



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)*

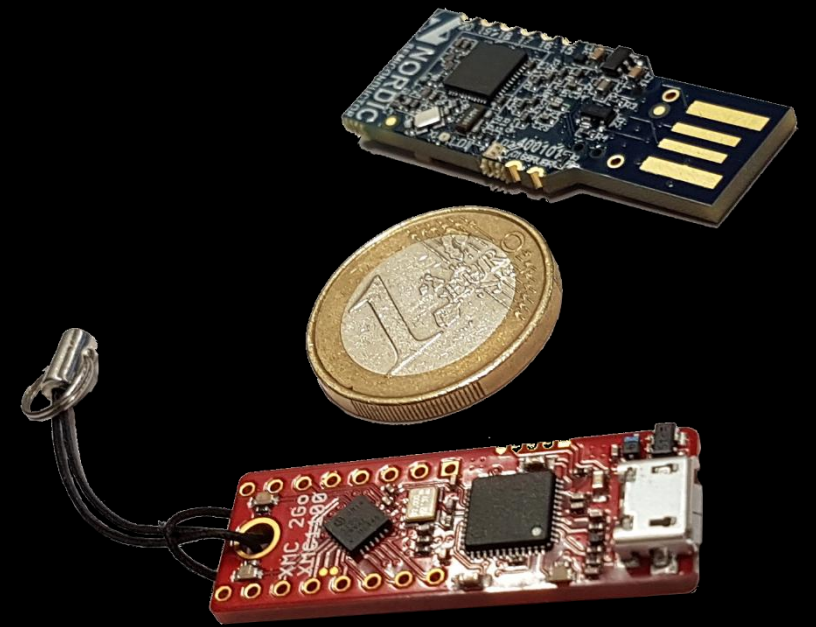
Key aspects:

