on the Internet of Things

Software Project for Computer Science
and Electrical Engineering

What is the Internet of Things?

A system in which objects in the physical world can be connected to the Internet by sensors and actuators (coined 1999 by Kevin Ashton)

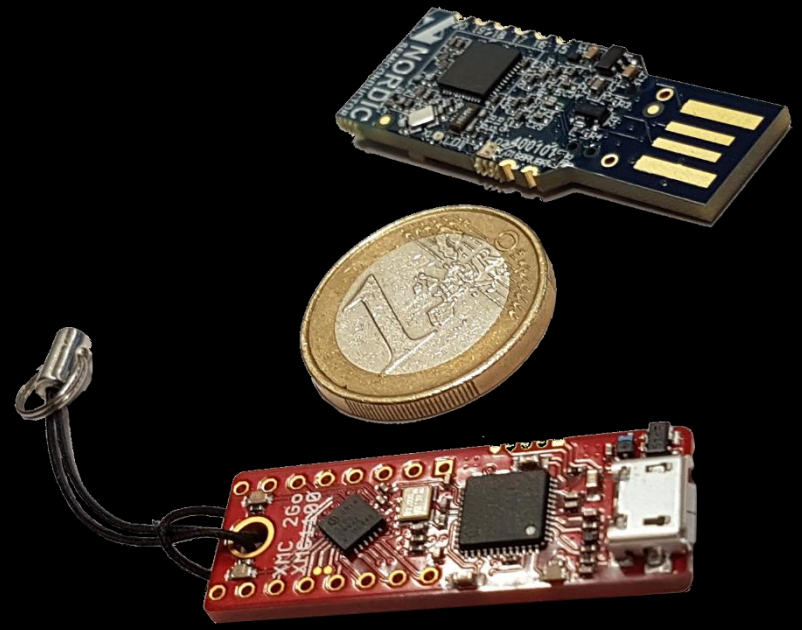
Key aspects:

- E2E communication via Internet standards
- Machine-to-machine communication
- Embedded devices, often constrained and on battery
- Typically without user interface
- Very large multiplicities, w/o manual maintenance

RIOT

IoT Applications

- Facility, Building and Home Automation
- SmartCities & SmartGrids
- Personal Sports & Entertainment
- Healthcare and Wellbeing
- Asset Management
- Advanced Metering Infrastructures
- Environmental Monitoring
- Security and Safety
- Industrial Automation



