SSF Octopi Project

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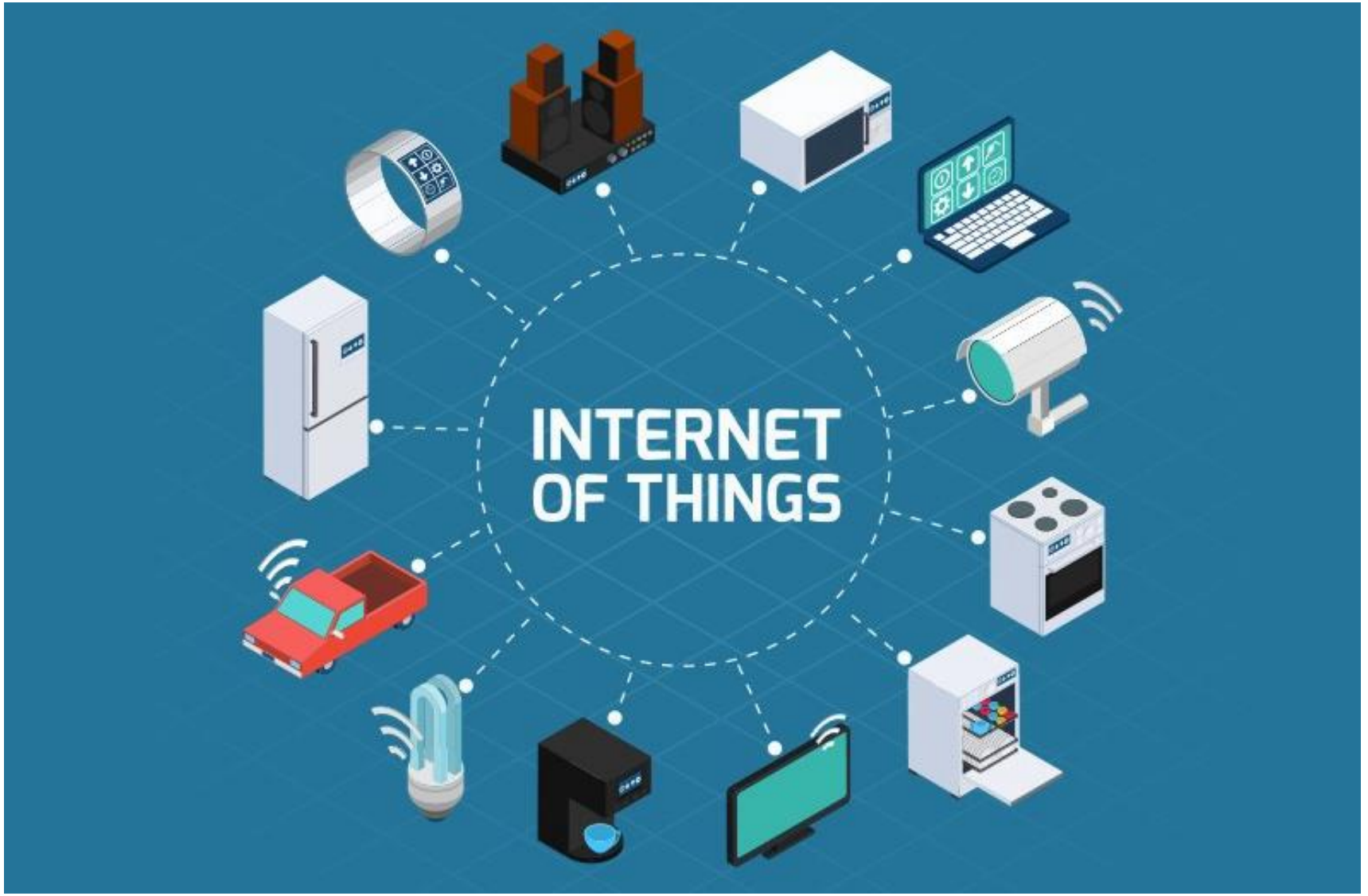
IoT is here!