- 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



# 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



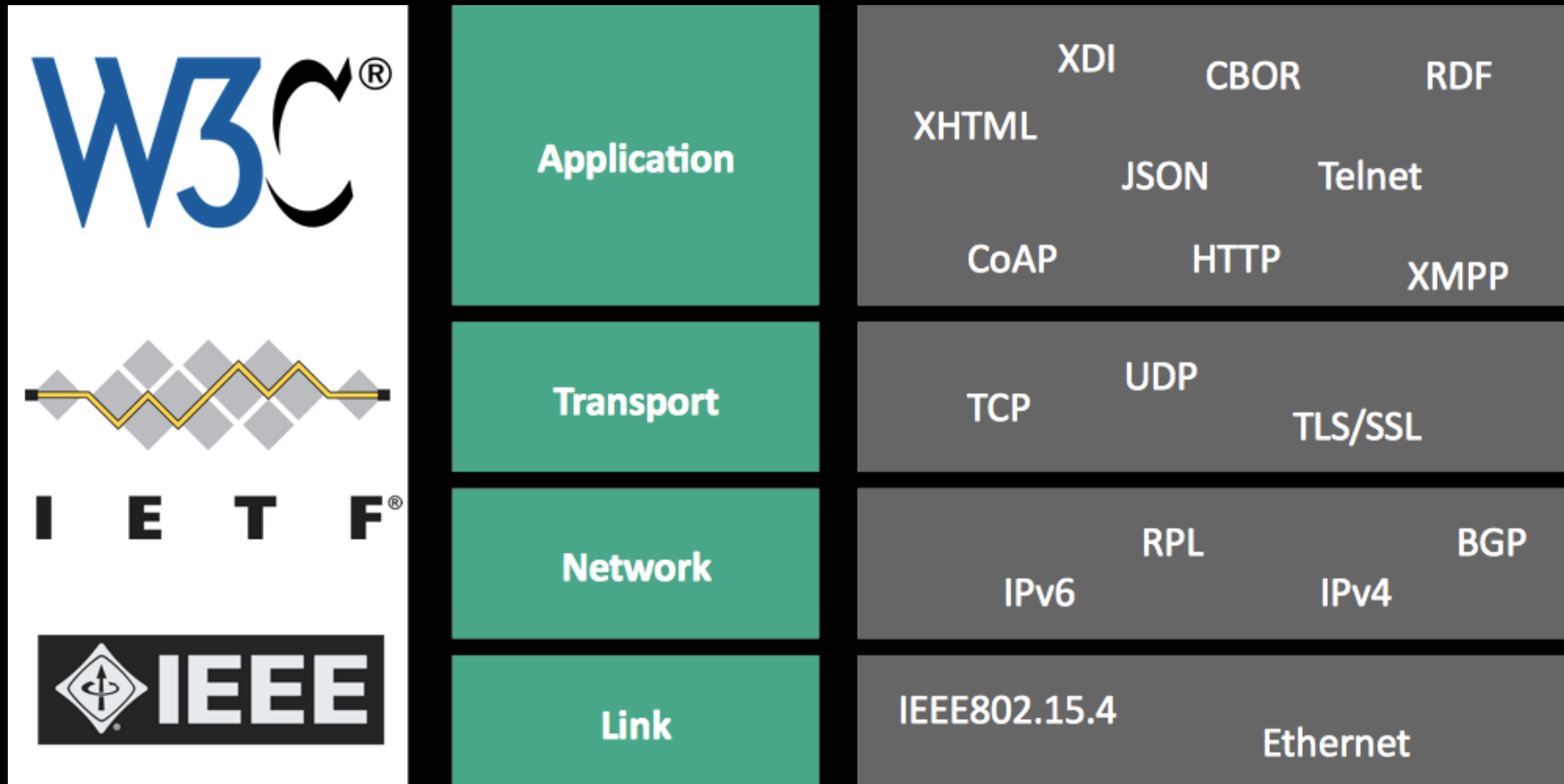
# IoT Challenges

The five key issue areas identified by ISOC:

