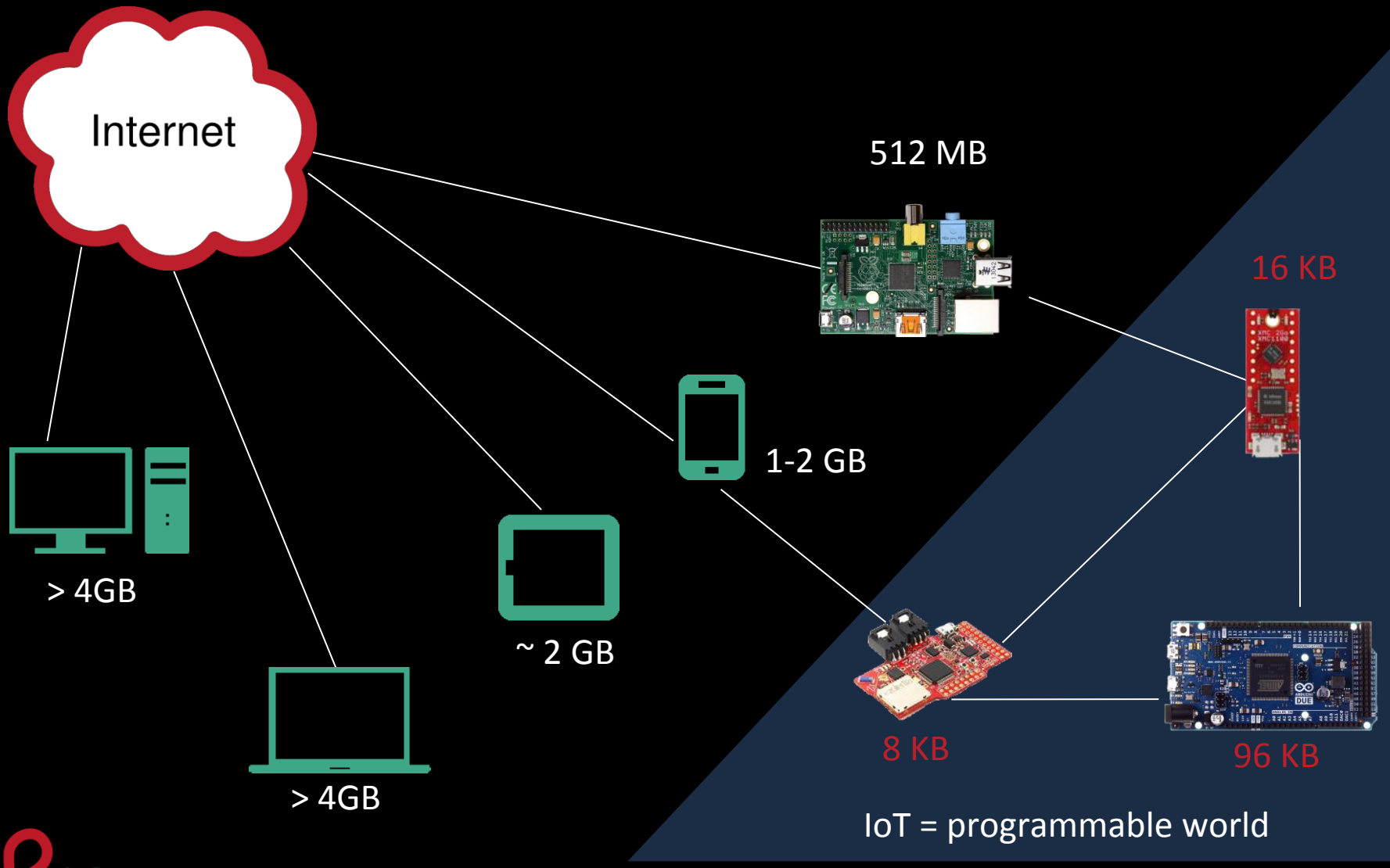
The friendly operating system for the IoT!

