



BACHELOR/MASTER THESIS

Extending TTCN-3 for NFV Service Chain Profiling

Background

One of the key concepts behind the next generation of networks (5G) is called network function virtualization (NFV). The idea behind this concept is to transform network functions, like intrusion detection systems, which were usually deployed as physical boxes into software components that can be executed in virtual machines. With this, complex network services which are composed of a set of virtualized network functions (VNFs) can be easily deployed on-demand in a very agile way.

However, such complex software systems need to be tested. Besides functional and integration tests, service developers and operators are also interested in the performance behavior of the virtualized service under different resource configurations, e.g., different number of available CPU cores. To collect such information, a single function or the entire service is instantiated and its performance is measured under different resource configurations. We call this NFV service profiling [3].

Setting up such profiling experiments has been a manual, time-consuming task in the past but should be fully automated for future use in very agile environments of 5G networks, e.g., in a network service DevOps pipeline. To achieve this, our group develops a service chain profiling prototype that can be used to automatically profile complex service chains on different target platforms [4]. However, the prototype's approach to initially describe the profiling experiments is still limited and not aligned to industry-standard testing languages, like TTCN-3 [2].

scalable and can be done as bachelor or as master thesis. Please talk to me to define the details.

Milestones

- Detailed investigation of the TTCN-3 standard, its extensibility, and available tooling
- Definition of requirements for a flexible profiling description language based on the lessons learned in [4] and your own ideas
- Design of a TTCN-3-based profiling description language and implementation of the corresponding TTCN-3 test suite
- Prototype implementation of the needed TTCN-3 test adapters to combine your description approach with our existing profiling prototype
- Practical evaluation of your description approach using a set of profiling experiments
- Detailed documentation of your TTCN-3 NFV profiling test suite

Required knowledge (or willing to learn)

- Good programming skills (e.g. Python, Java)
- Basic knowledge about testing
- Knowledge about virtualization, networks, and container technologies are a plus



Thesis Goals

The goal of this thesis is to design and implement a TTCN-3-based [2] description approach for NFV service chain profiling experiments. Besides the description language as such, the candidate has to develop the supporting modules (e.g. TTCN-3 adapters) to combine the description approach with our existing profiling prototype. Finally, the resulting description language needs to be well documented to be able to re-use it in a European research project called 5G TANGO [1]. The topic is

References

- [1] 5G-Tango Project. 5G Development and Validation Platform for Global Industry-Specific Network Services and Apps, 2017. Online at: <http://www.5gtango.eu>.
- [2] ETSI. Testing and test control notation version 3 (TTCN-3), 2017. Online at: <http://www.ttcn-3.org>.
- [3] M. Peuster and H. Karl. Understand Your Chains: Towards Performance Profile-based Network Service Management. In *5th European Workshop on Software Defined Networks (EWSDN'16)*, 2016.
- [4] M. Peuster and H. Karl. Profile Your Chains, Not Functions: Automated Network Service Profiling in DevOps Environments. In *Network Function Virtualization and Software Defined Networks (NFV-SDN), IEEE Conference on*. IEEE, 2017. Preprint at: <https://goo.gl/gfJvPZ>.