

Semester Thesis:

“Practicability of T4T Along Cycles”

This document describes the subject and the general time schedule of Michael König’s semester thesis in the spring term 2010. Adaptations or changes can be agreed upon by the advisers.

Subject

BitTorrent is a widely popular protocol for content dissemination based on the peer-to-peer (p2p) paradigm. The peers interested in the same content form so-called “swarms” in which blocks of the content are exchanged. As peers favor other peers from which they have already received several data blocks and consequently upload to those peers first, it has long been believed that the BitTorrent protocol offers sufficient incentives for each individual peer to actively upload and thereby help to keep the entire swarm alive.

We showed that this assumption is not true by building a simple BitTorrent client called *BitThief*¹ that refuses to upload a single bit and yet achieves good download rates. This implies that BitTorrent does not offer sufficient incentive for peers to upload, and any peer that does not want to upload, e.g., because its upload capacity is small and it wants to use this capacity for other purposes, can decide not to help out other peers while still being served by them.

As in the long term we would like to have a p2p file sharing protocol that completely discourages freeloading, we designed two protocols *CycleT4T* and *T4T with source coding*² that are much more robust to selfish participants. Both protocols aim at increasing trading opportunities among peers in a file sharing network. *CycleT4T* takes advantage of the fact that T4T trading is not only possible among two peers who are mutually interested in each other, but also in (larger) cycles of the interest graph. E.g. if A is interested in B , B is interested in C , and C is interested in A then A , B , and C can trade along the cycle $A \rightarrow B \rightarrow C$. Although *CycleT4T* performs well theoretically and in lab simulations, it is unclear how effective it will be when used in live swarms.

The goal of this thesis is to answer the question to what extent we can expect a cycle protocol to increase the trading opportunities and thus the efficiency of a P2P system. In particular, we want to investigate how common trading cycles up to a certain length are in current Bittorrent networks, and, if feasible, how much data could be traded along those cycles.

¹See <http://dgc.ethz.ch/projects/bitthief/>.

²T. Locher et al., “Rescuing Tit-for-Tat with Source Coding”. *P2P 2007*.

Outline of Work Plan

- Read related work and study the BitTorrent protocol and the implementation of the BitThief client.
- Carefully design the experiment so that most useful data is gathered within the limited scope of this thesis.
- Implement the design, and carry out the measurements.
- Analyze and interpret the gathered data.
- 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.
- The student will have to write a short summary of his progress at the end of each month (“Monthly Report”).
- 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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