



# SHARCS: Secure Hardware-Software Architectures for Robust Computing Systems

*Sotiris Ioannidis*

*FORTH*



# Project Details

- Start date: 2015-01-01
- Duration: 36 months
- Budget: 3,105,762
- Coordinator: FORTH
- Academia
  - FORTH
  - Vrije Universiteit
  - Chalmers
  - TU Braunschweig

- Industry

- Neurasmus BV
- OnApp Limited
- IBM Ltd
- Elektrobit GMBH



# Overview

---

- Design, build and demonstrate secure-by-design system architectures that achieve end-to-end security
- Analyze and extend each H/W and S/W layer
- Technologies developed directly utilizable by applications and services that require end-to-end security

# Motivation

---

- Systems are as secure as their weakest link
  - Must think in terms of end-to-end security
- Security is typically applied in layers
  - Tighten up one layer and attackers move to another
- Ultimately security mechanisms must be pushed down to the H/W
  - Immutability; Clean and simple API; Secure foundation; Efficiency
- H/W on-chip resources are no longer a problem
  - Billions of transistors on-chip; Exploit parallelism and H/W
- Pushing security to the H/W
  - Benefit: performance, energy/power-efficiency; Challenge: flexibility
- Global adoption of embedded systems
  - No widely deployed security software

# Objectives

---

1. Extend existing H/W and S/W platforms towards developing secure-by-design enabling technologies
2. Leverage H/W technology features present in today's processors and embedded devices to facilitate S/W-layer security
3. Build methods and tools for providing maximum possible security-by-design guarantees for legacy systems
4. Evaluate acceptance, effectiveness and platform independence of SHARCS technologies and processes
5. Create high impact in the security and trustworthiness of ICT systems