www.riot-os.org

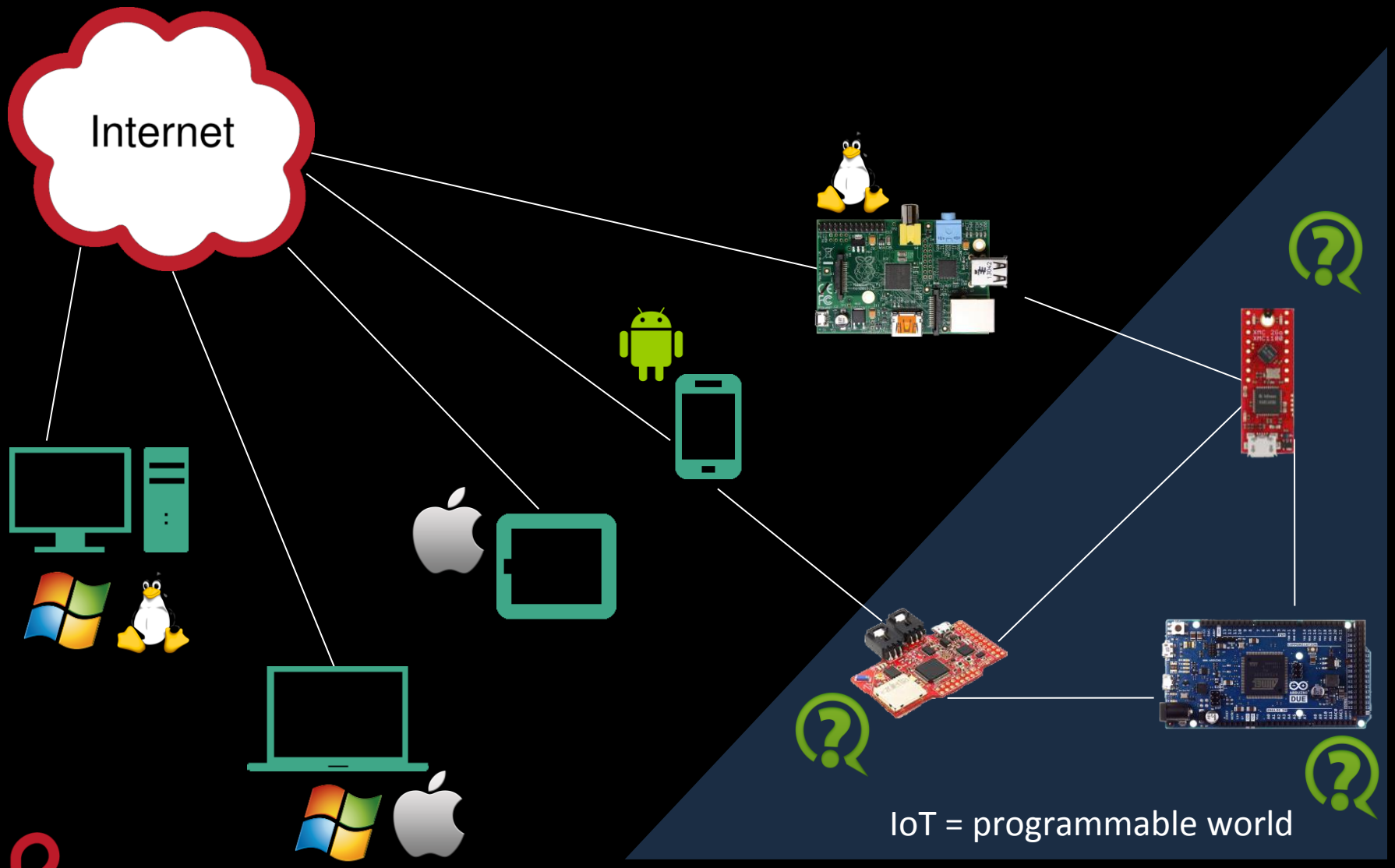
AGENDA

- Internet of Things: Which OS?
- RIOT in a nutshell
- RIOT user and developer evolution
- Roadmap

