Packet Classification Based On Standard Access Control List

S.Mythrei, R.Dharmaraj

***ABSTRACT*: Packet classification is to classify the packets as belonging to the flow in network systems such as firewalls and routers. The function of packet classification is to match packet headers against a set of predefined filters. In this paper we propose system the packet can be classified by using source IP address of each incoming packet. The accessing or denying of each packet can be checkout with the rule set. The algorithm compares the source IP address header field of the packets received on a link against a set of rules and return the action of the highest priority rule that matches the packet header. The final decision is made about classifying the individual packets by using the action provided in the rule set.**

***Keywords*: Packet Classification, Firewalls, Routers, Access Control List (ACL).**

I. INTRODUCTION

The sole aim of the routers and firewalls is classifying the packet and routing it to the appropriate destination. The identifying of packets for quality of service (QoS). Packets can be classified by source and destination ports and address and protocol type. Firewalls also have to classify packets, where speed of decision making to deny or not to deny, is of utmost importance. With the increasing demands on router performance, there is a need for algorithms that can classify packets quickly with minimal storage requirements [1].Each new algorithm published is evaluated from different perspectives and based on different assumptions. Without a common ground, it is almost impossible to compare different algorithms directly. This is especially true for packet classification in network routers, since packet classification is intrinsically a hard problem and all existing algorithms are based on some heuristics and filter set characteristics. The performance of the packet classification subsystem is critical to the overall performance of the network routers [9].Growing and changing network traffic requirements invokes need of larger filter with more complex rules, which in turn gives rise to different fast packet classification algorithms. Packet consists of header and information data and header consists of MAC address, IP address, port number etc. When a packet arrives to the interfaces of a network device, there could be multiple policies that match the specified packet header fields, and only the action associated to the policy with the top priority is taken [4].The classifier is a list of rules that identify each flow and the actions to be performed on each. In order to classify a packet as belonging to a particular flow or set of flows, network nodes must perform a search over a set of filters using multiple fields of the packet as the search key [10].

II. PREVIOUS WORK

The design of packet classification algorithms is encumbered on search time and memory requirements. Therefore, it will be in fructuous to attempt to find an algorithm performing well under all circumstances. Research work is mainly oriented to exhuming inherent structures or characteristics of certain classification problems that can make heuristic algorithms that compute “fast enough” and occupy “not too much” memory. In general how the packets can be classified and the action can be taken for each packet after the packets can be classified. In Fig 1, the header of the packet can be taken, the packet will be check with the rule set and the particular action can be taken.

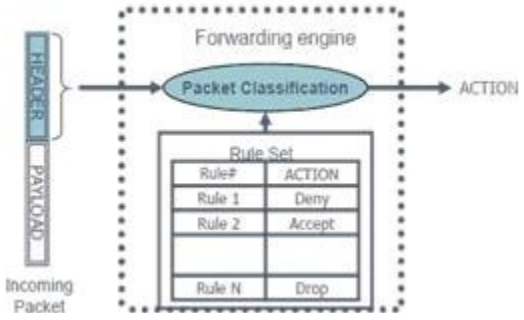

Fig1.Packet Classification in General

In [1], the authors have proposed an algorithm called Dim cut. This algorithm is the extensions of Hicut algorithm they have implement this algorithm by using two separated levels, pre-processing level and search level. This algorithm mainly concentrates

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about the full description of data structure and parameters which are tuneable. Whenever a packet arrives tree has been constructed and search key is also constructed from the header fields of packet. The search continues until the leaf node. In this algorithm the buckets are used for maintaining rules with the range. If the same rule repeated in all nodes in the same level separate that rule and bucket can be use at the time of search. The buckets should be sorted by priority. The advantage of this algorithm provides a better result on the basis of storage and throughput. The disadvantage is if the bucket size increases it leads to the longer linear search and if the bucket size is smaller, longer time has been need to process.

In [2], they have compared fast packet classification algorithm such as HSM and RFC. They mainly dealt with source and destination IP address and source and destination port number.RFC is decomposition based algorithm, where it computes multiple fields and ends with single field. Whereas in HSM algorithm, they have taken four dimensions and make it as a single table. In RFC, index value can be changed according to the internet service provider. For each incoming packet in a network router, it compares with a set of rule set it is used to check the information lies can be satisfied by the packet or not. The advantage of both algorithms provides a generic solution which can be implemented in software and hardware and it can be applied in multiple fields classification problems. The disadvantage is if number of policies increases then high memory will be required. In [3], the authors proposed a new algorithm called Hierarchical Intelligent Cuttings (HiCut). The algorithm is found to classify packets quickly and has relatively small storage requirements. It builds a decision tree data structure. Each time a packet arrives, the decision tree is traversed to find a leaf node, which stores a small number of rules. A node with fewer than *binth* rules is not partitioned further and becomes a leaf of the tree. An important consideration is the pre-processing time required to build the decision tree. The main advantages of this algorithm are its fast average query time and fast update time when rules change. The main disadvantage is the use of hashing which leads to lookups or updates of non-deterministic duration.

