Exercise for Lecture Software Defined Networking

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Contact: Please use the Moodle forum to post questions and remarks on the exercise.
Web: `http://www.ps.tu-darmstadt.de/teaching/ws1617/sdn/`
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Problem 3.1 - SDN Relatives to OpenFlow

a) Name three concrete implementations/instantiations of the SDN concept, other than OpenFlow and ForCES.

b) The Forwarding and Control Element Separation (ForCES) Framework was standardized by the IETF in 2004 (RFC 3746). Please revisit the concepts presented in the lecture on ForCES by reading Section 1 and 2 of the standard document and answer the following questions. RFC 3746: https://tools.ietf.org/html/rfc3746

I) Explain the responsibilities of Control Elememts (CEs) and Forwarding Elements (FEs) in ForCES.

II) What does the standard state as reason for the separation between FEs and CEs?

Problem 3.2 - The OpenFlow Protocol

For the following questions you have to use the official OpenFlow specifications. You are not intended to read the whole documents! Get familiar with their structure and use them to look up details. Knowing how to navigate and find details within the specifications is essential for several later tasks and the lab. If we do not specify the version to be used, we assume version v1.5.0 in the following.
Relevant OpenFlow Specifications for this task:

- v1.5.0: `https://goo.gl/VDxZN2`

Besides, we recommend the following webpage that can help to investigate differences between versions of the OpenFlow protocol etc.: `http://flowgrammable.org/sdn/openflow/`

a) OpenFlow v1.5.0 introduces the possibility of TCP flag matching. Name some examples what this new feature could be used for and sketch how the solution would work and what other OpenFlow features it might require/use.

b) Shortly explain the different steps of packet processing inside an OpenFlow Switch with multiple flow tables and in the context of *Pipeline Processing*.

Problem 3.3 - Flow Spaces

a) Flow Space Analysis

Flow spaces can be visualized in a multidimensional space. Fill in the flow spaces corresponding to the given flow rules of the table. Note the number of the corresponding rule next to the corresponding figure.

Number	Source IP	Destination IP
1.	10.10.2.1	10.10.2.1
2.	10.10.2.1	130.83.1.*
3.	*	192.168.55.76
4.	130.83.*	130.83.1.*