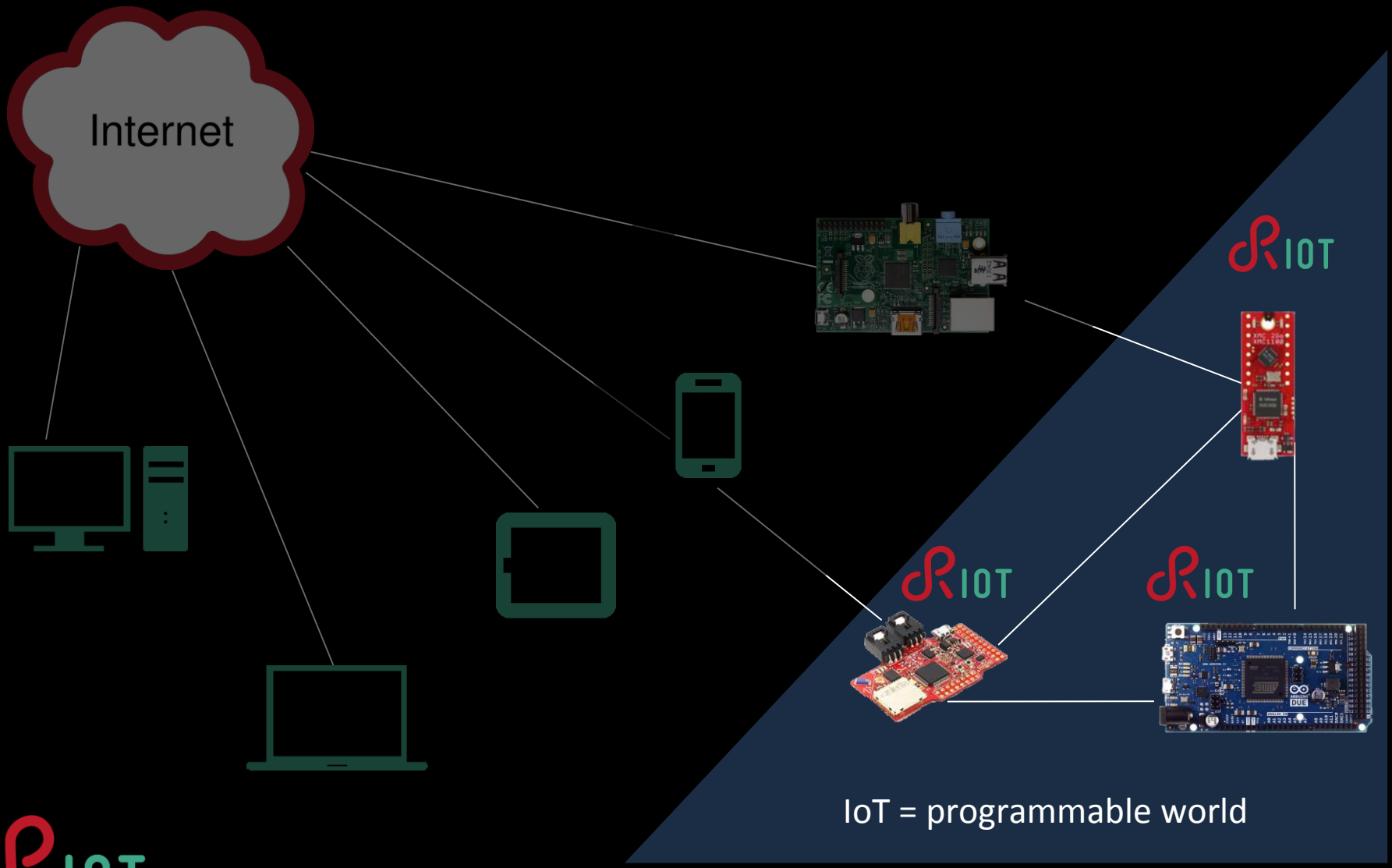
The Internet of Things (IoT)



IoT: The operating system question



RIOT: The friendly IoT operating system



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RIOT: Positioning

"If your IoT device cannot run Linux, then run RIOT!"