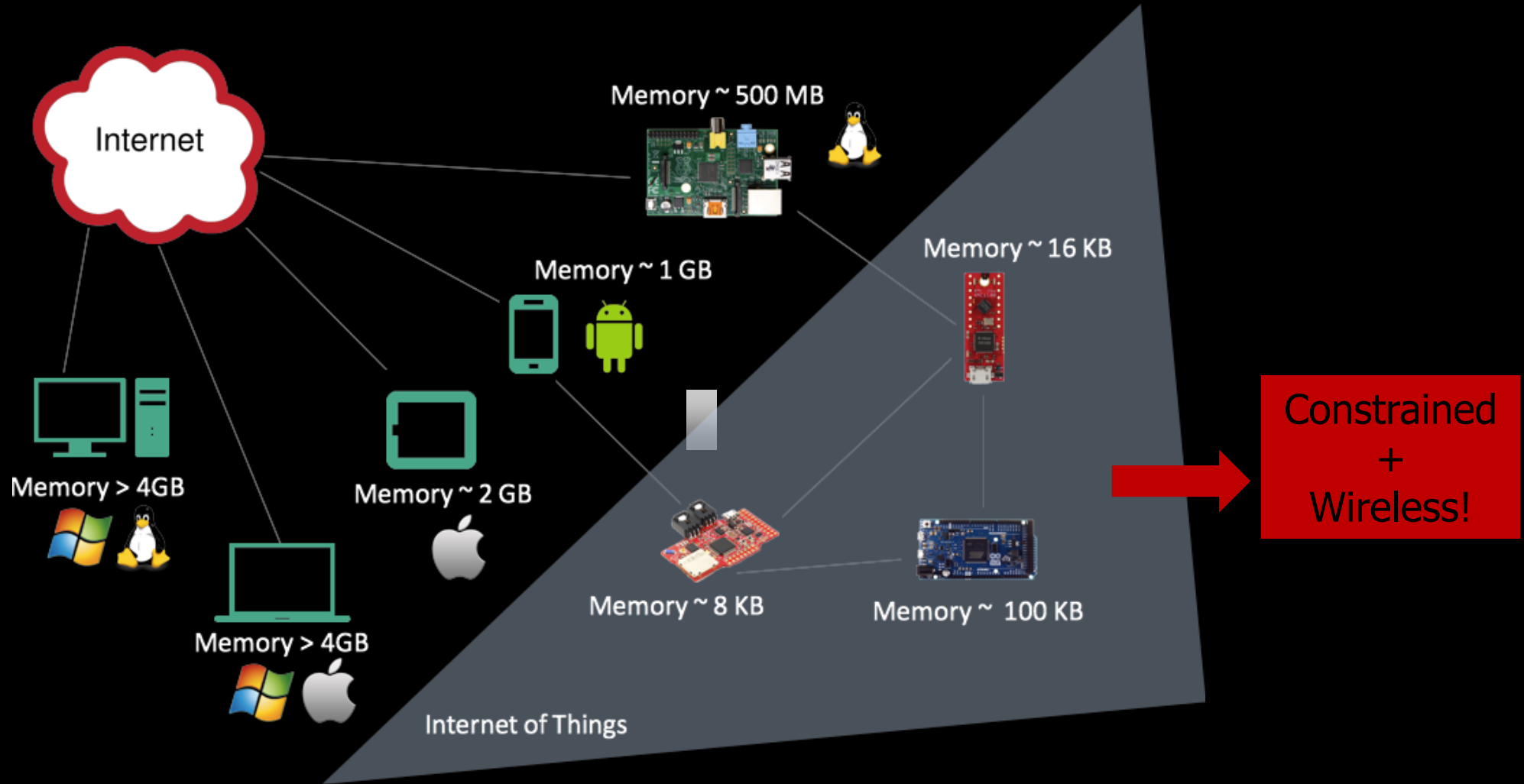
1. Security
2. Privacy
3. Interoperability and standards
4. Legal, regulatory, and rights
5. Emerging economies and development



