

State Of Tock

TockWorld 6

July 26th-28th, 2023

Outline

A Brief History of Tock

Project Mission

The state of Tock since the previous TockWorld

Coming Soon: Tock Foundation

Focus of this TockWorld

Agenda

A Brief History of Tock

6 nerds walk into a mailing list...

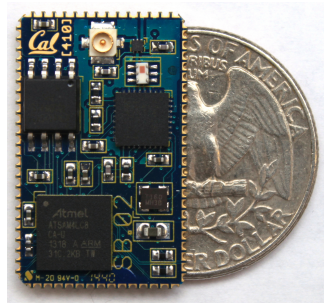
From: Philip Levis
Subject: [helena-project] SenSys poster/demo
To: helena-project@lists.stanford.edu
Date: Wed, 09 Jul 2014 13:15:12 -0700

Each of us has made some interesting progress on a next generation embedded platform. Michael @Berkeley has storm (an M4 + RF233), Tom and Amit @Stanford have a TinyOS nRF8001 stack and some interesting measurements for BLE, Pat and Brad @Michigan have a few Cortex M platforms, with the CC2420.

Operating system: what should an operating system for such a device look like? Can we achieve something like the efficiency and dependability of TinyOS without being so difficult to extend and program?

Before Tock, there was storm.rs (October 2014)

Storm is a 16mm x 26mm (1/2" by 1") solder on module that combines a 32 bit Cortex M4 microcontroller with an 802.15.4 radio, and 64 Mbit of flash memory. This ultra low power module exports 80 pins via castellated edges, and is designed to be soldered into a larger PCB that contains additional sensors or actuators.



Reboot with First Tock commit

```
commit a14379b850bf47e89cd2945226cbf9bcbab5f43f
Author: Amit Aryeh Levy <amit@amitlevy.com>
Date: Tue May 19 15:29:44 2015
```

Initial commit

Barebones build system and boot to Rust on Storm

Milestones since

- ▶ 2016: Dynamic userland code loading
- ▶ 2017: Tock training at RustConf, first deployment (Signpost)
- ▶ 2018: 1.0 release
- ▶ 2019-2021: ... not entirely sure what happened... some sort of newsworthy event...
- ▶ 2022: 2.0 release

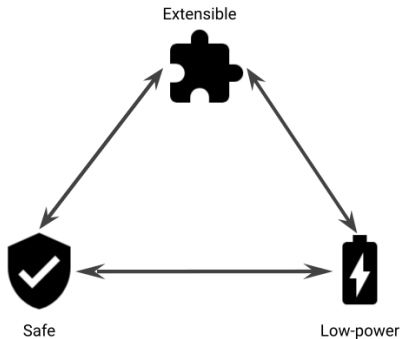
Project Mission

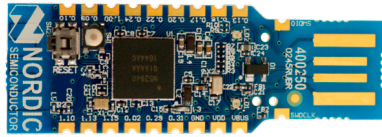
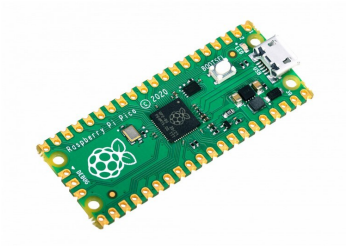
We believe in

Building embedded systems that

- ▶ are safe
- ▶ people can program
- ▶ not resource intensive

A modest desire, for modest devices, with big implications.





We believe that the best way to accomplish this includes

- ▶ Rust
 - ▶ Type safety
 - ▶ Careful and pragmatic use of formal tools
- ▶ Co-development with
 - ▶ Hardware
 - ▶ Applications
- ▶ Open source collaboration between
 - ▶ Practitioners
 - ▶ Researchers
 - ▶ Educators

The state of Tock since the previous TockWorld

The Project Today

TockWorld 5.0 (July 2022) -> Today (July 2023)

- ▶ Contributors: 244 overall
 - ▶ tock: 196 -> 212
 - ▶ libtock-c: 56 -> 63
 - ▶ libtock-rs: 43 -> 50
 - ▶ tockloader: 22 -> 24
- ▶ 11,943 commits, 2,902 closed PRs
 - ▶ over 1532 since TockWorld 5.0
- ▶ Releases since TockWorld 5.0
 - ▶ 2.1 in September 2022
 - ▶ Move subscribe and allow from capsules to kernel
 - ▶ 2.1.1 in January 2023

Coming Soon: Tock Foundation

- ▶ Tools (tockloader, tockilator, elf2tab, tock-bootloader, ...)
- ▶ Documentation
- ▶ Training materials
- ▶ Release management and PR herding

- ▶ Develop and maintain test infrastructure
- ▶ Web, “book”, CI, etc

- ▶ Event organizing
- ▶ Outreach
- ▶ Gathering use cases and pain points
- ▶ Education

- ▶ Security auditing and improvements (is low-level context arch-specific code correct? Are there soundness bugs?)
- ▶ Networking
- ▶ USB
- ▶ Better/other isolation primitives
- ▶ Performance and resource optimization, energy, ...
- ▶ Next generation platforms (multi-MCU, 64-bit, RISC-V, ...)

How?

- ▶ Short term: 2-years of NSF funding (any day now?)
 - ▶ Support for two people
 - ▶ **Community Director**: lead external ecosystem development and community building initiatives.
 - ▶ **Testing, Quality Control, and Security Director**: setup and manage the testing infrastructure.
 - ▶ Establish a foundation along the way
- ▶ Long term: member-based foundation
 - ▶ Who are the members? You! (well, your companies)
- ▶ Open questions:
 - ▶ Membership structure
 - ▶ Governance
 - ▶ Who do we hire?

Focus of this TockWorld

Tock moves away

- ▶ Users/developers of Tock less concentrated

- ▶ Which networks matter?
 - ▶ Originally Bluetooth Low Energy
 - ▶ Now 6lowpan too
 - ▶ 802.15.4: 6lowpan? Thread? Zigbee?
 - ▶ Ethernet
 - ▶ WiFi
 - ▶ CAN
- ▶ One network stack to rule them all? If not, what?

Long-term community viability/stability

- ▶ *Funding*
- ▶ *Staffing*
- ▶ Outreach

Supporting research, education, *and* production

- ▶ Big kid concerns, such as:
 - ▶ copyright
 - ▶ security auditing
 - ▶ API stability
- ▶ Engagement in non-academic settings
- ▶ Fairness and efficacy in decision making

Agenda

Today

- 9:15 State of Tock
- 9:45 Kernel soundness, size and ergonomics
- 10:30 Networking, current and future
- 12:00 Lunch
- 13:00 A check-in on development focus areas
- 13:30 Discussions: Vision & focus areas

- 9:30 Tock + X
- 11:30 Discussion: downstream users
- 12:00 Lunch
- 13:00 Community Development + Tock Foundation
- 16:45 Closing