



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)*

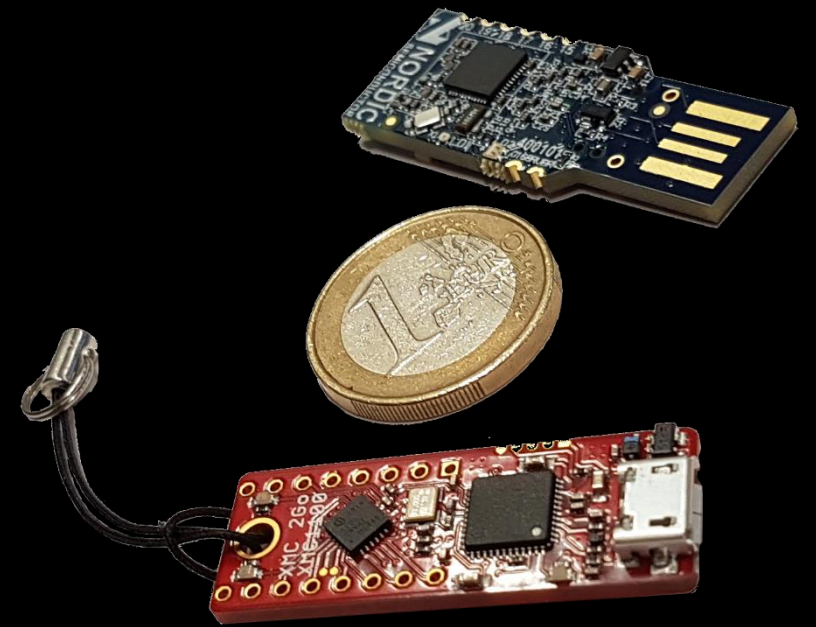
Key aspects:

