Universität Paderborn — Fakultät EIM
Fachgebiet Rechnernetze
http://www.upb.de/cs/cn/

Bachelor Thesis

Enhancing flexible reassignment of flow processing-aware controllers by using traffic load prediction

Background

Modern cellular networks deployments are generally very dense and heterogeneous to cope with the consistently growing traffic demands in mobile networks. Managing such networks imposes several challenges. In addition, network mechanisms inducing *data flows* in the network become more and more relevant. Considering both of these aspects, recent work [1] describes a flow processing-aware controller placement framework (FCPF) with controller devices that are able to perform both network control and data flow processing, extending the promising Software-Defined Networking (SDN) approach, for an efficient management of future wireless networks.

But as the traffic load of a mobile network can change very quickly, the performance of a static one-time placement will generally become worse over time. Especially in modern dense and crowded networks, many data flows appear and expire every second. As a result, the controller placement has to be modified over time. And to reduce reconfiguration overhead, such a reassignment should take into account the previous placement. A solution to this is *FlexFCPF* [2], a framework performing flexible controller reassignment based on the existing controller placement.

Traffic prediction: FlexFCPF as described in [2] works based on live monitoring of the given network, i.e. only reacts to traffic changes after they happen. However, an alternate approach could be to predict traffic changes and reacting to such forecasts with a more robust controller placement that can cope with traffic changes almost instantaneously.

Thesis

The main goal of the thesis is to design, implement and evaluate a prediction model for traffic changes and to extend FlexFCPF to take these predictions into account for placement decisions. In addition, the current FlexFCPF model will need to be extended by a notion for delay/lateness in order to compare the obtained results with the already existing approach without prediction.

The author of the thesis will need to familiarize him-/herself with different concepts for traffic load prediction (e.g. Bui et al. [3]) as well as with the existing work about flow processing-aware controller placement. As all previous work has been implemented using Python, using Python for the implementation stage of the thesis is strongly preferrable.

Required knowledge (or willing to learn):

- Concepts of traffic load prediction methods
- Understanding of computer networks
- Basic Python programming skills

References

[1] S. Auroux and H. Karl, “Efficient flow processing-aware controller placement in future wireless networks,” in *Proceedings of IEEE Wireless Communications and NetworkingConference (WCNC)*, 2015.

[2] ——, “Flexible reassignment of flow processing-aware controllers in future wireless networks,” in *Personal, Indoor, and Mobile Radio Communications (PIMRC), 2015 IEEE 26th Annual International Symposium on*. IEEE, 2015.

[3] N. Bui, F. Michelinakis, and J. Widmer, “A model for throughput prediction for mobile users,” in *European Wireless 2014; 20th European Wireless Conference; Proceedings of*. VDE, 2014, pp. 1–6.

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