



Specialeforsvar

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Optimization of TCP/IP Traffic Across Shared ADSL

Kom og hør hvordan man laver QoS på ADSL
... på den rigtige måde!

Yderligere informationer kan finde på:

www.ADSL-optimizer.dk

Abstract:

This thesis presents practical studies of the TCP performance problems caused by the asymmetric nature of ADSL connections. Previously, it has been shown on other types of asymmetric links that TCP throughput may be reduced due to a variable and imperfect ACK feedback. The upstream capacity of ADSL products in general does not disturb the ACK feedback mechanism, but we analyze and document that TCP traffic across ADSL in fact is affected by the asymmetric nature of ADSL, when utilizing the upstream capacity. For a single user ADSL installation it is manageable to avoid upstream congestion, but for larger networks, connected to the Internet by ADSL, the rise of peer-to-peer file sharing applications may result in a permanently congested upstream link.

The thesis provides evidence that the achievable downstream throughput is reduced significantly in case of a saturated upstream link. Saturation of the upstream link introduces a high queueing delay that effectively renders the connection useless for interactive and other delay-sensitive applications (like VoIP).

Previous work within the field of asymmetry has primarily been concerned with optimizing downstream throughput. Our solution incorporates latency as an important design parameter in order to support different types of network applications at the same time. The thesis also provides a practical solution to mitigate these problems. We demonstrate how it is possible to achieve full downstream and upstream utilization, while at the same time supporting different delay-sensitive applications, using the packet scheduler of a Linux based middlebox between the network and the ADSL connection.

On ADSL the available bandwidth for IP traffic varies significantly, which is caused by protocol overhead and packet/cell aligning at the ATM/AAL5 link layer. Depending on packet sizes the available bandwidth can be reduced up to 62 percentage. Therefore, a packet scheduler needs to account for the varying available bandwidth by accounting for the link layer overhead. As part of implementing a practical solution, based on Linux, the Linux Traffic Control system have been modified to perform accurate packet scheduling through modeling the ATM link layer overhead of ADSL.