- RIOT requires only a few kB of RAM/ROM, and small CPU
- With RIOT, code once & run heterogeneous IoT hardware
  - 8bit hardware (e.g. Arduino)
  - 16bit hardware (e.g. MSP430)
  - 32bit hardware (e.g. ARM Cortex-M, x86)

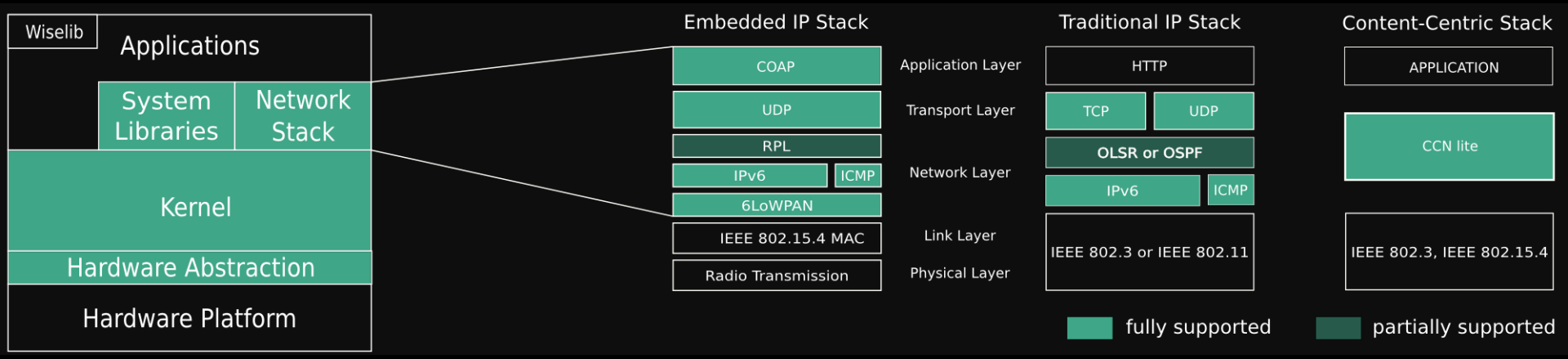
RIOT: Fact sheet

- Microkernel architecture (for robustness)
  - The kernel itself uses ~1.5K RAM @ 32-bit
- Tickless scheduler (for energy efficiency)
- Deterministic O(1) scheduling (for real-time)
- Low latency interrupt handling (for reactivity)
- Modular structure (for adaptivity)
- Preemptive multi-threading & powerful IPC

RIOT: IoT development made easy

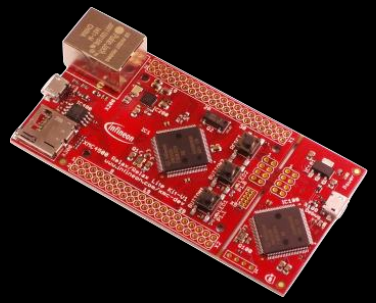
- Open source, community-driven
- Write your code in ANSI-C or C++
- Compliant to the most widely used POSIX features such as pthreads and sockets
- No IoT hardware needed for debugging
  - Run & debug RIOT as native process in Linux

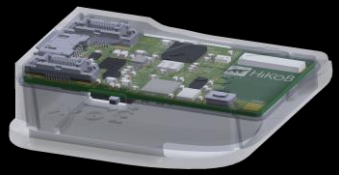
RIOT: Built to connect



- RIOT supports several network stacks
- RIOT community has a strong commitment to use and promote open standards
  - e.g. 6LoWPAN, IPv6, CoAP

RIOT already runs on a wide range of IoT hardware





Competing IoT Operating Systems

Contiki

Pioneer sensor network OS, big open source community

(see also: TinyOS, but clearly losing momentum)

mbed OS

ARM product launch expected soon

Aiming to support & favor ARM hardware

- FreeRTOS

Popular microkernel, open source

Used by a variety of embedded software « add-ons »

RIOT

Alternatives to RIOT?