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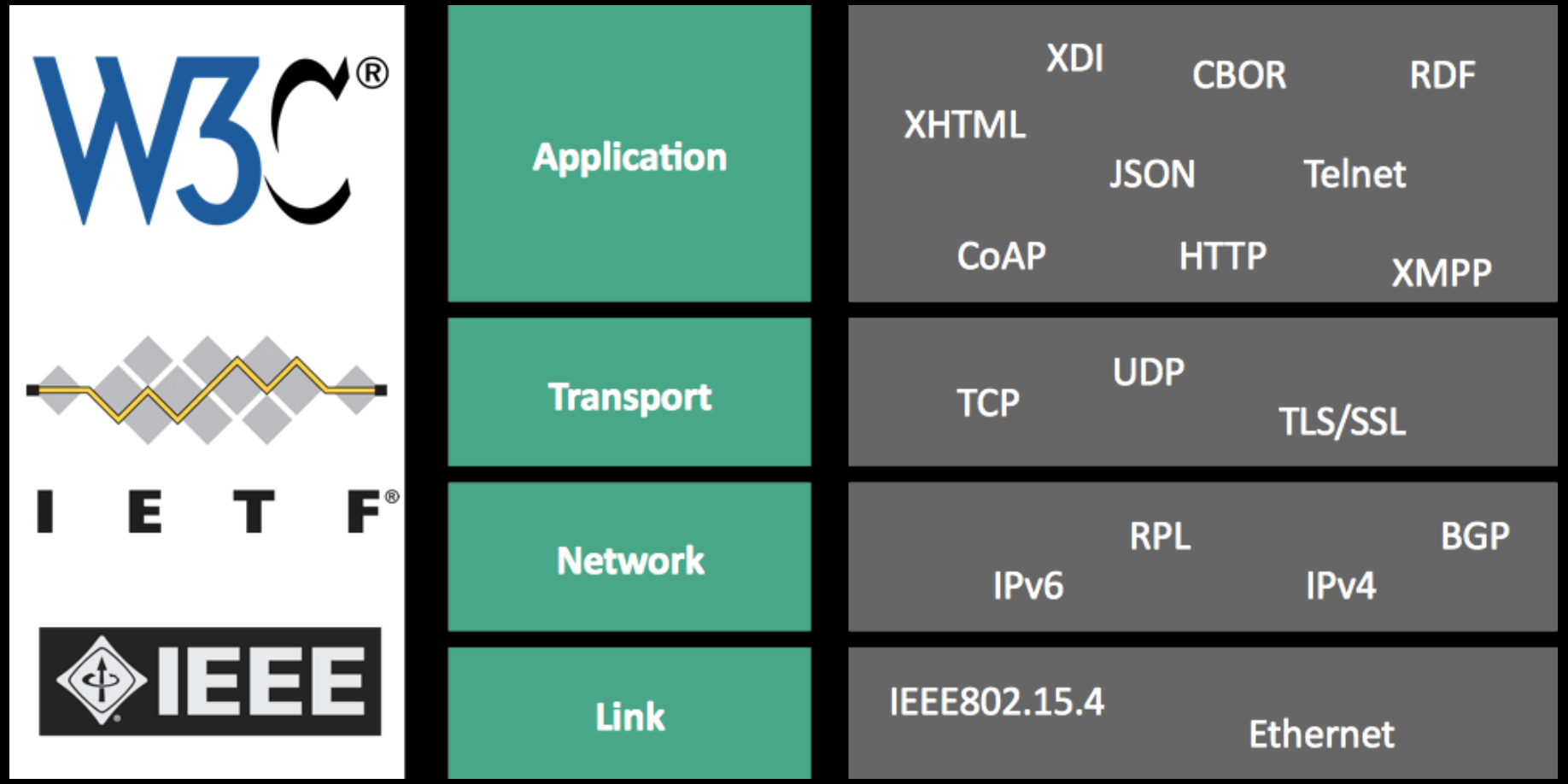
IoT Challenges

The five key issue areas identified by ISOC:

1. Security
2. Privacy
3. Interoperability and standards
4. Legal, regulatory, and rights
5. Emerging economies and development