In [4], the authors have proposed a technique known as Hierarchal space mapping (HSM).This algorithm is a multiple stage reduction scheme. The action for each packet can be taken by using the top priority from the rule set which matches. The policies in the rule set can be kept in cache because the execution order in classifying tasks strictly determines the actions to be taken to the packet. The main idea in this paper is to reduce the searching fields by mapping the lookup domains two to one, step by step and hierarchically. The mapping of address spaces and port number spaces into non overlapped segments reduced table. The policy table can be constructed in order to reduce the two dimensional space into one dimension policy space. The advantage is suitable for multiple fields, fast lookup rate and memory requirements are reasonable one. The disadvantage is large pre-processing time and small memory is not enough for large policy tables.

In [5], they have proposed a method in classifying the packet which is Grid of Segment trees that has been derived from Grid of Tries. They have implemented this method for better performance. The Grid of segment trees modifies the Grid of Tries by replacing the binary tries with segment trees. They use pre computation and in speed up the search process they have used a concept of switch pointers in Grid of Tries. The Grid of Tries is designed to solve the shortness of hierarchical tries and set pruning tries. They have considered the two fields such as source and destination address form the packets in the construction of Grid of Tries, Dynamic Segment Tree and Grid of Segments. In Dynamic segment Tree, the segment tree is constructed by pre computing it in elementary intervals and then uses a bottom to build a data structure, so the segment tree does not fit to dynamic routing table. In this Grid of segment trees method they are construction and processing the trees by using the following steps. Creating a node structure, insertion into Grid of Segment Trees, construction of the switch pointer and querying the Grid of Segment trees. The advantage of this technique is the multidimensional packet classification can be done effectively. The Grid of segment trees achieves better performance than the other two. The drawback is that they have been classifying the packet by using the prefix from the fields in packet.

III. CLASSIFICATION BASED ON ACCESS CONTROL LIST

In general, there are two types of access control list. One is standard control list and another is extended control list. In this paper we are considering the classification based on standard access control list. The classification can be done using the source/destination addresses and ports as well as the protocol and the priority of the packet. For each incoming packet, a set of rules have to be match with the fields. Packet-filtering router either blocks or passes packets presented to it according to a set of filtering rules. In most algorithms; multiple fields are required for classification. Most multidimensional packet classification algorithm needs more memory usage and in increasing the search speed. Standard

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Access List only uses the source IP address in an IP packet to filter the network. This basically permits or denies an entire suite of protocols. Extended Access Lists these check for source and destination IP address, protocol field in the network. An ACL is a group of statements that define whether packets are accepted or rejected coming into an interface or leaving an interface. ACL statements operate in sequential, logical order. If a condition match is true, the packet is permitted or denied and the rest of the ACL statements are not checked. If all the ACL statements are unmatched, an implicit "deny any" statement is placed at the end of the list by default.

IV. IMPLEMENTATION OF CLASSIFICATION USING ACCESS CONTROL LIST

Access control lists (ACLs) perform packet filtering to control which packets move through the network and where. Such control can restrict the access of users and devices to the network, providing a measure of security. Access lists can save network resources by reducing traffic. Benefits, depending on how they are used. In figure 2, the implementation of the proposed technique can be given.

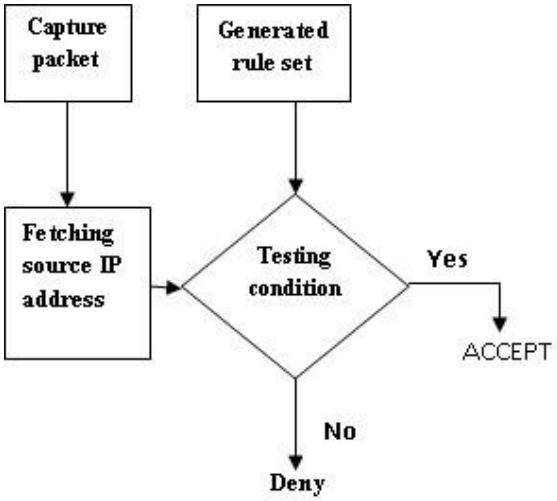

Fig 2 Classification Based On ACL

CAPTURING THE PACKET

In this capturing packet means collecting data being transmitted on the network. The packet can be captured from the system/Ethernet. For capturing live packets the capturing software is used. Fig 3, represents the live packets capture through the software.