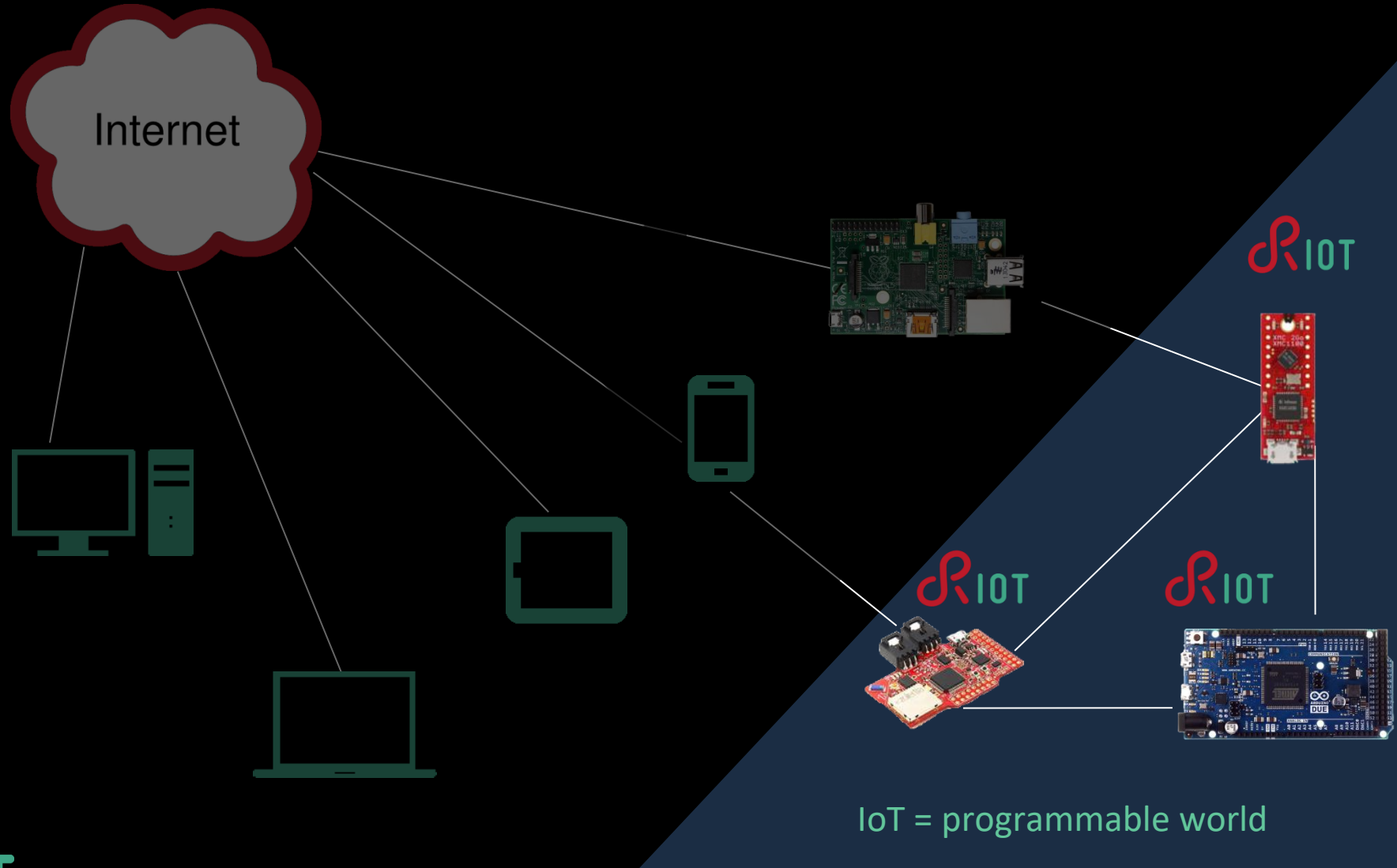
# No Internet without Open Standards



# The Constrained Internet of Things (IoT)



# RIOT: The Friendly OS for the IoT



# RIOT is the friendly OS for ...

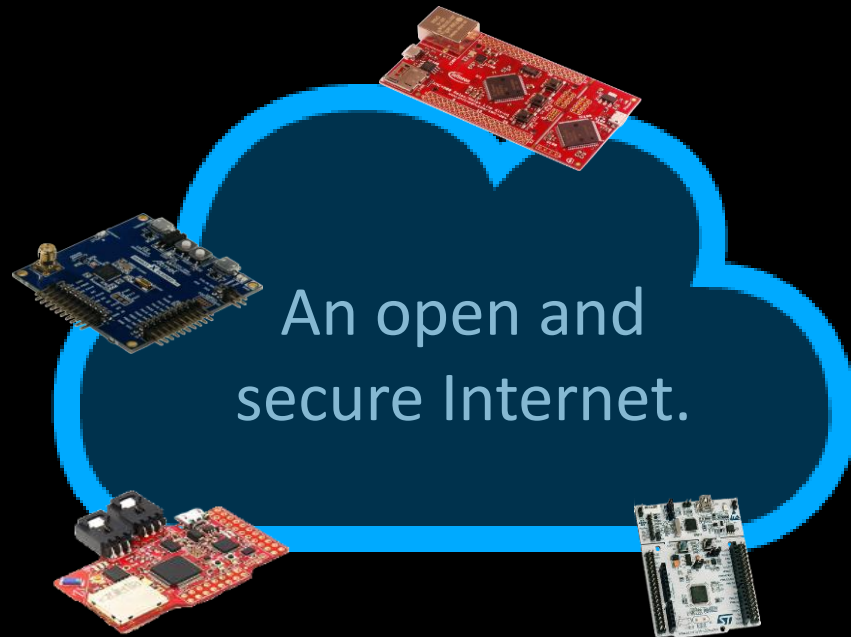
the smaller devices  
8, 16, 32 bit – 10+ kB RAM