No Internet without Open Standards



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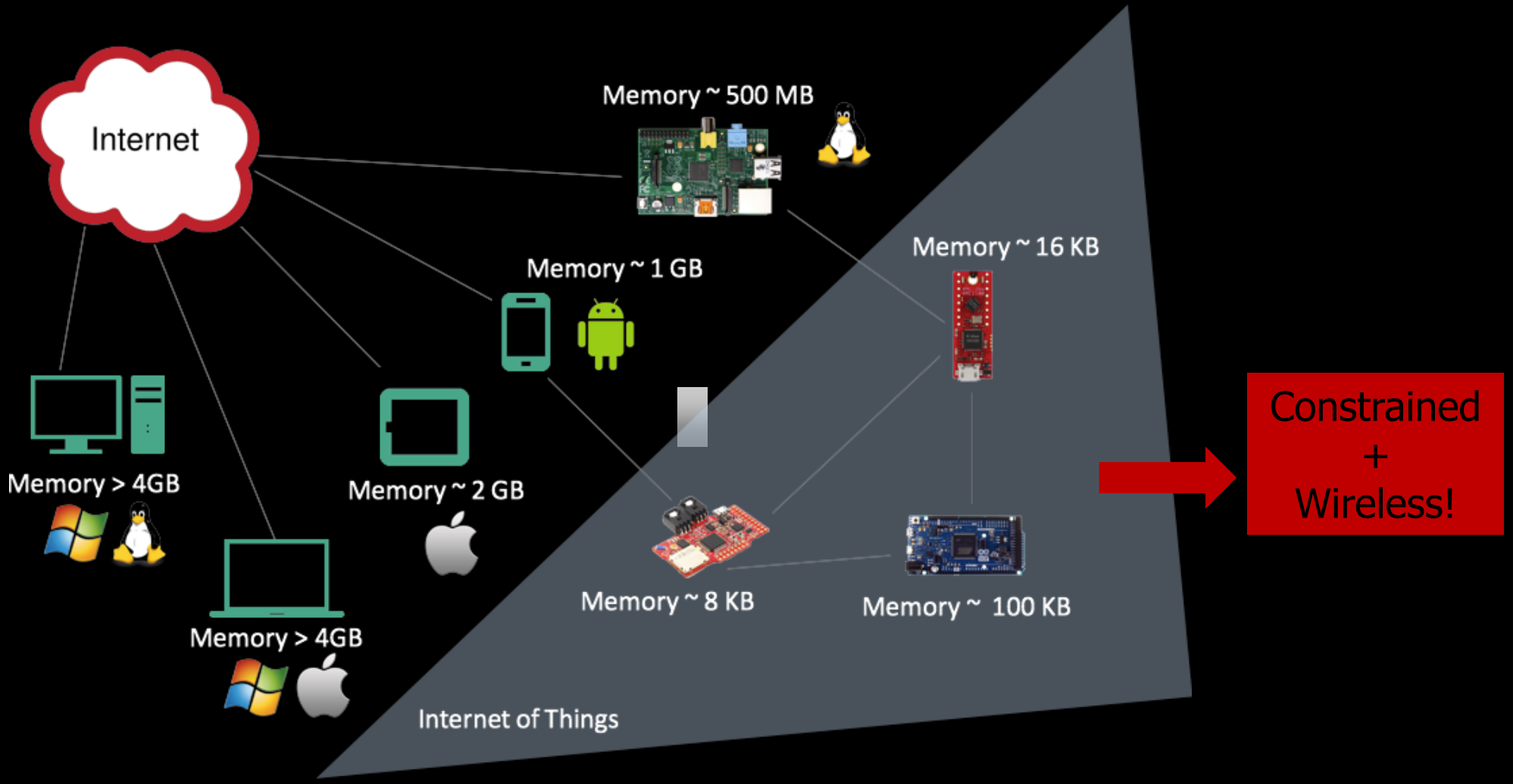
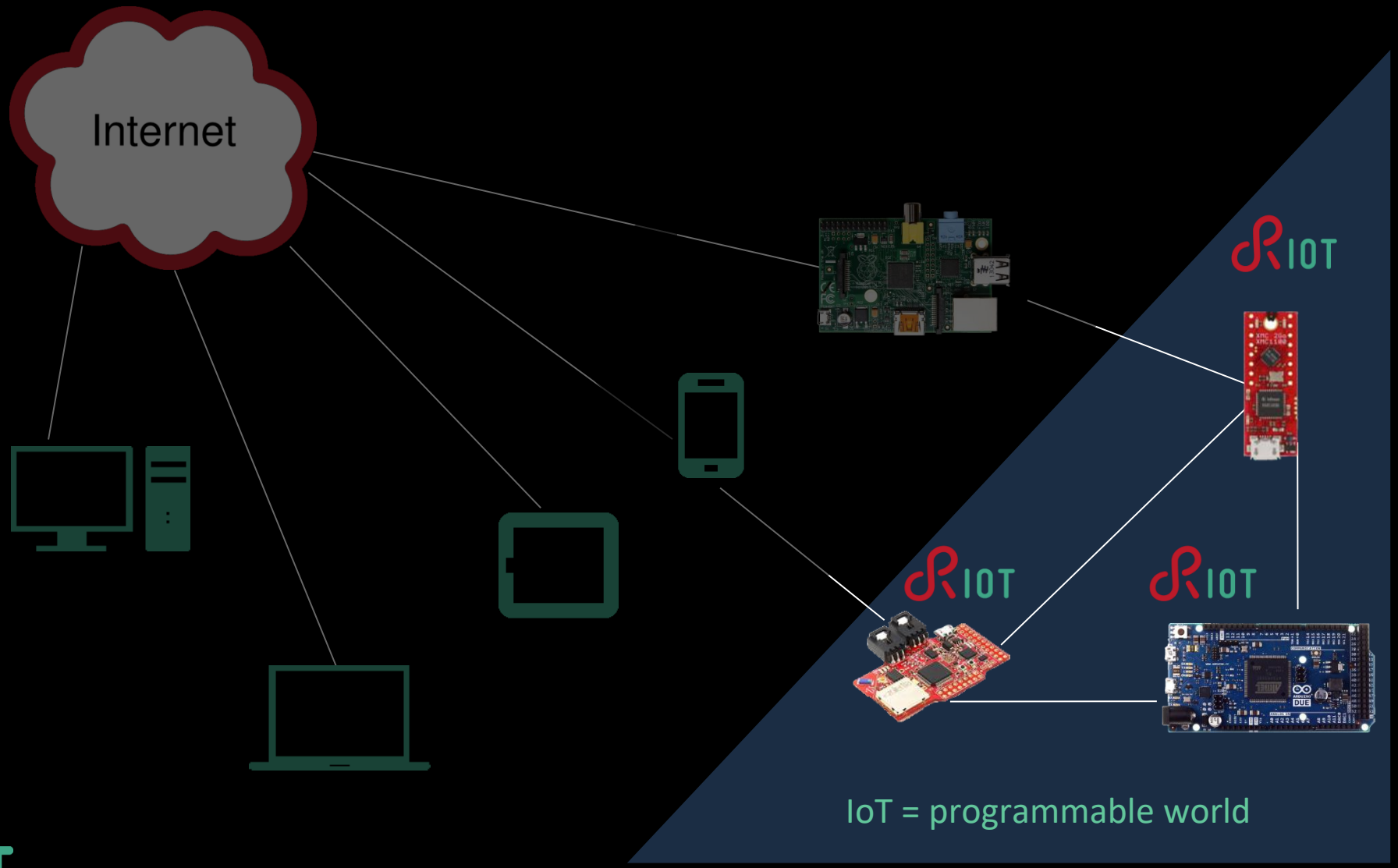
The Constrained Internet of Things (IoT)



