More Efficient High-Speed Data Packet Classification

[View U.S. Patent No. 9,219,694 in PDF format.](#)

WARF: P130240US01

Inventors: Suman Banerjee, Yadi Ma

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a ternary content addressable memory system that saves power by activating only needed portions of the memory.

Overview

In contrast to random access memory (RAM), content addressable memories (CAMs) allow data to be located simply by knowing the desired data value. CAM memory receives the desired value and then returns one or more addresses (or the contents of those addresses) where the data is located. Such memories and searches are called 'associative.'

A special subclass, called ternary content addressable memory (TCAM), allows desired data values to be specified with wildcard characters. TCAMs are used in high-performance network hardware like routers to perform data packet classification. Such classification is important not only for routing, but also for security filtering and traffic shaping.

While TCAMs provide extremely fast packet classification, they consume lots of power. A typical 18 megabit TCAM device can use up to 15 watts of power, which is inefficient.

The Invention

UW–Madison researchers have developed a system to reduce power usage using a TCAM preclassifier, which determines and activates only those memory blocks needed for a search.

The method works by preclassifying data packets according to a small set of rules and steering the process to a selected portion of the TCAM. To do this, a set of memory blocks hold classification rules dependent on multiple arguments. The rules are configured to be associatively searched as a group for particular argument values.

The preclassifier circuit receives a data packet and matches it to a preclassification rule, which activates the correct subset of blocks to perform an associative search.

Applications

- Use in TCAMs found in routers, firewalls and servers
- Analysis of large amounts of packets

Key Benefits

- Reduces power usage
- Maintains performance
- System may be wholly implemented by conventional TCAM.

- Suitable for high-speed network data classification

Additional Information

For More Information About the Inventors
- Suman Banerjee

Related Technologies
- For more information about optimizing packet classification configuration on IP networks, see WARF reference number P06413US.
- For more information about wire-speed packet classification on IP networks, see WARF reference number P09053US.
- For more information about a packet router with improved packet classification abilities, see WARF reference number P09044US.

Publications
- Ma Y. and Banerjee S. 2012. A Smart Pre-Classifier to Reduce Power Consumption of TCAMs for Multi-dimensional Packet Classification. ACM Sigcomm, Helsinki, Finland.

Tech Fields
- Information Technology : Networking & telecommunications

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842