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Master Degree Course Electronics Engineering, MSc EE

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Design, Implementation and Evaluation of Congestion Control Mechanisms for Concurrent Multipath transfer-stream Control Transmission Protocol.

ABSTRACT - Masterthesis

Stream Control Transmission Protocol, SCTP is a general purpose transport protocol, based on multi-streaming as well as multihoming that distinguishes it from the prevalent transport protocols TCP and UDP.

Multihoming indicates multiple independent addressing (i.e. the device has multiple network interfaces) which can bring benefits to improve the characteristics of the IP-based networks. However, this feature is still used for fault tolerance in failover situations where there is fast recovery, that's when the load is transmitted on alternative path while main path inactive. Additionally, it can be used for retransmitting the lost data chunks on the alternative path to reduce the overhead traffic over the main path and increase the probability for successful retransmissions.

On the other side, IP-based networks grow rapidly, with more critical internet applications, and more internet services where there is a higher demand of the existence of multihoming concept to provide stability and robustness of the network. On the other hand, it becomes more desirable to utilize all paths simultaneously (load sharing) to transmit the data and increase payload"s data throughput instead of using single path between two endpoints. Load sharing over multiple paths simultaneously is denoted as Concurrent Multiple Path Transfer (CMT).

CMT-SCTP a protocol extension have been added to SCTP implementation, allows to bind multiple internet addresses –multiple paths- within single association and transfer the load in parallel over these paths, is proffered by and implemented in free BSD kernel.

This master thesis focuses on CMT congestion control and evaluates its performance. Discuss CMT challenges: Identify the side effects of CMT with congestion control mechanisms -which applied in current SCTP. Identify blocking issue at the sender and the receiver which occurs due to reordering of data chunks.

In order to achieve better throughput performance and eliminate the side effects with CMT, this thesis discusses CMT- Congestion Control Algorithms: Spilt Fast Retransmit Algorithm, Congestion Window Update Strategy for CMT, and finally Delayed

Acknowledgment for CMT. In addition to appropriate approaches to solve blocking issue at the sender and the receiver buffer.

This master thesis employs SCTP module in Omnet++ simulation program. We investigate the CMT-SCTP congestion control including the necessary mechanisms that show improvement on the performance of CMT compared with using CMT to current SCTP congestion control mechanisms.

Independent bottlenecks on the end to end paths are proposed to estimate the performance of CMT. SCTP module is provided by the research group of Institute of Experimental Mathematics at Essen-Duisburg University.