Assignment

for the project seminar:
Online Monitoring of Complex Conditions for Event-based Distributed Architectures

Lucas Sakizloglou

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Introduction

The goals of the assignment is to i) practice the formulation of properties for online monitoring ii) get familiar with relevant tools and iii) understand factors that impact performance. We will examine two use-cases, that is, two application scenarios where certain conditions are checked during the application execution. Executions will be provided in the form of logs. Checking is to be carried out by two tools: DejaVu [2, 3] MonPoly [1, 5].

Tasks

For each use-case the assignment comprises these tasks:

- Formulate the properties of each use-case in the specification language of each tool (regarding QTL, when applicable)

- Derive the event types

- Check the property against the given log

- Use the tools' output to measure the computation time and consumed memory

Present the results together with your commentary in both the report and the final presentation of the project seminar.

Use-cases

The first use-case scenario and data is based on a real-world data-collection campaign (cf. [1]). The campaign collected contextual information from cell phones of participants.

Use-Case 1 (Nokia's Data-collection Campaign) *The data collected by a participant's phone is propagated into databases. For privacy reasons, data has first to be anonymized before it can be seen by the Nokia analytics department. Also users can*

delete their own data but deletions have to propagated in all databases. Data dele-tion/propagation is done by scripts.

Below the desired conditions:

script2 Only the script *script2* may delete data in db2

insert Data uploaded by the phone into db1 must be inserted into db2 within 30 hours after the upload, unless it has been deleted from db1 in the meantime.

delete Data may be deleted from db3 iff it has been deleted from db2 within the last minute.

The second use-case is based on the vision of smart medical environments where medical guidelines are carried out by smart medical devices, such as pumps. All of the taken actions are logged at a central authority. Online monitoring could be used to check all the logged actions for any violations. The use-case is based on a real-world medical guideline [4].

Use-Case 2 (Smart Medical Environment) *If a patient is scheduled for an infective endocarditis procedure, an antibiotic for prophylaxis should be administered by a smart pump before the procedure. If the antibiotic is not administered before the procedure, it may be administered up to 2 hours after the procedure. However, administration of the antibiotic after the procedure should be considered only when the patient did not receive the pre-procedure dose.*

Below the desired conditions:

before If a patient is scheduled for a procedure, an antibiotic for prophylaxis should be administed by a smart pump before the procedure.

2hrs If the antibiotic is not administered before the procedure, it may be admin-istered up to 2 hours after the procedure. However, administration of the antibiotic after the procedure should be considered only when the patient did not receive the pre-procedure dose.

For this use-case, a number of executions are provided. In these executions, the number of patients/procedures varies.

References

[1] David A. Basin, Felix Klaedtke, and Eugen Zalinescu. "The MonPoly Moni-toring Tool". In: *RV-CuBES 2017. An International Workshop on Competitions, Usability, Benchmarks, Evaluation, and Standardisation for Runtime Verifica-tion Tools, September 15, 2017, Seattle, WA, USA*. Ed. by Giles Reger and Klaus Havelund. Vol. 3. Kalpa Publications in Computing. EasyChair, 2017, pp. 19–28. URL: http://www.easychair.org/publications/paper/62MC.

[2] Klaus Havelund. *DejaVu*. [Online; accessed: 2019-05-17]. 2019. URL: https://github.com/havelund/dejavu.

[3]   Klaus Havelund, Doron Peled, and Dogan Ulus. "DejaVu: A Monitoring Tool for First-Order Temporal Logic". In: *3rd Workshop on Monitoring and Testing of Cyber-Physical Systems, MT@CPSWeek 2018, Porto, Portugal, April 10, 2018*. IEEE, 2018, pp. 12–13. ISBN: 978-1-5386-6748-4. DOI: `10.1109/MT-CPS.2018.00013`. URL: `https://doi.org/10.1109/MT-CPS.2018.00013`.

[4]   Walter Wilson et al. "Prevention of Infective Endocarditis". In: *Circulation* 116.15 (2007), pp. 1736–1754. DOI: `10.1161/CIRCULATIONAHA.106.183095`.

[5]   Eugen Zalinescu. *MonPoly*. [Online; accessed: 2019-05-17]. 2019. URL: `https://sourceforge.net/projects/monpoly/`.