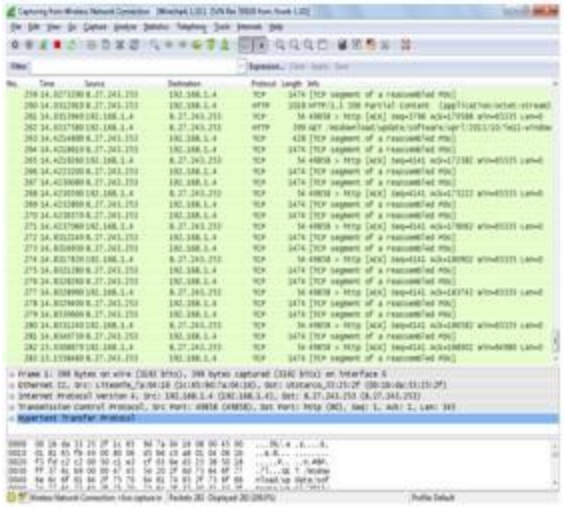

Fig 3. Capturing Of Live Packets

FETCHING SOURCE IP ADDRESS

After the packet can be captured from the software, packet's header from each packet the source IP address can be considered for taking the action. Fig 4 represents the fetching source address after the capturing of packet.

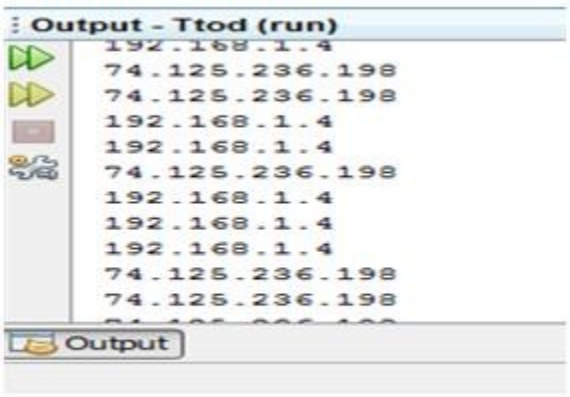

Fig4.Source IP Address

CREATION OF RULE SET

It can be used to implement security applying an access list will then cause the router to analyse every packet crossing that interface in the specified direction and take action accordingly.ACLs can be configured at the router to control access to a network or subnet. If the packet contains single source IP address the rule set can be generated whether to accept a packet or to deny a packet. Fig 5 denotes the rule set.

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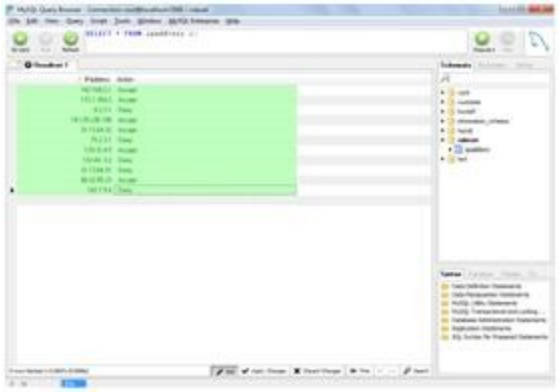

Fig 5, Pre Defined Rule Set

DECISION MAKING

ACLs filter network traffic by controlling whether routed packets are forwarded or blocked at the router's interfaces. The router examines each packet to determine whether to forward or drop it, based on the conditions specified in the ACL. ACL conditions could be the source address of the traffic. The packet is tested against the statements in the list. If the packet matches a statement, it is either accepted or rejected.

V. CONCLUSION

The paper we proposed, focuses on the issues in performance of packet classification algorithms, which are enable the routers and security challenges in network environments. While considering packet classification in networks, the packets have to be filter in a way it will provide security as well as the search speed has to be increased. Flexibility in the creation of rule sets as well in rule specification and implementation. Because packet classification algorithms are mostly based on heuristics, different rule sets with different structures and sizes tend to give different results. At the same time, the algorithm should be implements in order to reduce the work required for filter set management and it should be suitable for the filter updates occur frequently. The main focus on this paper is to classify the packet in real time environment. The acceptance or denial of packet should be classified effectively and efficiently.

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