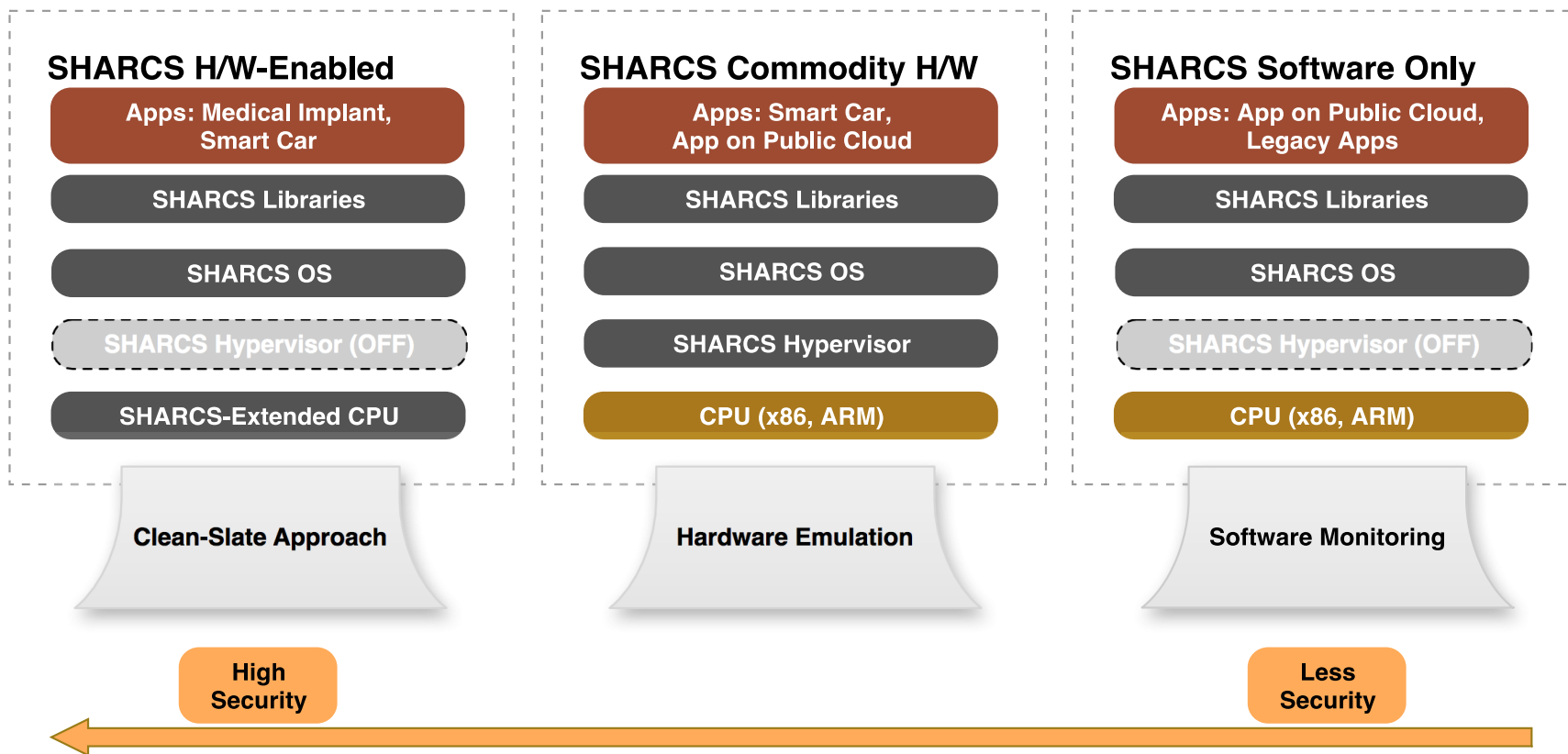


# Candidate Hardware Extensions

---

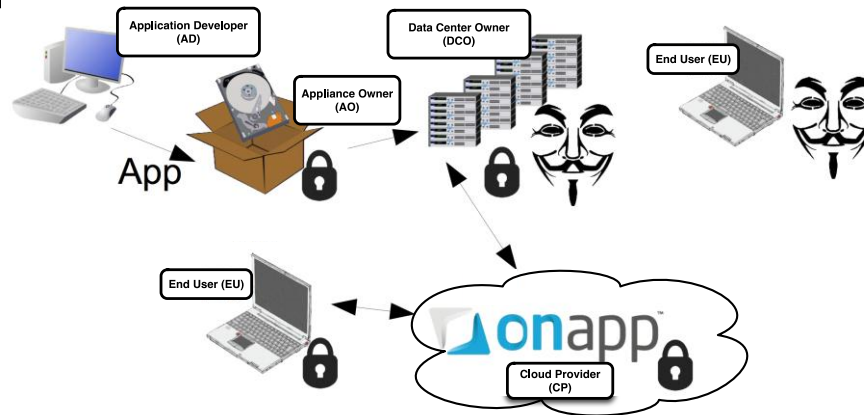
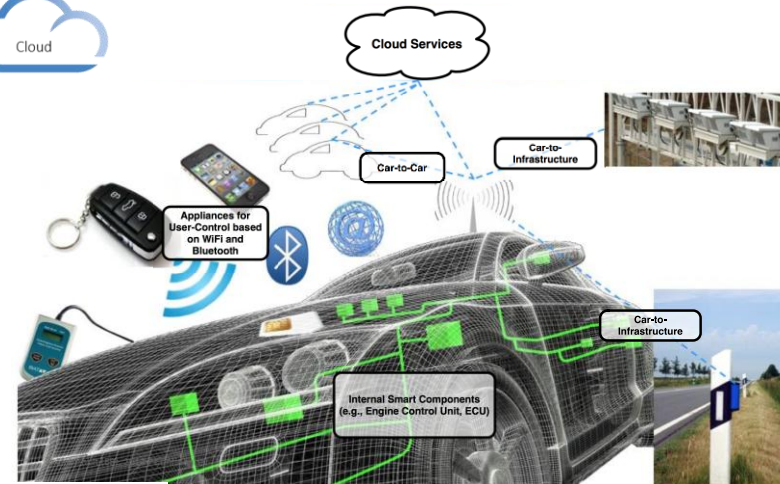
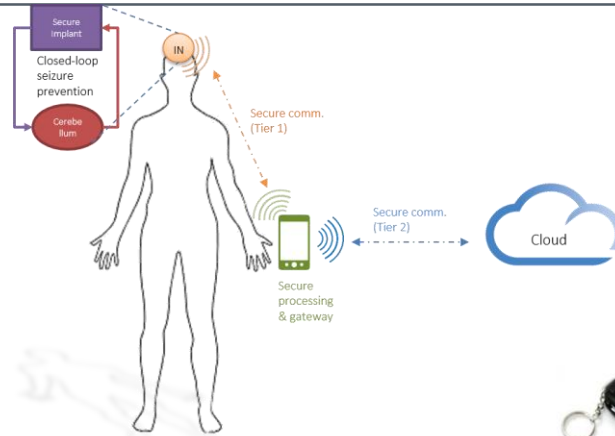
- Instruction Set Randomization
- Control Flow Integrity
- Information Flow Tracking
- Secure H/W Memory
- Fine-grained Memory Protection
- Dynamic Type Safety

