Lehrstuhl für Netzarchitekturen und Netzdienste
Fakultät für Informatik
Technische Universität München

Antrittsvortrag zur Bachelor arbeit

Leistungsanalyse der Funktionen von Middleboxes

Name:	Simon **Sternsdorf**
Betreuer:	Florian Wohlfart
Aufgabensteller:	Prof. Dr.-Ing. Georg Carle
Beginn:	04/2017
Ende:	08/2017

Topic

In this Bachelor's Thesis we test different implementations of middleboxes. We will set up different middleboxes in our testbed and then measure the performance of packet-processing. Our advanced goal is to identify different bottlenecks in modern middlebox implementations. As a common middlebox we will quantify NAT-boxes.

The intended field of application is very broad. NAT-Boxes are used in big ISP networks as well as in home-routers. ISPs often use middleboxes in their setups to cache or even modify user data. End-user routers mostly use NAT to give all devices in their network an private IP address as IPv4 addresses are expensive and most End-users only get one from their provider. NAT-boxes also play an important role in cellular networks, where ISPs use them to give private IP addresses to mobile devices.

We want to understand what really influences performance of middleboxes. We will try to look at different common implementations of middleboxes to identify software or hardware parts that affect the performance. Our goal is to make general applicable statements about performance of middleboxes.

Approach

First we will research good implementations of middleboxes, for example iptables. We will implement up to two middlebox variants in our testbed.

Then we will use Moongen, a high-speed packet generator, on a second server to produce and send traffic to our middlebox. Afterwards we will measure and quantify the traffic that comes back from our test subject. Here we will experiment with different packet sizes, Ipv4 vs IPv6, different ports, IP addresses and more. Simultaneously, we will measure benchmark data from the middlebox.We aim to measure the packet rate at which the middlebox can process the packets, the power consumption of the server under maximum load, the RAM usage or the Latency.

To make these tests replicable we will automate the procedure completely with different shell and python scripts. The goal here would be to have a script with different input parameters. This way we can get reproducible results.

We will then evaluate the data. Our goal here is to find a correlation between different benchmark data and the performance of our middlebox. A secondary goal would be to find the right models to explain our results.

Previous work

The thesis is thematically similar to the Bachelor's Thesis *A Model for Performance Prediction in PC-based Packet Processing Systems* [1] by Dominik Scholz. He tested the general performance of the Linux Network Stack and generated a performance prediction model for some use cases. He did not directly test middlebox implementations and especially no NAT implementations. So we can follow up his thesis and use similar methods to test middleboxes in our testbed.

To help use with the implemenation of the middlebox we can use different APIs for modular development of middleboxes. An example would be mOS, described in *mOS: A Reusable Networking Stack for Flow Monitoring Middleboxes* [2]. Such an reusable networking stack will be useful when setting up different middleboxes in the testbed.

If we want to use a middlebox with deep packet inspection BlindBox might come in handy, described in *BlindBox: Deep Packet Inspection over Encrypted Traffic* [3].

Time Management

Tasks	**Start Date**	**End Date**
Research about middlebox implementations, induction in the testbed	15-April	15-May
Testing of middlebox implementations, data collection	15-May	15-June
Evaluate the data, find models for characteristic effects	1-June	1-July
Write the thesis and print it	1-July	15-August

Literatur

[1] D. Scholz, "A model for performance prediction in pc-based packet processing systems," 2014.

[2] Y. M. Muhammad Jamshed and D. Kim, "mos: A reusable networking stack for flow monitoring middleboxes."

[3] C. L. Justine Sherry and R. A. Popa, "Blindbox: Deep packet inspection over encrypted traffic," 2015.