RIOT

RIOT: The Friendly OS for the IoT



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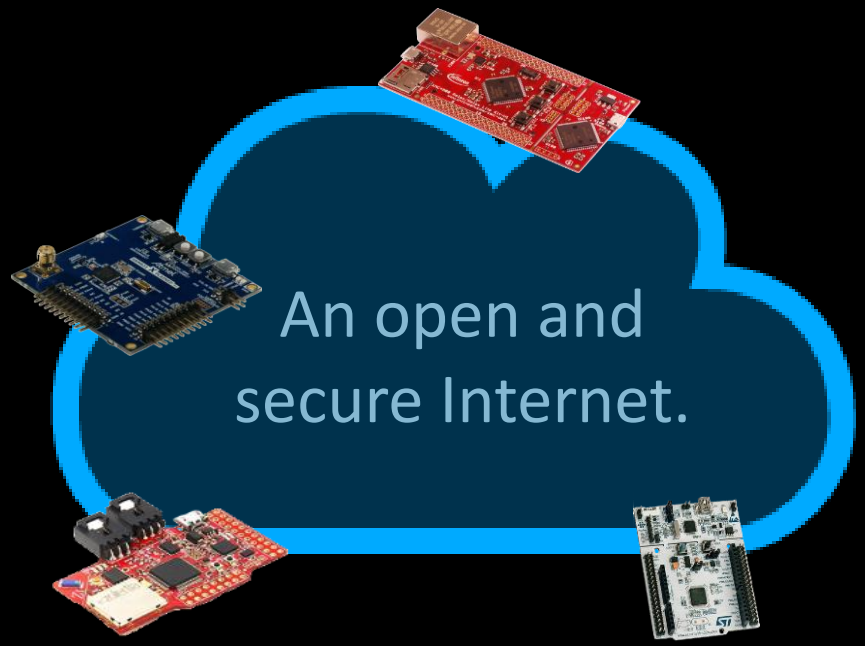
RIOT is the friendly OS for ...



the smaller devices
8, 16, 32 bit – 10+ kB RAM

the better hardware support
> 250 boards run RIOT

full neutrality
no lock-in with vendor or hw architecture

a Linux-style open community + license
275 developers

a firm ground for your portable IoT solution

If your IoT device cannot run Linux,
then run

RIOT

RIOT: Facts sheet

- Microkernel architecture (for robustness)
  - The kernel itself uses ~1.5K RAM @ 32-bit
- Efficient hardware abstraction (for portability)
- 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
- Appealing API