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

# 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

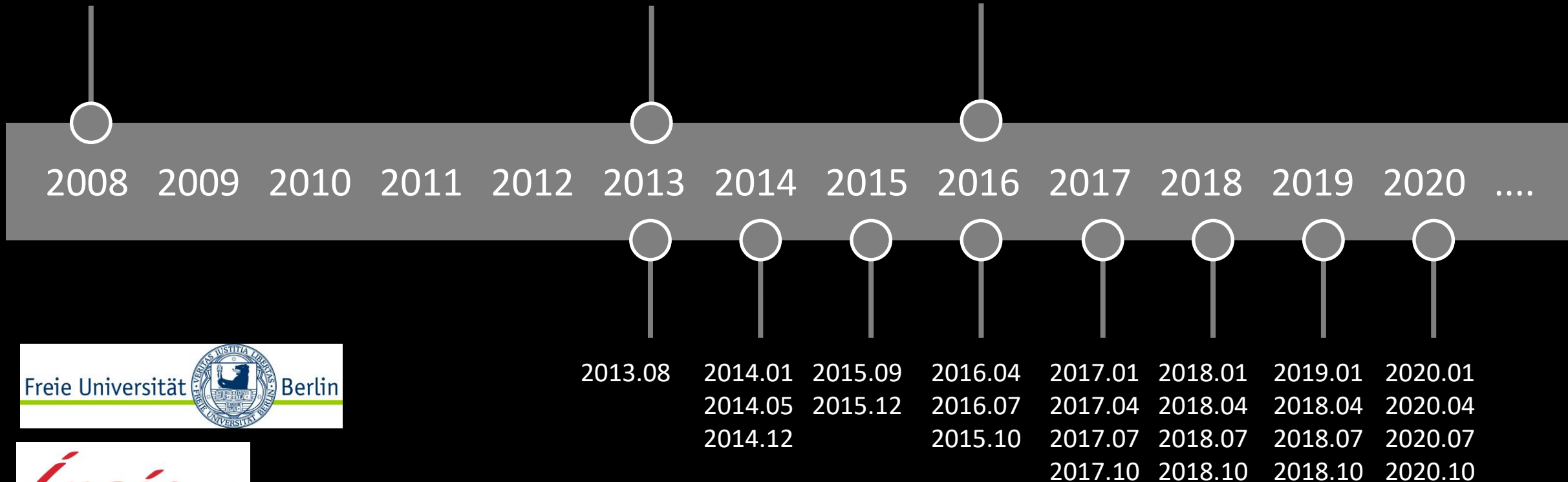


# The History of RIOT

FeuerWhere Project

Branding of 

1st Community Summit



12 years of RIOT – 40 Releases – 9 RIOT Summits

# The RIOT Ecosystem

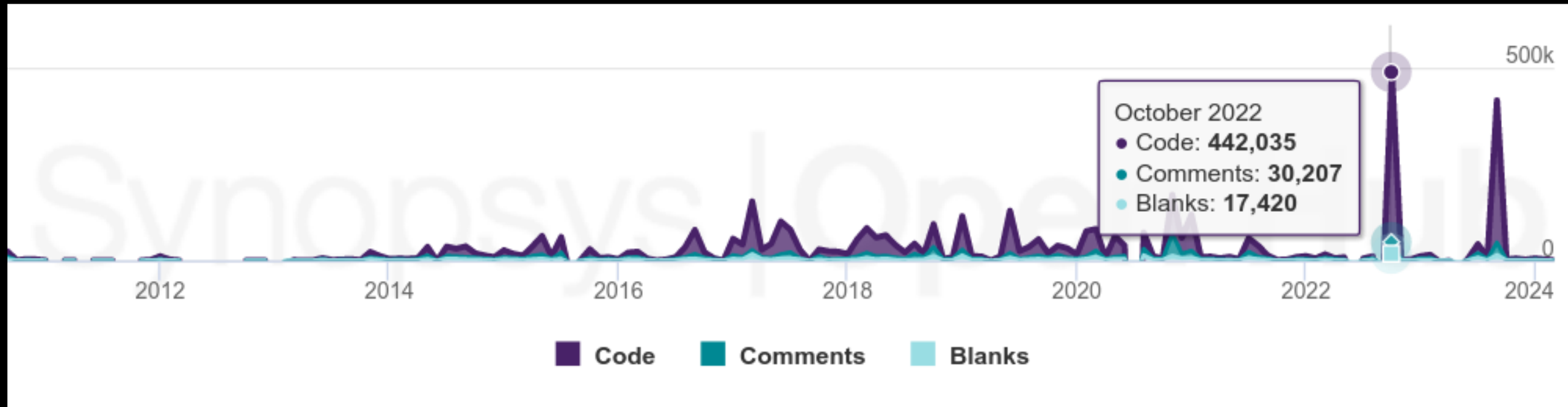
Community follows the IETF spirit.

Rough consensus and running code!

