chist-era SUCCESS

D2.2: Tool set

Grant Agreement:	N/A
Project Acronym:	SUCCESS
Project Name:	SecUre aCCESSibility for the internet of things
Instrument:	CHIST-ERA Call 2015
Thematic Priority:	SPTIoT
Start Date:	1 December 2016
Duration:	36 months
Document Type[1]:	T (Technical Report)
Document Distribution[2]:	CO (Confidential)
Document Code[3]:	SUCCESS-UGA-PR-001
Version:	v1.0
Editor (Partner):	M. Bozga (UGA)
Contributors:	M. Bozga, F. Kammüller, Ioana-Domnina Cristescu
Workpackage(s):	WP2
Reviewer(s):	F. Kammüller (MU)
Due Date:	Month 36
Submission Date:	Nov 2019
Number of Pages:	7

Funded by EPSRC Engineering and Physical Sciences Research Council, ANR, NWO Netherlands Organisation for Scientific Research

[1]MD = management document; TR = technical report; D = deliverable; P = published paper; CD = communication/dissemination.
[2]PU = Public; PP = Restricted to other programme participants (including the Commission Services); RE = Restricted to a group specified by the consortium (including the Commission Services); CO = Confidential, only for members of the consortium (including the Commission Services).
[3]This code is constructed as described in the H2020 Project Handbook.

D2.2: Tool set

M. Bozga[1]

[1]UGA

REVISION HISTORY

Date	Version	Author	Modification
17.1.2020	1.0	F. Kammüller	Started the document
20.1.2020	1.1	M. Bozga	Draft presentation of the toolset
27.1.2020	1.	F. Kammüller	Approval

APPROVALS

Role	Name	Partner	Date
Project Manager	F. Kammüller	MU	27.1.2020

Contents

1 Executive Summary

This is the toolset description.

2 Tool Set

The main components of the SUCCESS toolset and their interaction flow are depicted in Fig. 2.1. The boxes and arrows depicted with a solid red border denote respectively formalisms, tools and connections completely developed in the frame of the SUCCESS project. The boxes depicted with dashed red border denote partial development / extensions in the frame of the project.

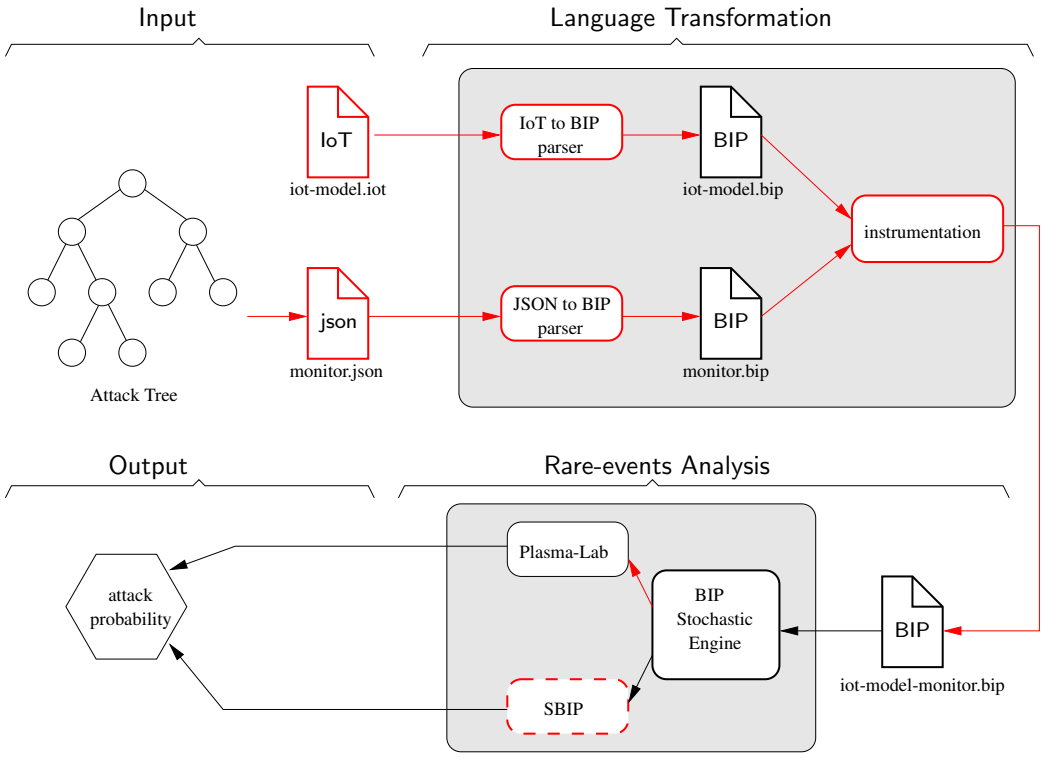

Figure 2.1: SUCCESS Tool Set and Workflow

The toolset uses Stochastic BIP [5] as the common language for model representation and tool integration. The toolset provides frontend components for translating domain-specific representation of the inputs into BIP. First, the IoT model proposed in [2, 1] is structurally translated into a composition of BIP components. Second, the JSON representation of attack trees is translated into one BIP monitor component. The two BIP models are glued together into one instrumented BIP model, representing both the IoT system under analysis and the monitor generated from the attack tree.

The instrumented BIP model is used for stochastic analysis using either the Plasma-Lab tool [3] or the *S*BIP tool [4]. Both tools are using the Stochastic Real-Time BIP Engine [5] for generating random execution traces on the instrumented model. The intermediate results obtained on these traces are then aggregated using the rare-events algorithms of respectively Plasma-Lab and *S*BIP in order to obtain the global verdict, namely the probability of an successful attack of the IoT model.

3 Conclusion

Bibliography

[1] D. Beaulaton, I. Cristescu, A. Legay, and J. Quilbeuf. A modeling language for security threats of iot systems. In F. Howar and J. Barnat, editors, *Formal Methods for Industrial Critical Systems*, pages 258–268, Cham, 2018. Springer International Publishing.

[2] D. Beaulaton, N. B. Said, I. Cristescu, and S. Sadou. Security analysis of iot systems using attack trees. In M. Albanese, R. Horne, and C. W. Probst, editors, *Graphical Models for Security - 6th International Workshop, GraMSec@CSF 2019, Hoboken, NJ, USA, June 24, 2019, Revised Papers*, volume 11720 of *Lecture Notes in Computer Science*, pages 68–94. Springer, 2019.

[3] B. Boyer, K. Corre, A. Legay, and S. Sedwards. Plasma-lab: A flexible, distributable statistical model checking library. In K. Joshi, M. Siegle, M. Stoelinga, and P. R. D'Argenio, editors, *Quantitative Evaluation of Systems*, pages 160–164, Berlin, Heidelberg, 2013. Springer Berlin Heidelberg.

[4] B. L. Mediouni, A. Nouri, M. Bozga, M. Dellabani, A. Legay, and S. Bensalem. *S* BIP 2.0: Statistical model checking stochastic real-time systems. In S. K. Lahiri and C. Wang, editors, *Automated Technology for Verification and Analysis - 16th International Symposium, ATVA 2018, Los Angeles, CA, USA, October 7-10, 2018, Proceedings*, volume 11138 of *Lecture Notes in Computer Science*, pages 536–542. Springer, 2018.

[5] A. Nouri, B. L. Mediouni, M. Bozga, J. Combaz, S. Bensalem, and A. Legay. Performance evaluation of stochastic real-time systems with the SBIP framework. *IJCCBS*, 8(3/4):340–370, 2018.