IOWA STATE UNIVERSITY
Department of Electrical and Computer Engineering
July 31, 2020

Summer Engagement in Cyber Undergraduate Research Experiences (SECURE)

Marcella Anderson, Muhamed Stilic, Dr. Kristin Rozier, Megan Ryan

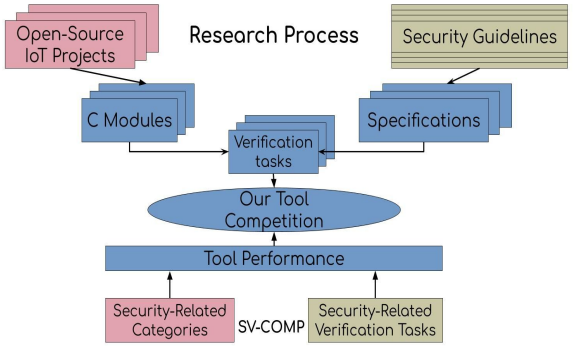
IoT Security Through Formal Methods

Problem:

IoT devices are increasingly becoming part of the average household, and often do not have the level of security we expect from them.

Solution:

Use formal methods to create a security framework that IoT developers can use in the future.



Keywords:

- **Formal Methods**: Techniques used to model complex systems and analyze them for possible errors.
  Tools: DAFNY, Z3, and Alloy
- **IoT**: The "Internet of Things" device has a sensor/actuator and network connection. Communication is done from a hub or app through the network.
- **Verification Task**: C program and a specification.
- **Verification Tools**: Tools that test software and hardware with each individual task.
- **Benchexec**: Program used in SV-COMP to measure and test Verification Tools.

IoT Devices

Door Locks: IoT Device that has an actuator (motor) to open the lock. The door lock communicates through a mobile app by bluetooth connection.

Security Cameras: The Camera will be the sensor, then, it will send the information online via Wi-Fi to an app or hub.

Thermostats: Uses HVAC(Heating Cooling and Air Conditioning) systems to control the temperature through wires. Receives information online from apps and hubs.



SV-COMP

- Competition held every year for testing out Verification Tools.
- Runs tasks from C and Java
- Verifies programs based on set properties like memory and unreachable functions.
- To test the tasks. It is run through a verifier and then to a witness validator for final inspection.

ETAPS
EUROPEAN JOINT CONFERENCES ON THEORY & PRACTICE OF SOFTWARE

Evaluation Metrics:

- CPU time measured by Sosy-Lab's BenchExec tool.
- Accuracy of the tool's verification software using verification tasks.
- Scored based on SV-COMP system which punishes inaccuracy.

SoSy-Lab
Software Systems

Conclusions

We have created a couple of tasks and have tested out our verification tools. We need a bit more time until we have our own security tasks ready for SV-COMP. This project is not complete but is continuing next semester.

This material is based upon work supported by the National Science Foundation (NSF) under awards DGE-1303279 and EEC-1565130. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the NSF.