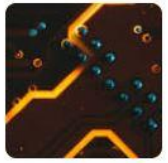
IoT Security

PortSwigger

Majority of consumer IoT vendors still lack vulnerability disclosure programs – report

Researchers from UK IoT security firm Copper Horse found that only 21.6% of companies marketing consumer IoT devices appear to have a...

2 weeks ago



ZDNet

The IoT is getting a lot bigger, but security is still getting left behind

Four in five Internet of Things device vendors don't provide any information on how to disclose security vulnerabilities. That means problems...

2 weeks ago

IoT For All

5 IoT Security Challenges That Keep CISOs up at Night

Whether it's a connected IoT healthcare system, a supply chain, or a fleet, vulnerabilities can put any major IoT operation at risk. CISOs...

2 weeks ago

IoT For All

Why Securing Your IoT Device Has Never Been More Important

Security Breaches Can Cause Severe Financial, Reputational, and Brand Damage ... Most IoT products are developed with ease of use and connectivity...

2 weeks ago

IoT For All

Why Credentials Are the Achilles Heel of IoT Security

In addition, the use of default passwords also opened the manufacturer up to vulnerabilities—for example, bad actors could hijack the...

5 days ago

ZDNet

These cybersecurity vulnerabilities could leave millions of connected medical devices open to attack

... been to showcase the vulnerabilities in older devices and to push for connected devices to be built with IoT security in mind – and to...

1 week ago

AiThority.com

Top IoT Security Trends to Secure Your Smart Home Assistants

If any device, location, or transmission throughout the smart home ecosystem has a security vulnerability, then it can create a wide variety of...

3 weeks ago

Threatpost

Millions of Routers, IoT Devices at Risk from BotenaGo Malware

Join thousands of people who receive the latest breaking cybersecurity news every day. Subscribe now. Twitter. A security vulnerability in @...

4 days ago

TDWI

How to Address 6 Security Weak Spots in Your IoT Armor ...

One huge challenge facing hardware is the inherent vulnerabilities within processors exploited to carry out attacks by injecting malicious code...