OS	Min RAM	Min ROM	C Support	C++ Support	Multi-Threading	MCU w/o MMU	Modularity	Real-Time
Contiki	< 2kB	< 30kB	●	✗	●	✓	●	●
Tiny OS	< 1kB	< 4KB	✗	✗	●	✓	✗	✗
Linux	~ 1MB	~ 1MB	✓	✓	✓	✗	●	●
RIOT	~ 1.5kB	~ 5kB	✓	✓	✓	✓	✓	✓

✓ Full support
● Partial support
✗ No support

- Contiki and TinyOS: mostly optimized for 8bit
- mbed: ARM only, cloud-dependent tool chain, not there yet
- FreeRTOS: micro-kernel only, no built-in energy efficiency

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RIOT Origins

History

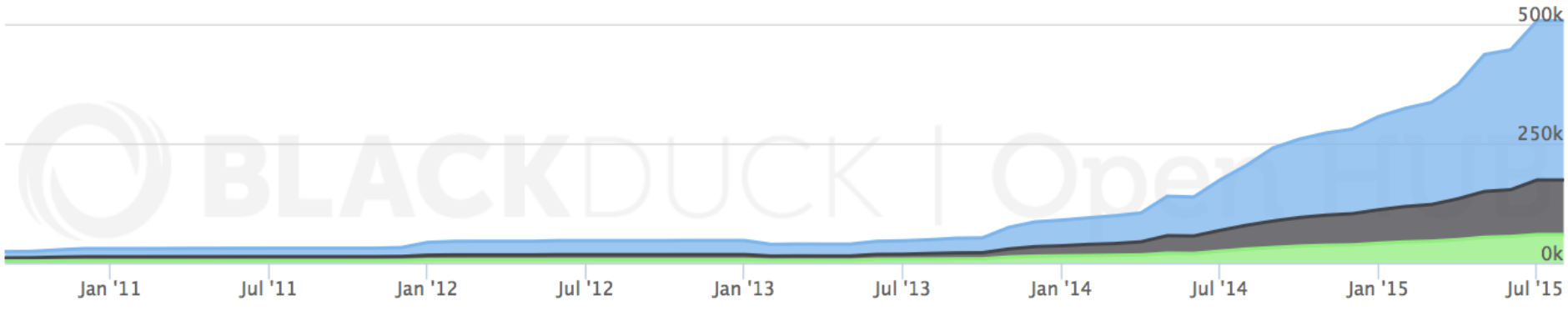
- 2008 – Project roots:
  The kernel was started
  as part of a research project
- 2010 – Towards the IoT:
  Implementation of 6LoWPAN
  and RPL was initiated
- 2013 – RIOT goes public: Branding
  of RIOT started, source code moved
  to Github

Founding institutions

RIOT stats

107 contributors, 78 active in last 12 months

Estimated cost: $5M, 90 person-years [1]