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



# Development of code on Github



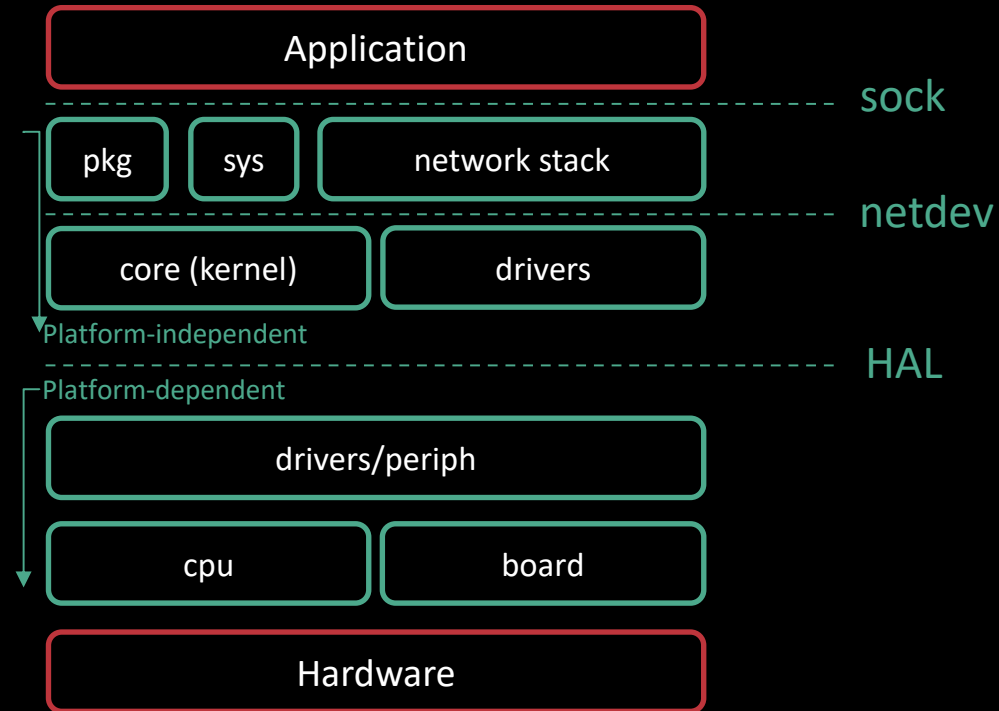
# Some commercial supporters



# An active and strong community

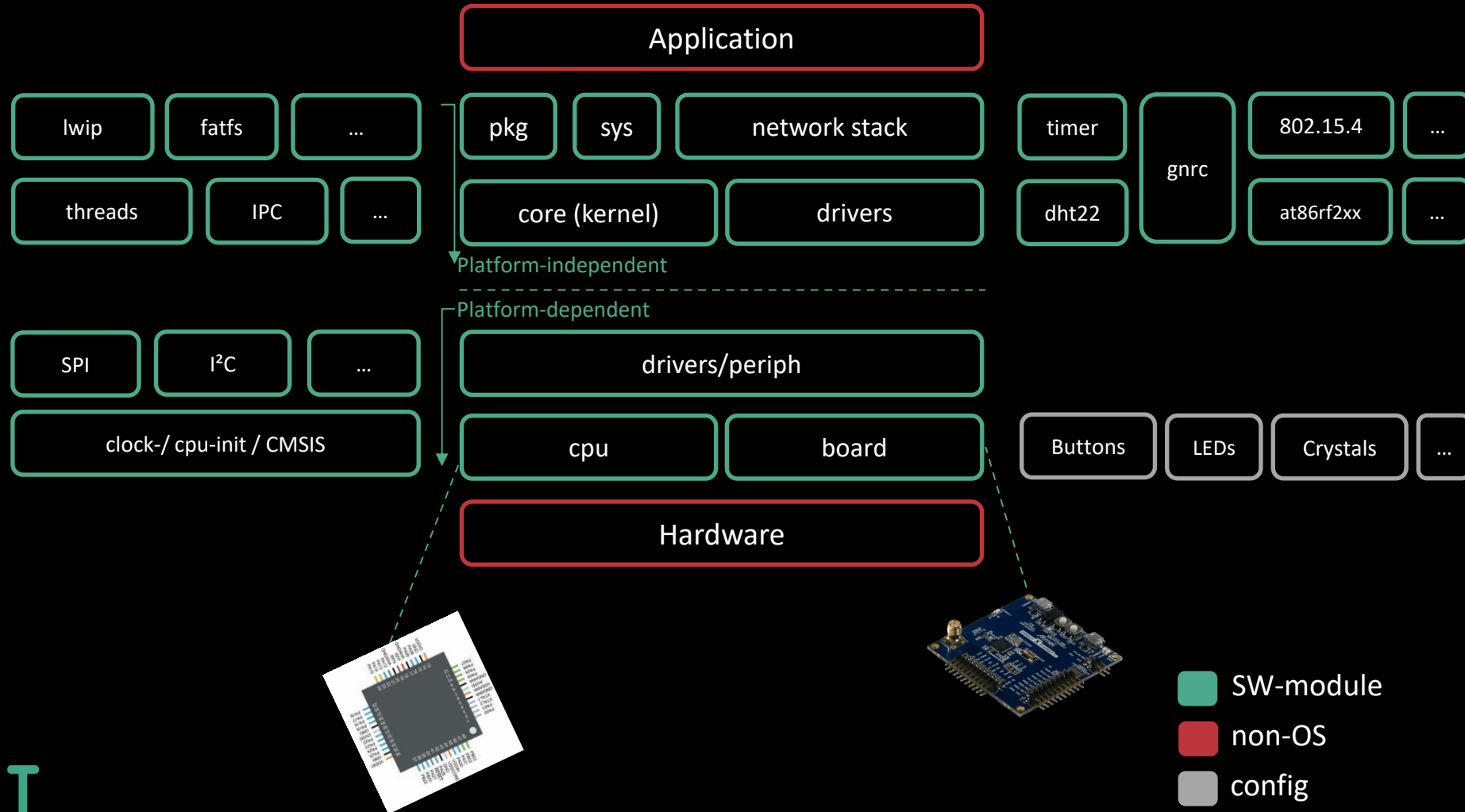


# RIOT Software Components

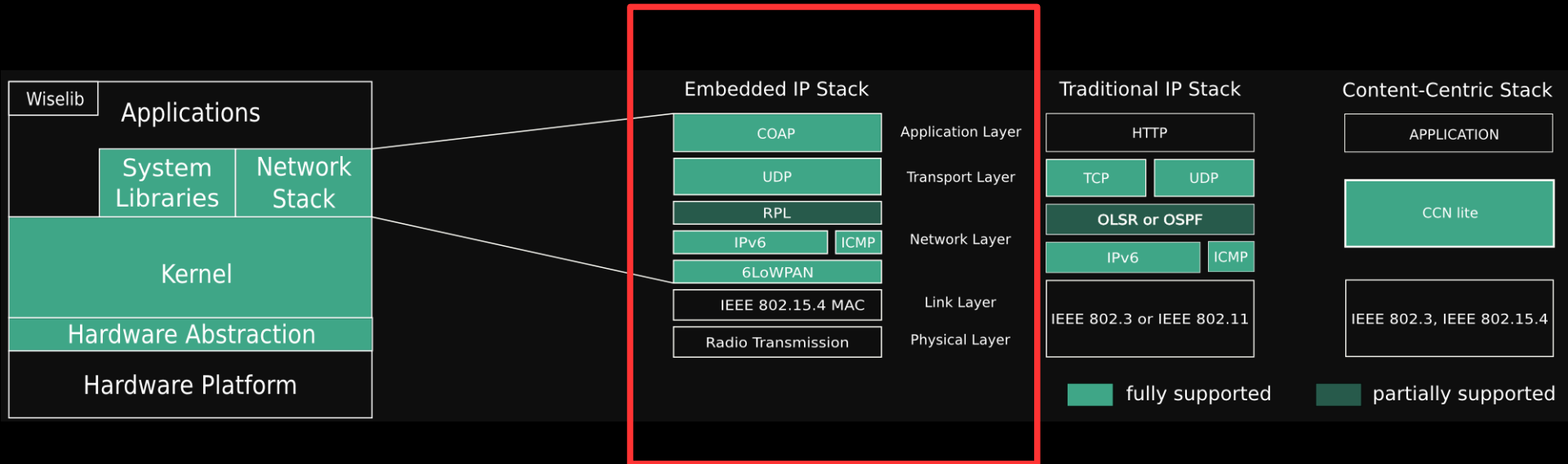




# RIOT Software Components (2)



# RIOT: Built to connect



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



# 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



# Four Milestones

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



# Final Presentation



# Project Organization

Binding project plan:

<https://www.inet.haw-hamburg.de/teaching/ss-2025/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)

