

**Dynamically Updatable Ternary Segmented Aging Bloom Filter for OpenFlow-Compliant Low-Power Packet Processing**

**Abstract:**

OpenFlow, the main protocol for software-defined networking, requires large-sized rule tables and frequent updating. For fast packet processing, rule tables are often implemented with ternary content-addressable memory (TCAM) in the OpenFlow. To deal with TCAM power problems, many network applications employ bloom filters (BFs) to reduce the redundant operations of table-lookup and for low power consumption. However, applying traditional BFs to an OpenFlow switch leads to problems, such as unsupported dynamic update, large space overhead, and the rule-set expansion of ternary data. In this paper, we propose a dynamically updatable ternary segmented aging bloom filter (TSA-BF). The TSA-BF consists of two parts: a segmented aging BF algorithm (SA-BF) and a ternary prefixtagging encoder (TPE). First, in the SA-BF, we develop an automatic update scheme using the mechanisms of content-aging and buffer-segmenting. The SA-BF ages and deletes its contents automatically, thus eliminating the costly communication overhead and enabling dynamic updating. It also achieves space efficiency by the developed partial-deletion mechanism. Second, in the TPE, we encode ternary prefix-rules into uniquely decodable binary code words. The TPE prevents the rule-set expansion of ternary-data in the OpenFlow environment. Simulation results show that the SA-BF alone can save 37% of space overhead, compared with state-of-the-art techniques. In an environment with the ternary prefix-rules, the TSA-BF can save another 93% of space overhead, compared with the best-performance scheme. Hence, the proposed TSA-BF is highly suited to the requirements of emerging high-performance TCAM-based packet processing in the OpenFlow, which considers dynamic update and power efficiency.

**Existing System:**

TCAM consumes around *50* times more power than conventional RAM. Hence, power consumption is a critical concern for backbone TCAM-based switches. However, owing to the frequent updating feature in current SDN environments,

the miss rate of table-lookup is as high as *25%*. This implies that *25%* of table-lookups are redundant, and lead to wastage of power. The large amount of wasted power becomes the bottleneck in designing power-efficient backbone OpenFlow switches.Recently, studies on effective membership-checking mechanisms to reduce redundant lookups and unnecessary power consumption have been widely reported. Bloom Filter (BF) has proven to be highly efficient in performing membershipchecking in various applications. BF possesses the essential characteristic of no false negatives, which ensures the correctness of functionality. Also, it achieves line-rate speed by implementation in on-chip memories.

**Proposed System:**

The proposed SA-BF ages and deletes contents automatically, thus eliminating the communication overhead. We employ the mechanisms of buffer- segmenting and double-buffering to develop a novel update scheme, the. It ensures more fine-grained updating and that cold cache effects do not take place.

The proposed TPE encodes ternary prefix-rules into binary codewords, thus eliminating rule-set expansion. The designed codewords are uniquely decodable, which prevents the cooperating BFs from falsely registering the membership.

We combine the SA-BF and the TPE efficiently while considering physical memory structure. We develop the TSA-BF to have constant and few memory accesses in each operation.