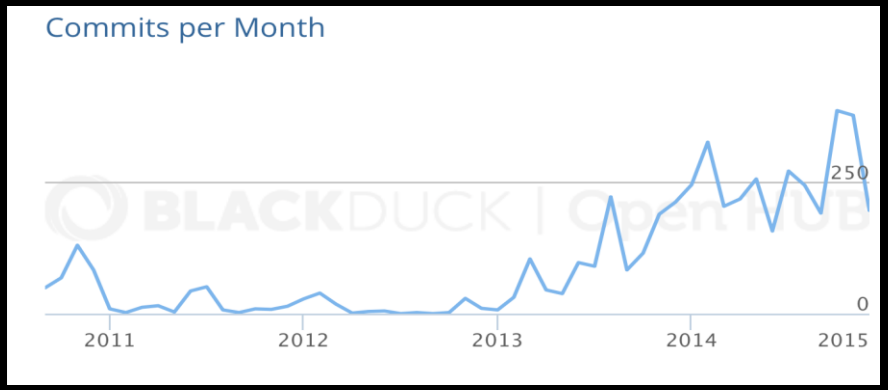


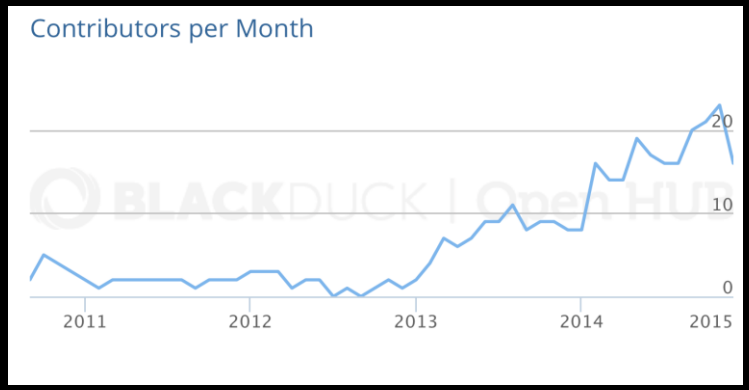
1k followers on Twitter

RIOT: Code evolution

»RIOT is one of the largest open-source teams in the world«

www.openhub.net/p/RIOT-OS, Jan. 2015





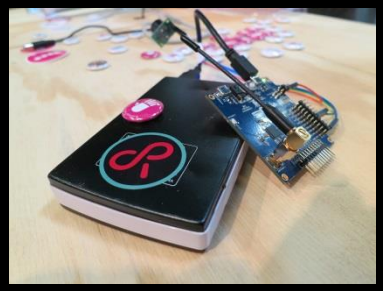
Join the RIOT

- World-wide, open source community
- ~ 200 forks on GitHub
  https://github.com/RIOT-OS/RIOT
- Hundreds on the developer mailing list: devel@riot-os.org
- Developers from Asia, Europe, North America, South America
- Support & discussions on IRC:
  irc.freenode.org #riot-os

Some Active Supporters

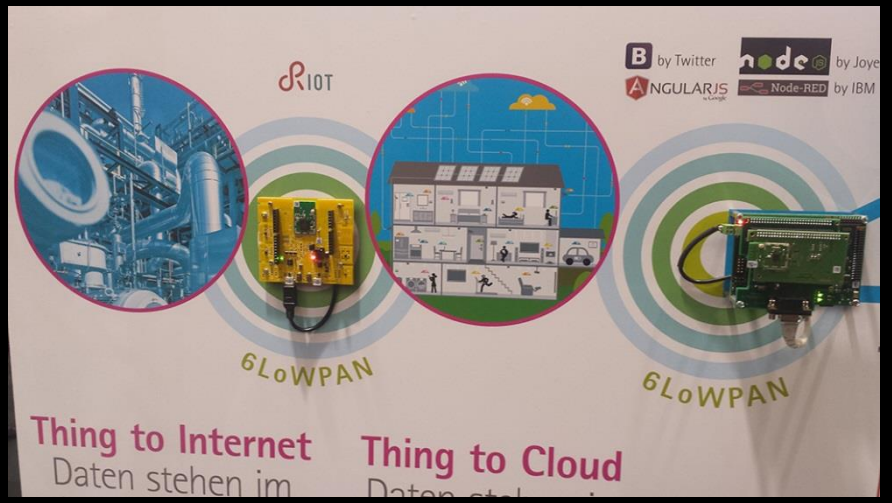
RIOT

Embedded World 2015:
UDOO Pays for RIOT Sub-Booth. Thanks!



RIOT

Embedded World 2015: Additional Booths Advertising RIOT



RIOT

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Ongoing work in RIOT

- Redesign of the network stack architecture
  - Unified inter-module API
  - Exchangeable MAC protocols
  - Portable Link-Layer architecture
  - Central packet buffering
- Enabling Over-The-Air Updates

Roadmap 2015

- Network stack developments
  - Refactoring, CCN-lite 1.0, BLE support...
- Deployment tools
  - Over-the-air application updates, over-the-air OS update...
- More development tools
  - Advanced test-framework, including distributed testing
- Additional hardware support
- Further application layer protocols
  - MQTT, LWM2M...

Thank you for your interest!

For cooperation questions: riot@riot-os.org

For developer questions: devel@riot-os.org