**Developing a Software Defined CG-NAT**

Denis Plotnikov

<INTRO>

<WHAT IS NAT>

RFC

<WHAT IS CARRIER GRADE NAT>

RFC

<WHAT IS THE NOWADAYS APPROACH TO DO NAT>

Specific network devices

<WHAT ARE THEIR PRICES>

My doc about prices

<HOW CAN WE DO BETTER>

Algorithmic + technology

… let’s try to make one

<WHAT OUR NAT SHOULD DO>

<WHAT THE NAT KEY METRICS ARE>

<WHAT ITS PERFORMANCE SHOULD BE>

Our goal is to develop a working prototype of software defined carrier-grade network address translator (SD CG-NAT). To make sure that our SD CG-NAT is close to reality in terms of performance it is necessary to define the performance metrics and set their values. In order to get those metrics, a couple of sources are used. The first one is Rostelecom technical requirements to CG-NAT [ref\_TT\_ROS\_TEL]. The second one is the performance specification claimed by one of the on-market available NAT device producers[ref\_RDP.RU] which employ the same approach as this research does: **to use not task specific computer (a commodity server) to make a network specific solution using a mix of algorithmic and technological approaches. (our\_approach)**

<WHAT ARE THE NAT KEY METRICS>

The key characteristics are:

* ***Packets processing rate*** – (packets per second [PPS]) – the router’s maximum rate of packet processing. This is the main metric describing the packet processing abilities of a NAT device.
* ***Concurrent session support*** *–* (number) – the maximum number of sessions produced by served network. It describes the maximum network size which can be served by the NAT device. As described later in this document than bigger the network than harder to maintain translations to its nodes.
* ***Connections setups rate*** – (connection setups per second [csps]) the number of new NAT records to be created in a second. This metric shows the NAT ability to create new NAT records and could be a drawback of the NAT device in a certain modes of network work like when the networks nodes start creating of new connections actively, for example in the beginning working hours
* ***Throughput – (***bit per second[bps]***) –*** it isn’t very clear metric of the NAT device because it is mostly defined with NIC (network interface card) performance used by NAT device. If the NAT device won’t have enough of packet processing rate its throughput can’t achieve the maximum throughput provided with NIC and vice versa. The main sense of having it in the metric list is to make sure that NAT device is able to transfer needed amount of information.

<WHAT ARE THE METRICS VALUES>

Based on the sources of information the performance requirements of the NAT device are set following:

1. Packet processing rate: > 5.5 Mpps
2. Concurrent session support: 65.5M (a B-class network with 1000 ports to each node)
3. Connection setups rate: > 3 Mcsps
4. Throughput: > 10 Gbps

<OUR NAT>

1. What the NAT should do (RFC tra-la-la)

2. What is the core functionality (CHECK SUM etc.)

3. What to achieve - target characteristics - rostelecom, rdp.ru

4. How to achieve - what is the main problem - the main problem is lookup data structure

5. Plan on what to test: linear, tree, tree-array, rb-tree(balanced) array, hash, parallel

6. Test program description (what is the bottle neck, what does it do, how much does it cost)

7. Performance comparison (packets per second, memory usage, limitation)

7.1 Base line

7.2 Linear

7.3 Tree

7.3.1 Tree-tree

7.3.2 Tree - plain array

7.3.3 RB-tree - plain array

7.4 Hash+array

7.5 Parallel hash+array

7.5.1 Size

7.5.2 Cores

8. Summary

**REFERENCES**

[ref\_TT\_ROS\_TEL] file:TT CGNAT 2014\_26\_06v1.doc

[ref\_RDP.RU] http://rdp.ru/