3 weeks ago

Root problems

I. Lack of security expertise
II. Low-level programming languages
III. No system-wide control

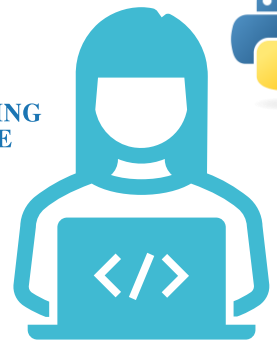
IoT Zoo


Zephyr™


freeRTOS


CONTIKI
NEXT GENERATION


THE
C
PROGRAMMING
LANGUAGE




python™


RIOT


Tock


The Rust
Programming
Language


GRiSP

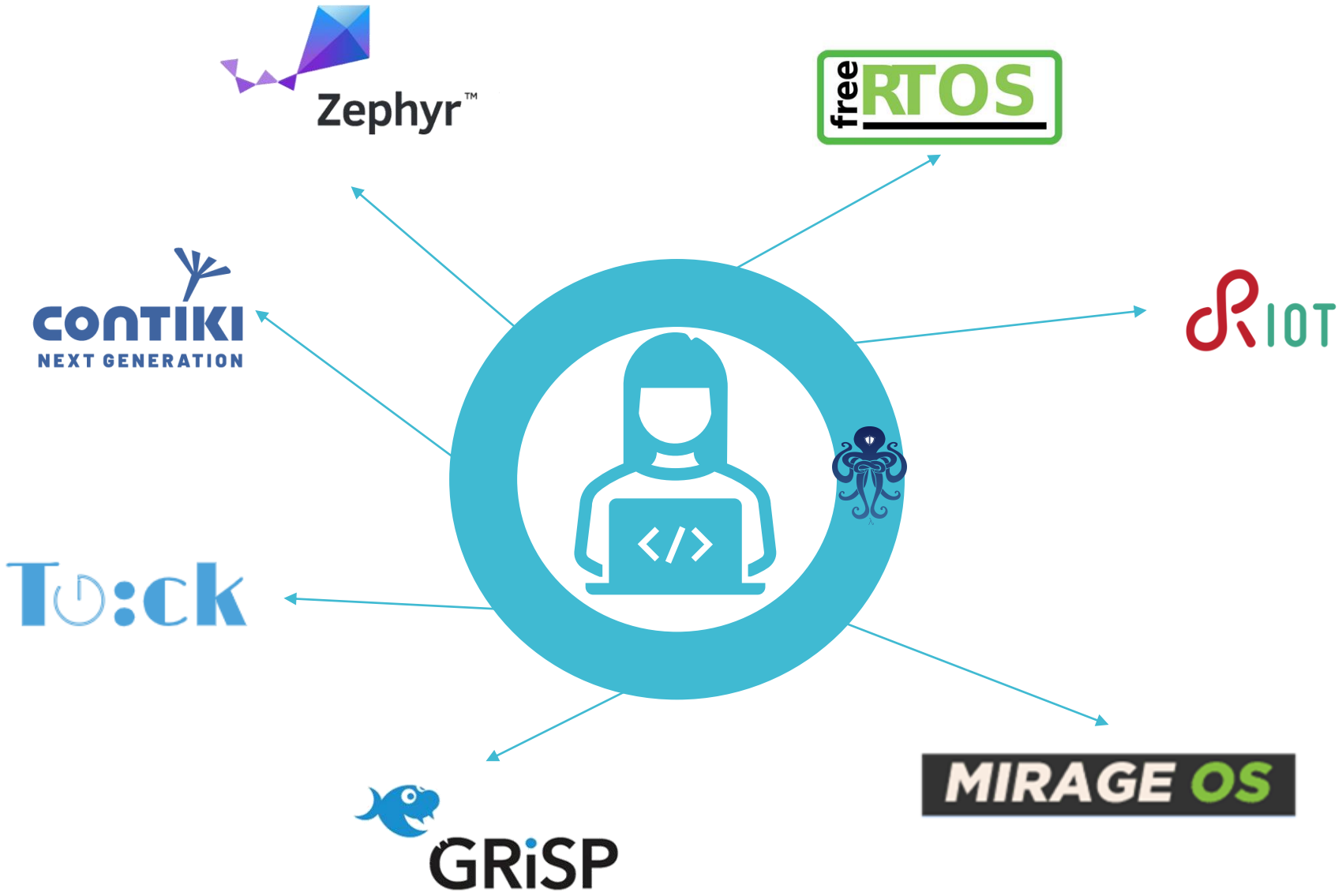

MIRAGE OS

Goal:
Security-by-Design

To develop technology for securely programming IoT systems

A technology that can be used by developers on their daily activities: *programming languages*

IoT Zoo


Zephyr™
freeRTOS
CONTIKI
NEXT GENERATION
RIOT
Tock
GRiSP
MIRAGE OS

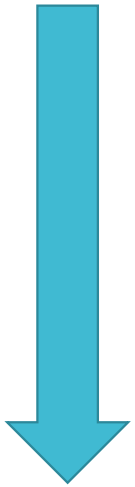
Approach

Using high-level languages

- Root problems of insecurities:
  I. ~~Lack of security expertise~~
  II. ~~Low-level programming languages~~
  III. ~~No system-wide control~~

Research Challenge

Pushing high-level languages guarantees and abstractions



Constrained embedded devices

Domain Specific Languages (DSL)

