Software defined networks (SDN) have made data traffic routing a lot more convenient. The functionality of the additional controller can be used e.g. for detecting network threats like DoS or also for load balancing by redirecting data traffic. The initial idea of SDNs is that each time a new packet enters the network the packet is first forwarded to the controller to be checked. The controller then decides on which route the packet shall be send inside the network or tells the network to drop the packet, for instance if it is a threat. Each of the switches then save this information in their match-action tables. However, this model cannot scale in large networks with thousands or even millions of different packets trafficking, since that would lead to an additional latency, if every single packet needs to be sent to the controller.

Therefore, a promising solution to improve the model is to include a Machine Learning algorithm into the process. Specifically, Decision Trees (DT) and Random Forests (RF) can be used to do this line-rate classification. Since Decision Trees do not require complex mathematical operations, they can be easily deployed into the programmable switches using P4 language. Either a per-packet or a per-flow approach, each with its advantages and its drawbacks, will automate the decision of the switch of how to handle the incoming traffic instead of always forwarding it first to the controller.

In this master thesis a realisation of a DT into the P4 switches will be tested. First a functioning DT based on a real data traffic dataset will be implemented. Both variations (per-packet/per-flow) will be taken into consideration. The second step will be to translate the algorithm into the P4 switches. Afterwards the prediction performance will be analysed. The final step will be to compare the ML approach to the non-ML approach and draw conclusions on the results.

**Prerequisites**

- Machine Learning
- Python and P4 programming
- Knowledge of Software-Defined Networking

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