QUEUE MANAGEMENT ON ACTIVE NETWORK ELEMENTS

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Abstract: Delay is an QoS (*Quality of Service*) parameter which has effect on almost every service provided by Internet connection. Every network element increases delay because of the need of handling data. The introduction presents an optimization process performed on MikroTik device, using Mangle and Queue tools. This optimization has positive effect on this important parameter. In last part of this work is shown that positive effect on delay is obvious as the transmission speed has raised up, after optimization process has been applied.

Keywords: QoS, MikroTik, Mangle, Queue,

1 INTORDUCTION

At present, almost every electronic device has the ability to connect to the Internet, and this tendency in the last few years, has led to inexorable increase in the amount of data transmitted by the network. Improving the efficiency of data processing on active network elements is therefore necessary. Generally the performance of network is evaluated based on the QoS. QoS specifies several parameters, such as: *jitter, bandwidth, delay,* etc [2].

For the purpose of this work, the delay is assumed as the most relevant parameter. In communication, delay is generally defined as the time interval that elapsed between data departure from the source to its arrival at the destination. There is a number of events and operations on transmitted data that contribute to the total delay. One of contributions is caused by the network active elements and represents the time needed to process ingress packets, routing and queueing. Improving the efficiency of marking and packet queueing may reduce the delay caused by network elements and reduces the processor usage. Hence, the purpose of my work is to increase just this data processing efficiency on active network elements, by reorganizing rules to correct order in Mangle tool, which is implemented on MikroTik devices. Experimental measurements show the improvement in the transmission and decrease the delay.

2 MIKROTIK QUEUE MANAGEMENT TOOLS

In MikroTik routers, the Mangle and Queue tools are implemented and enable advanced packet marking and queueing.

The Mangle tool is primarily used as a marker in MikroTik systems. Tagging is subjected to the rules created by administrator and serves to future processing in other tools. These rules and tags are only used within the router where they are configured, they are not forwarded to the network. Packet tags are especially useful for the Queue tool, where tagged packets are assigned to queues.

On the other hand, the MikroTik devices use the Queue tool for limiting and prioritizing the traffic. Implementation of queues in MikroTik systems is based on HTB *(Hierarchical Token Bucket)*. HTB

allows to create hierarchical queue structures, and defines the relationships between each queue [1]. MikroTik offers two options for configuring queues in RouterOS – queue simple and queue tree.

3 IMPLEMENTATION AND SOLUTION

The Mangle tool marks each incoming packet, that process can be relatively demanding on the hardware of network element, especially if it is a rule which needs to match with many parameters from IP header or address list. The incoming packet is held in buffer and is compared to rules from the list created by administrator, the system compares the packet sequentially with each rule from the list until it encounters one that matches the specifications see Figure 1. A rule that does not match any of rules continues for further processing without marking.

The goal of my work is just to optimize this list of rules so that new ordering of rules are descending according to loadability. In fact the most used rule will be at the first place in the list and the least used will be in the list as last one. Such an arrangement prevents the unnecessary capture of the packets in buffer, and the ones most used would be served among the first. This simple policy change in the list should result in acceleration of packet processing and a reduction of delay caused by the network device.

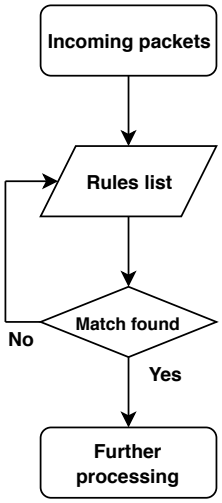


Figure 1: The basic principle of Mangle tool.

In order to being able to change the rules list efficiently, or to notify the administrator about the need to optimize the list of rules, a series of scripts is used ensuring the realization of our idea. The implementation of the process is shown in Figure 2. If the threshold, set by administrator, is exceeded on the counter of one of the rules, the script will extract the information data about usage of each rule from Mangle tool. Based on the extracted data, a new list of rules will be created in the correct order. After notifying the administrator about creating a new list of rules, the new rules list will be uploaded back to the Mangle tool.

This idea is applicable on every active network element with advanced options of management, my solution is demonstrated just on network device of company MikroTik with RouterOS version 6.4.x. or higher.

Device with optimization and without optimization was tested by a series of measurements. Each test was realized by downloading a 100 Mb of data from FTP server and measuring average bit rate. A bit rates for each download test on optimized and unoptimized device either, are shown in Figure 3.

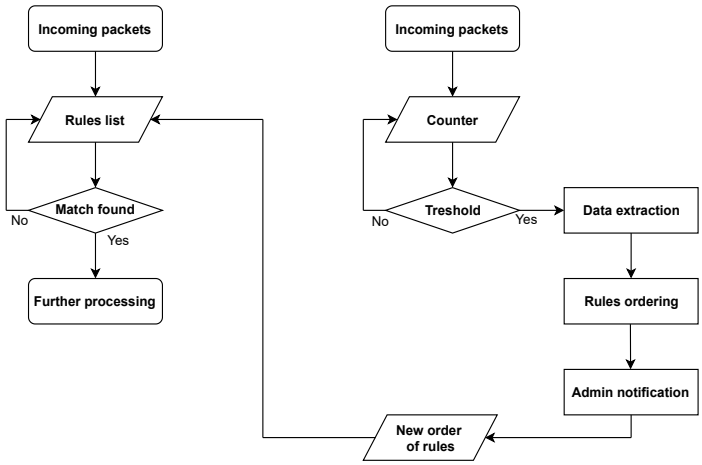
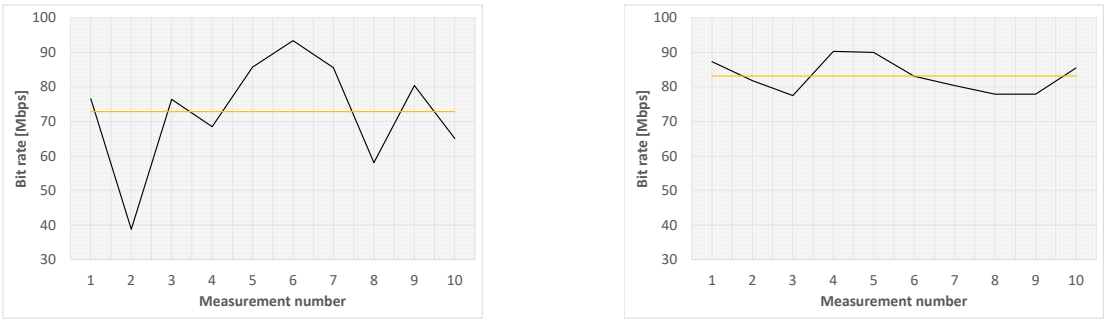


Figure 2: Solution flowchart.



(a) **(b)**

Figure 3: Transmission speed: (a) before optimization (the worst case), (b) after optimization of Mangle rules list.

4 CONCLUSION

In Figure 3a are shown transmission speeds measured on device with the worst case of rules order and speeds measured on device with the best rules order are displayed in Figure 3b. Straight line in both graphs represents average bit rate. Based on experiments made in the test network with the equipment where the idea was applied, is claimed that for device with the correct rules order is average bit rate higher by 13%. Based on results, the solution presented in this article appears to be a relatively efficient and simple way to streamline data processing on active network elements.

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