



Level Intended: Masters / Diplom

Project Type: Thesis

Collaborative Theme: IP-lookup, relaxed balancing

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Implementation of a Relaxed Balanced Min-Augmented Range Tree

Preamble

When an Internet router receives a packet p from an input link interface, it uses the destination address in packet p to look up a routing database. The result of the lookup provides an output link interface, to which packet p is forwarded. In router tables, where packet classification is intermixed with updates, it is important to avoid extensive locking since high packet throughput with as few misclassifications as possible are of grand importance.

Thesis Description

Trees with relaxed balance were introduced with the aim of improving runtime performance by allowing a greater degree of concurrency. This is obtained by uncoupling updating from rebalancing such that extensive locking can be avoided in connection with updates. Several relaxed balancing schemes have been proposed [1] [2]. In [3] three relaxed balancing schemes for red-black trees have been experimentally compared with the strictly balanced red-black tree. The results indicate that in a concurrent environment, the relaxed balancing algorithms have a significant advantage over the strictly balanced red-black tree.

The overview of the IP-lookup problem and its related issues is presented in [4].

In this thesis, we shall explore how the min-augmented range tree [4], a structure which can be utilized for IP lookup, can be relaxed. After the tree has been implemented, this includes a suitable mechanism for concurrency control and administration of the rebalancing requests, experiments shall be conducted to test its performance.

References

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2. Joan F. Boyar and Kim S. Larsen. Efficient Rebalancing of Chromatic Search Trees. *Journal of Computer and System Science*, 49:667-682, 1994.
3. S. Hanke, .The performance of concurrent red-black tree algorithms. *Lecture Notes in Computer Science*, vol. 1668, 1999.
4. A. Datta and Th. Ottmann. A note on the IP table lookup problem. 2004.