# SHARCS Framework



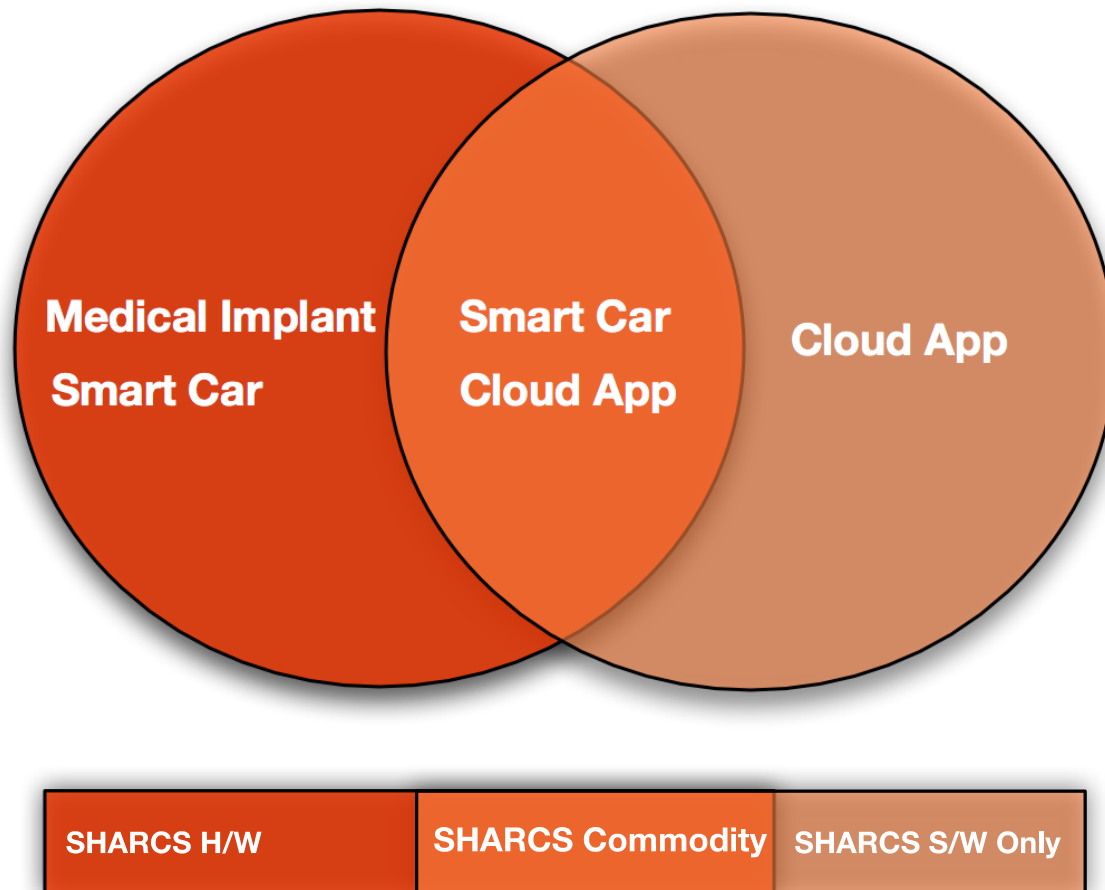
# Applications

- Medical
- Automotive
- Cloud

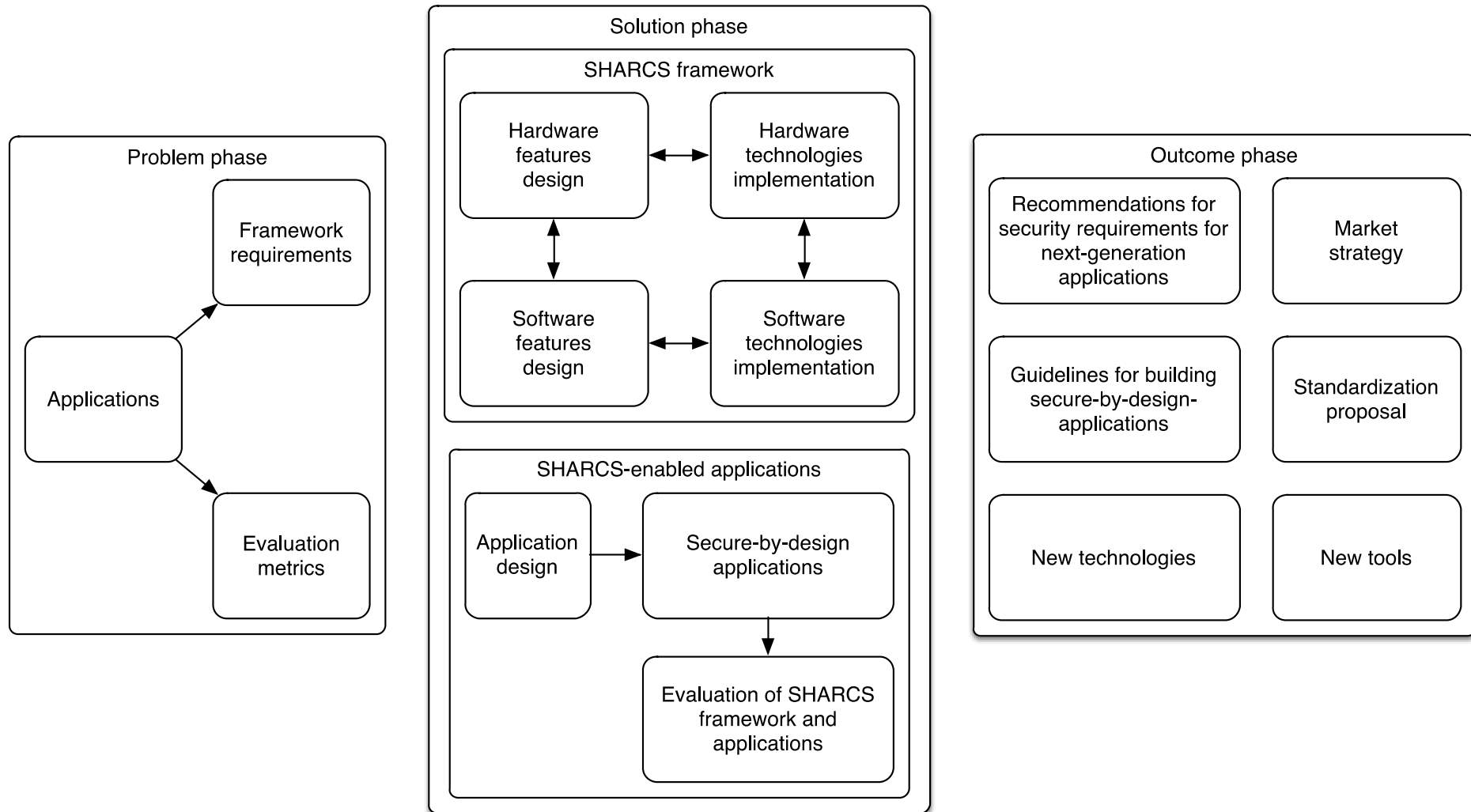




# SHARCS Applications



# SHARCS Methodology





# More Information

---

- Visit us on the web: [sharcs-project.eu](http://sharcs-project.eu)
- Follow us on Twitter: [@sharcs\\_project](https://twitter.com/sharcs_project)
- Like us on Facebook:  
[facebook.com/sharcsproject](https://facebook.com/sharcsproject)
- Email us at: [sotiris@ics.forth.gr](mailto:sotiris@ics.forth.gr)



# **SHARCS: Secure Hardware-Software Architectures for Robust Computing Systems**

*Sotiris Ioannidis*

*FORTH*