The History of RIOT

FeuerWhere Project

Branding of RIOT

1st Community Summit

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	....
					2013.08	2014.01 2014.05 2014.12	2015.09 2015.12	2016.04 2016.07 2015.10	2017.01 2017.04 2017.07 2017.10	2018.01 2018.04 2018.07 2018.10	2019.01 2018.04 2018.07 2018.10	2020.01 2020.04 2020.07 2020.10	

Freie Universität Berlin

Inria INVENTORS FOR THE DIGITAL WORLD

Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences

13 years of RIOT – 43 Releases – 10 RIOT Summits

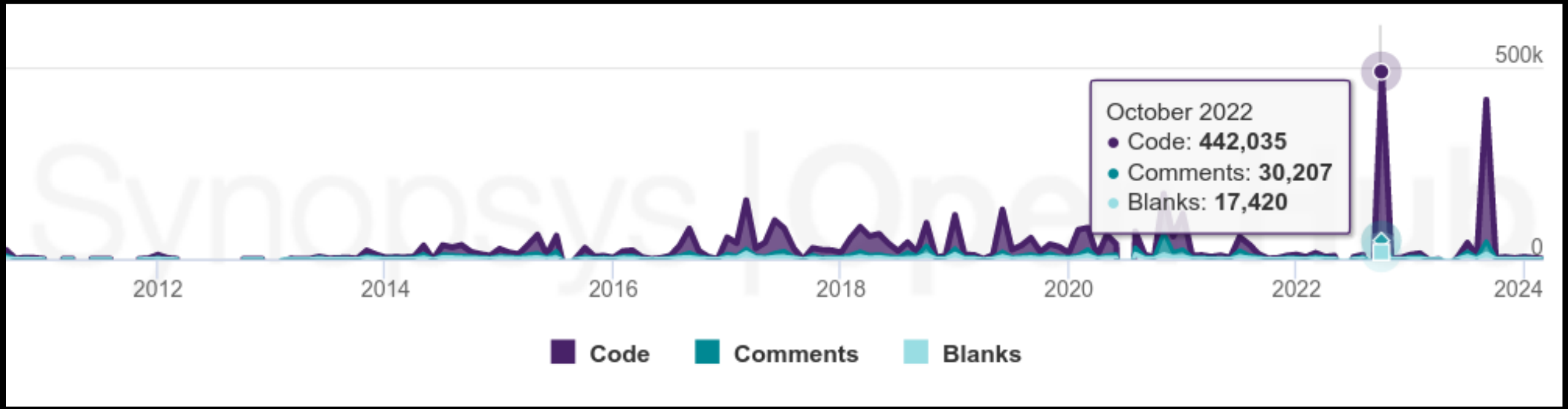
The RIOT Ecosystem

Community follows the IETF spirit.

Rough consensus and running code!

- RIOT uses copyleft license (LGPLv2.1)
- 210 contributors worldwide
- 2000+ merged PRs (last 12 months)
- Maintainer team of ≈ 40 people
- Many industrial opportunities & support

