# HYPERCUTS: A Decision Tree Based Algorithm for Fast Packet Classification

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**Abstract**

A classifier consists of a set of rules for classifying packets based on header fields. Because core routers can have fairly large (e.g., 2000 rule) database and must use limited SRAM to meet OC-768 speeds, the best existing classification algorithms (RFC, HiCuts, ABV) are precluded because of the large amount of memory they need. Thus the general belief is that hardware solutions like CAMs are needed, despite the amount of board area and power they consume.

In this paper we provide an algorithm based on a fast search structure capable of providing search results with a throughput closer to the speed of the line where speed of the line may be OC 192, i.e. a packet every 32 ns.

It is based on a decision tree in which each node can be seen as a k-dimensional hypercube, in which each dimension of the hypercube is associated with a dimension in the rules of the classifier.

In each node a decision is taken based on information from one or multiple fields. The fields chosen to be used in a decision process of a node are based on a set of heuristics that we develop. These heuristics take into account the overall memory that may be occupied by the whole search data structure as well as providing a maximal acceptable depth to the decision tree.

The search structure also allows fast incremental updates, with an update time comparable with the time of the search. It can also be pipelined in which case the throughput may be increased to about one packet per 8 ns (limited by the speed of SRAM) in which case the packet classification operation may be applicable to OC 768 links.

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