Chair of Network Architectures and Services
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Thesis B.Sc. | Thesis M.Sc. | Guided Research

Performance Guarantees for Wireless Links: Validation using Measurements

Motivation

Performance evaluation and guarantees are an important part in some use-cases like real-time communications. Network calculus is a mathematical framework created for giving guarantees on end-to-end latency of packets and buffer sizes, which enables engineers to design networks with hard real-time requirements. One real-world application of this approach is aeronautical applications, where the fly-by-wire network of the Airbus A380 and A350 has been validated using network calculus.
In this thesis we want to study wireless links using this method. The main goal is to validate and extend exiting theoretical work with real-world measurements and new traffic models. Since wireless links may be lossy, retransmission mechanisms are often used which generating potential delays for packets. As a result, stochastic models have been created in order to predict those delays and give guarantees [1, 2].
The focus of this thesis is on setting up automation and measurements to validate and extend those models using reproducible experiments.

Your Task

- Setup reproducible measurements of the performance of wireless links such as WiFi
- Evaluate those measurements against stochastic network calculus models
- Extend models and measurements to more advanced use-cases such as evaluation of security mechanisms

Knowledge about probability theory, protocols for packet retransmission, wireless channel modeling and setup of measurements are recommended but not required.

References

[1] H. Wang, J. Schmitt, and F. Ciucu, “Performance modelling and analysis of unreliable links with retransmissions using network calculus,” in *Proceedings of the 25th International Teletraffic Congress (ITC 25)*, Sep. 2013.

[2] D.-K. Dang and A. Mifdaoui, “Stochastic delay analysis of a wireless safety-critical avionics network,” in *Proceedings of the 10th IEEE International Symposium on Industrial Embedded Systems*, ser. SIES 2015. IEEE, jun 2015.

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