Development of code on Github



Some commercial supporters

An active and strong community

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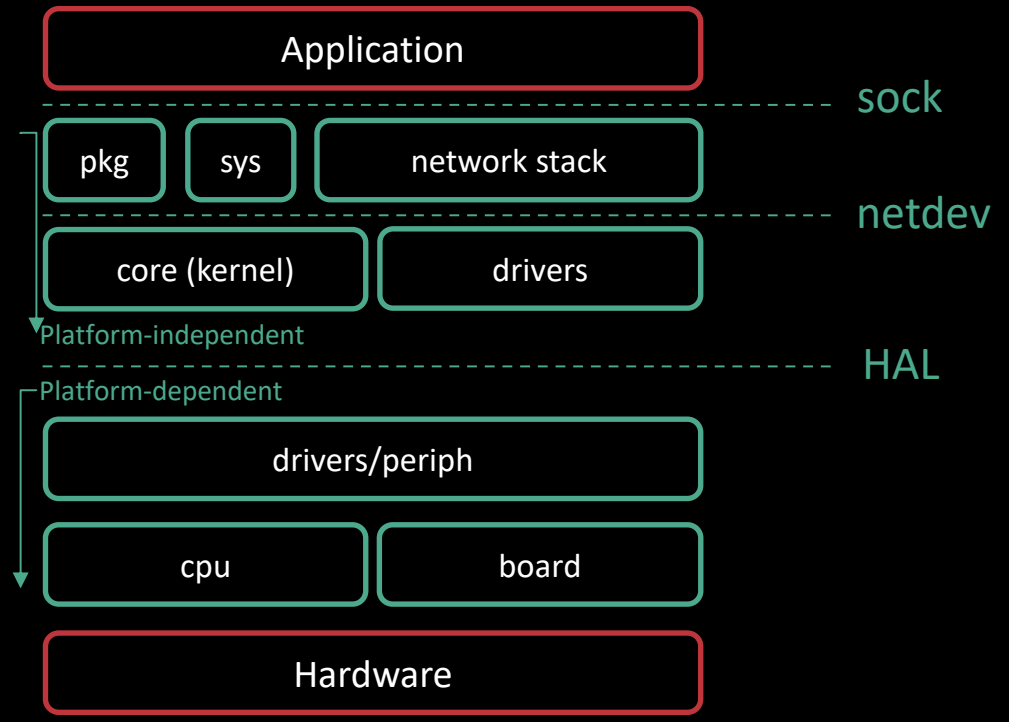
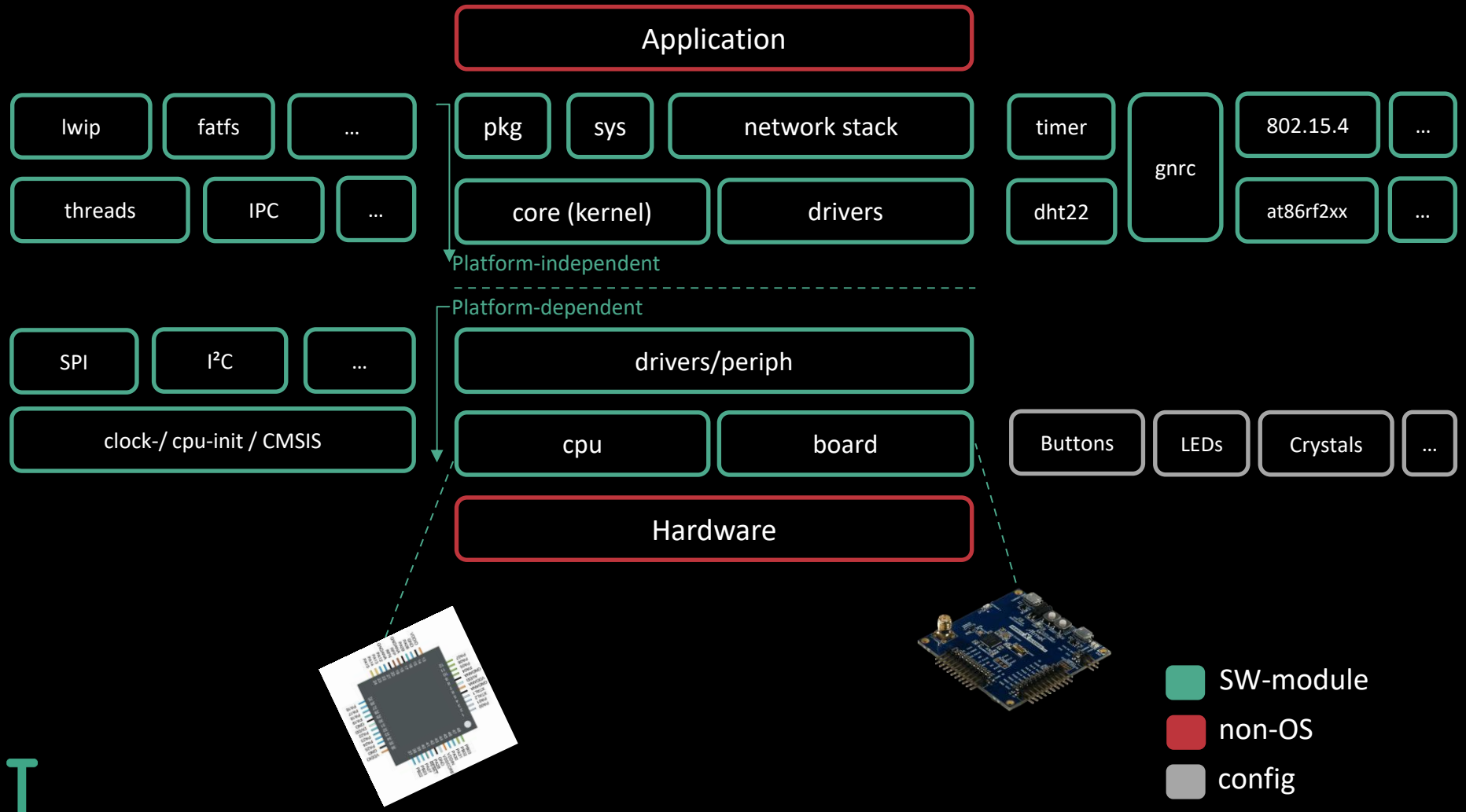
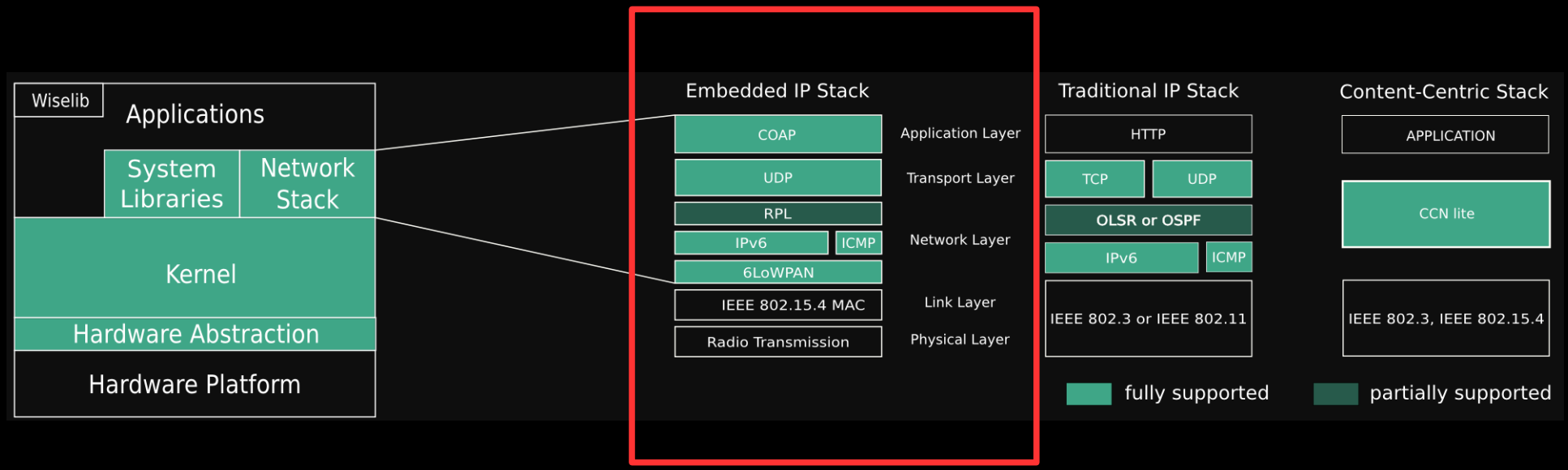
RIOT Software Components



RIOT Software Components (2)



RIOT: Built to connect



- Open-access protocols
  - e.g. 6LoWPAN, IPv6, CoAP, …
- RIOT supports several network stacks
- On many wireless technologies and NICs

RIOT

What this Project is About

- Get involved in building the IoT
- Find your team, work out your ideas
- Master IoT technologies and standards
- Collaborate with your team and others
- Build a multi-layered IoT solution
- Help making the world smarter with

17:00 - every last Tuesday of the month

This Year‘s Theme: RESCUE MATE

Digital Twin for Flood Protectors:

Integrated View from Sensors

RIOT

Four Milestones

1. Present your project design:
   Share the ideas of you and your group
2. Revise your architecture after feedback, first practical proofs
3. First prototype: Show that it can work and how
4. Final project presentation: Make your results public

Final Presentation

RIOT

Project Organization

Binding project plan:

https://www.inet.haw-hamburg.de/teaching/ss-2026/riot-im-internet-of-things/

- May want to choose a project master
- Attendance in presence is mandatory at all times
  (if you are sick present a doctor‘s certificate)
- Presentation at milestones: Everybody presents
- We work on Github: All Code and Docs must be up prior to each milestone (this is part of our project assessment)