Software-Defined Security via P4-based Solution

25/03/2020

Description

Software-Defined Networking (SDN), along with Software-Defined Security (SDS) [1], essentially relying on software-based approaches, allow to significantly reduce the need to have dedicated hardware devices by introducing virtualized devices and APIs to process and control network traffic. The P4 [2] programming language is potentially becoming a disruptive instrument [3] enabling the programming and customizing of the data plane of next-generation SDN/NFV-based mobile networks. It can be considered as an interface between a SDN controller and networking devices, such as routers or switches, introducing the ability program the devices following the controller's requirements, rather than to be constrained by a prefixed traditional switch design.

Preliminary results [3] demonstrate P4's capability in early vulnerability detection. Although it is still unclear how it would fundamentally impact the global landscape of network security, and how it can help improve SDS management. This internship involves adding a brick connecting P4 and SDS using the Montimage Monitoring Tool (MMT) [4]. MMT is a high-performance monitoring solution providing a real-time visibility of network traffic. It consists of data capture, filtering and storage, events extraction, statistics collection, traffic analysis and reporting.

– **Mission:**

As a software engineer intern, you will work on the MOSAICO project to tackle challenging but fascinating problems of network security in a virtualized environment. MOSAICO (`https://www.mosaico-project.org`) is a research project financed in part by the ANR research agency in France. It is a collaborative project lead by Orange (Lannion) and incliding the UTT (Technological University of Troyes) and LORIA (INRIA Nancy). In particular, you will first need to study the current state-of-the-art of P4-based network security to be able to consequently propose a communication model between P4-based devices and MMT. You will then enforce the model for the attack detection and prevention applying it to high-bandwidth network traffic. The experiments will be conducted on virtual switches and eventually on physical ones, such as, NetFPGA SUME.

– **Required knowledge:**

Network Security and Cloud&Virtualization Computing basics.
Fast learner, seeking constant self-improvement.
Hands on. Passionate. Persistent. Independent. Creative.
Fluent in English.

Other information

– **Location:** The internship will be located at Telecom SudParis and at the company Montimage's premises, located in Paris 13.
– **Duration:** The internship will start April 15, 2020 and last 4 months.
– **Retribution:** The intern will receive a retribution of 600€ net per month.
– **How to apply:** Please send your CV and a motivation letter to `ana.cavalli@telecom-sudparis.eu`.

References

[1] M. Al-Zewairi, D. Suleiman, and S. Almajali, "An experimental Software Defined Security controller for Software Defined Network," in *International Conference on Software Defined Systems*, 2017, pp. 32–36.

[2] P. Bosshart, D. Daly, G. Gibb, M. Izzard, N. McKeown, *et al.*, "P4: Programming Protocol-Independent Packet Processors," *Computer Communication Review*, vol. 44, no. 3, pp. 87–95, 2014.

[3] F. Paolucci, F. Civerchia, A. Sgambelluri, A. Giorgetti, F. Cugini, *et al.*, "P4 Edge Node Enabling Stateful Traffic Engineering And Cyber Security," *Journal of Optical Communications and Networking*, vol. 11, no. 1, A84–A95, 2019.

[4] B. Wehbi, E. Montes De Oca, and M. Bourdellès, "Events-Based Security Monitoring Using MMT Tool," in *Conference on Software Testing, Verification and Validation*, 2012, pp. 860–863.