetings with the advisers. Ideally, there will be a meeting every week, but the frequency of meetings can be adapted.
- There will be one presentation given by the student in front of the research group at the end of the thesis.
- Finally, the student has to write a report (10 to 20 pages, English or German), presenting his work and results. This report should also include a critical review of the work.

General

- Independent working is expected.
- A possibility to work in our building (ETZ) is provided. It is also possible to work at home.

Contacts/Advisers

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