Data Privacy

Information-flow Control

Resources

Testing

Code generation

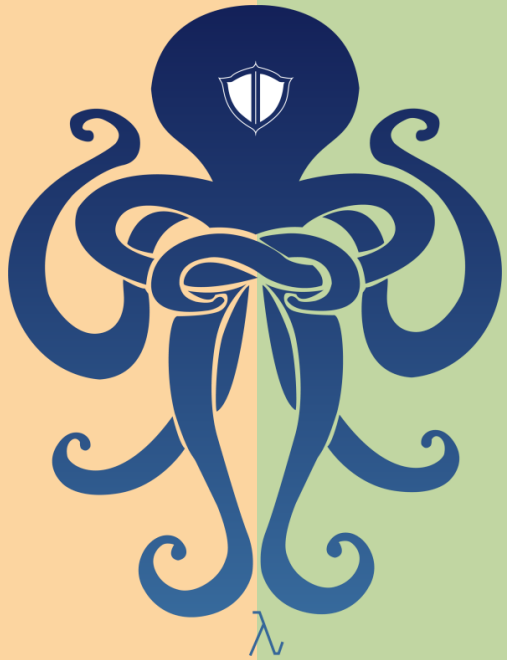
Clean slate

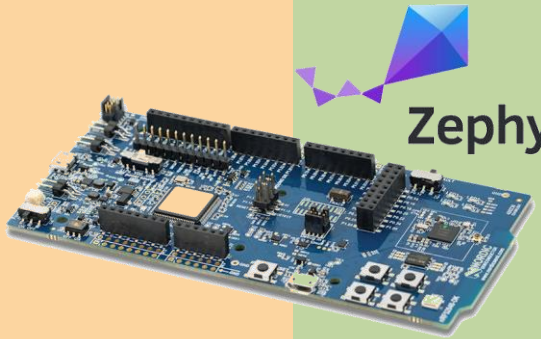
DSL

C code

DSL

Virtual Machine





Zephyr™

Secure Hardware

Code generation

Clean slate

re Hardware

Selected publications

- From fine- to coarse-grained dynamic information flow control and back. POPL 2019 (distinguished work)
- Faceted Secure Multi Execution. CCS 2018.
- A Programming Framework for Differential Privacy with Accuracy Concentration Bounds. IEEE S&P 2020.
- Practical normalization by evaluation for EDSLs. Haskell 2021.
  Code - github.com/nachivpn/nbe-edsl
- Hailstorm: A Statically-Typed, Purely Functional Language for IoT Applications. PPDP 2019.
  Code - github.com/Abhiroop/hailstorm
- Towards secure IoT programming in Haskell. Haskell 2020.
  Code - github.com/OctopiChalmers/haski
- Branching processes for QuickCheck generators. Haskell 2018.
  Code - github.com/OctopiChalmers/dragen
- Higher-order concurrency for microcontrollers. MPLR 2020.
  Code - github.com/svenssonjoel/Sense-VM
- Cephalopode: A custom processor aimed at functional language execution for IoT devices. MEMOCODE 2020.
  Code - github.com/cjhseger/FP_HW
- Stately: An FSM Design Tool. MEMOCODE 2020.
  Code - github.com/popje-chalmers/stately
- Optimising Faceted Secure Multi-Execution. CSF 2019

Domain Specific Languages (DSL)

Data Privacy

Resources

Code

ate

Alejandro Russo

Mary Sheeran

Koen Claessen

Carl Seger

John Hughes

DSL

V

Nachiappan Valliappan

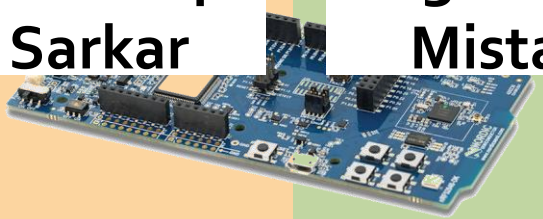
Jeremy Pope

Abhiroop Sarkar

Agustín Mista

Robert Krook

Joel Svensson



Secure Hardware