Software Modeling and Verification Chair

RWTH AACHEN UNIVERSITY

— Master's Thesis —

Investigating Security-related Trees in Storm

What is it all about? Fault trees along with many dynamic extensions are an industry standard for dependability analysis. As dynamic extensions of fault trees are amenable to analysis by a translation into continuous-time Markov chains, probabilistic model checking comes into the picture. The probabilistic model checker Storm developed at i2 chair is by far an accurate and fastest analysis tool available for dynamic fault tree analysis. Since their inception, fault trees have found significant attention in a (not so) parallel universe namely security-related applications. We are interested in the quantitative analysis of security-related trees (attack trees and variants thereof) using probabilistic model checking. In particular, we intend to develop support for security-related fault trees in Storm and thus contribute to the state of the art. To get an impression of the topic, see e.g., [JLM16, KMRS14, AP16].

What is to be done? There are four parts of this work:

1. what kind of quantitative security properties are typically checked on attack trees?,
2. can these properties be cast as probabilistic model-checking queries?,
3. what are existing tools?,
4. is there a potential to be competitive with using Storm?

Requirements

- High motivation to work on the topics of dependability reliability and security.
- Motivated enough to do work with different tools especially when things does not seem to progress.
- Familiarity with topics: model checking, Petri nets, Python. **The Most important trait to complete this thesis is a motivation to work hard to see results.**

What you can expect

- A work place in our student room.
- Access to our coffee machine.
- We will work together towards advancement of this interesting topic.

Contact

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References

[AP16] Maxime Audinot and Sophie Pinchinat, On the soundness of attack trees, International Workshop on Graphical Models for Security, Springer, 2016, pp. 25–38.

[JLM16] Ravi Jhawar, Karim Lounis, and Sjouke Mauw, A stochastic framework for quantitative analysis of attack-defense trees, STM, Lecture Notes in Computer Science, vol. 9871, Springer, 2016, pp. 138–153.

[KMRS14] Barbara Kordy, Sjouke Mauw, Sasa Radomirovic, and Patrick Schweitzer, Attack-defense trees, J. Log. Comput. **24** (2014), no. 1, 55–87.