- 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



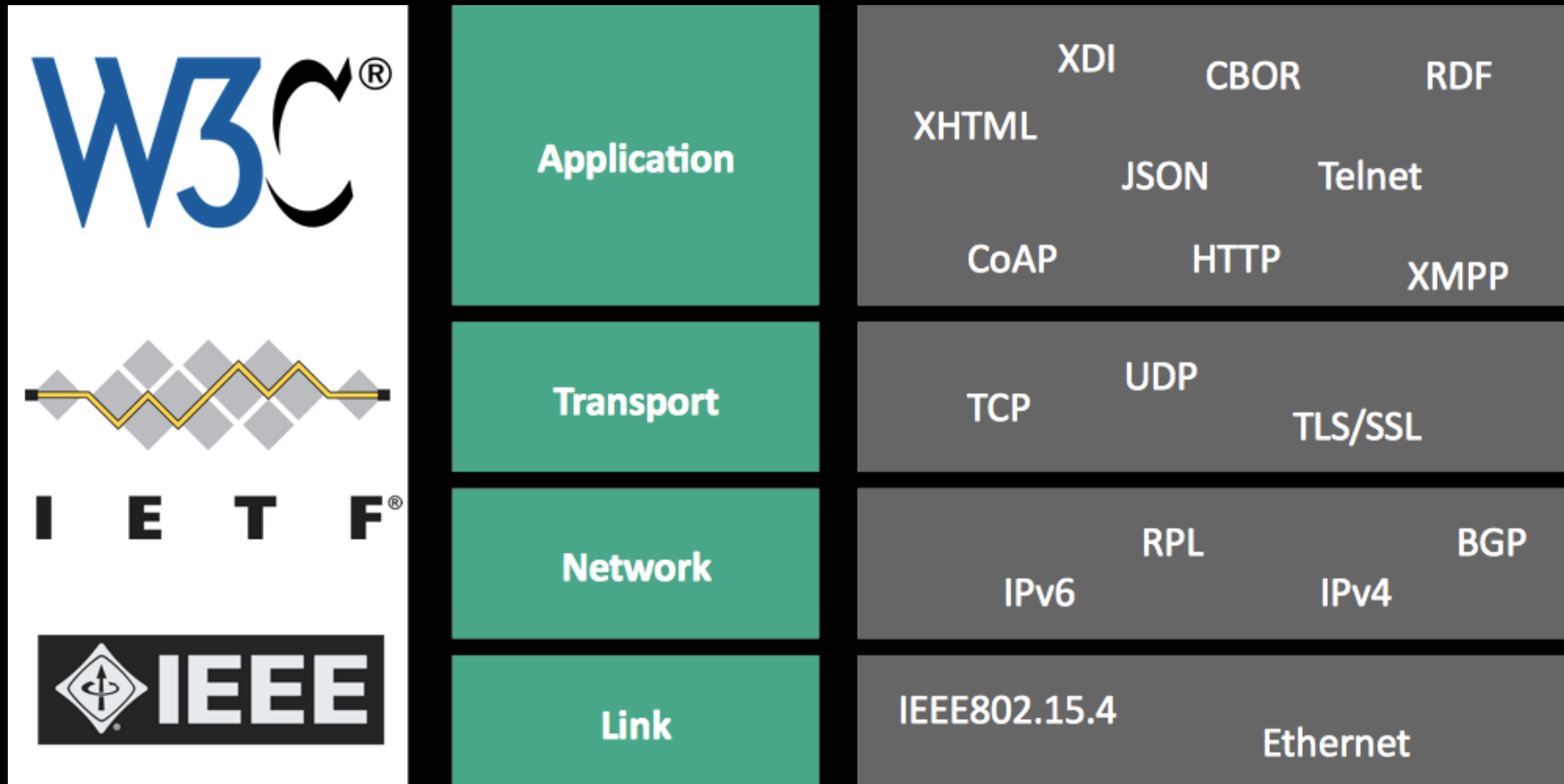
# IoT Challenges

The five key issue areas identified by ISOC:

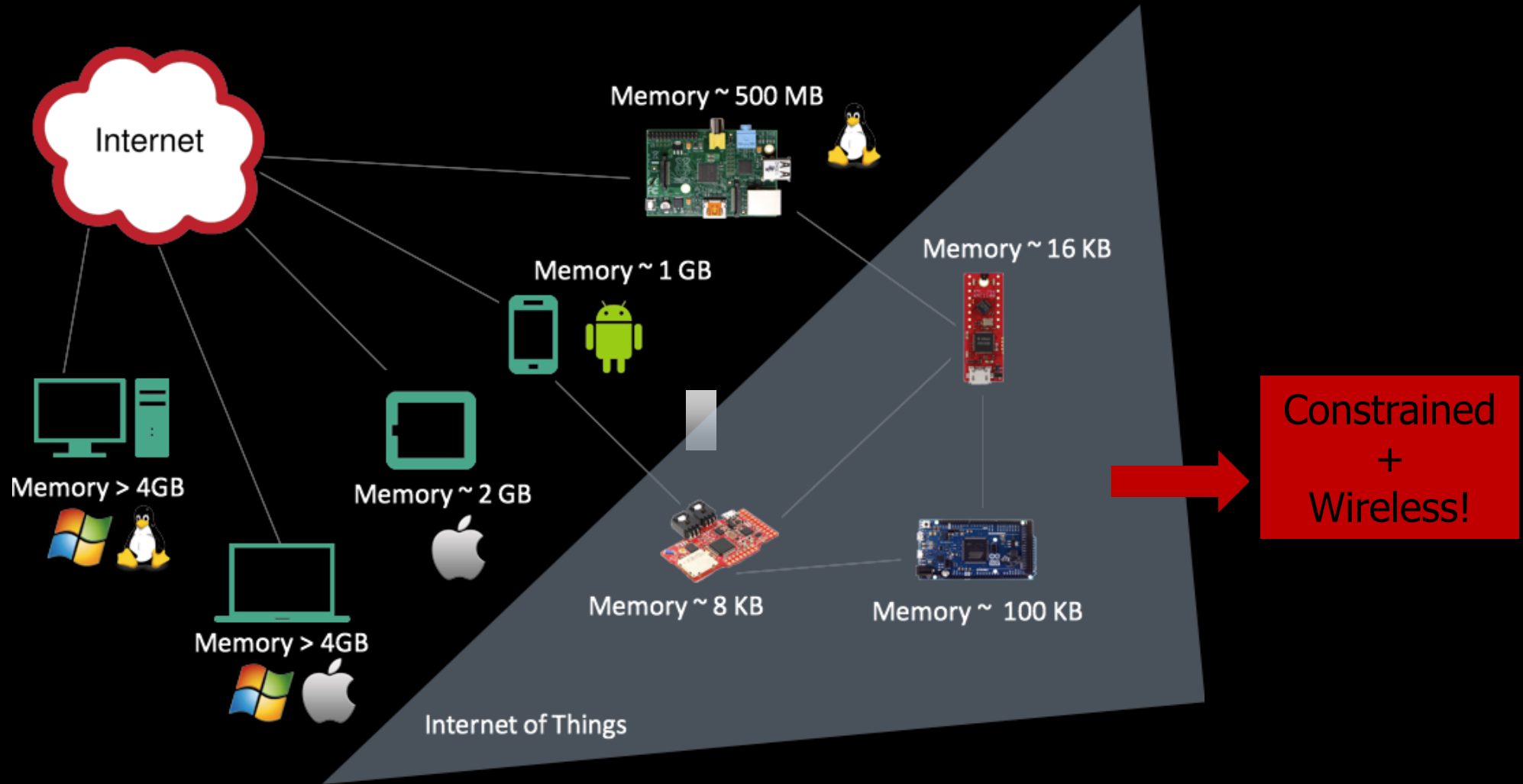
1. Security
2. Privacy
3. Interoperability and standards
4. Legal, regulatory, and rights
5. Emerging economies and development



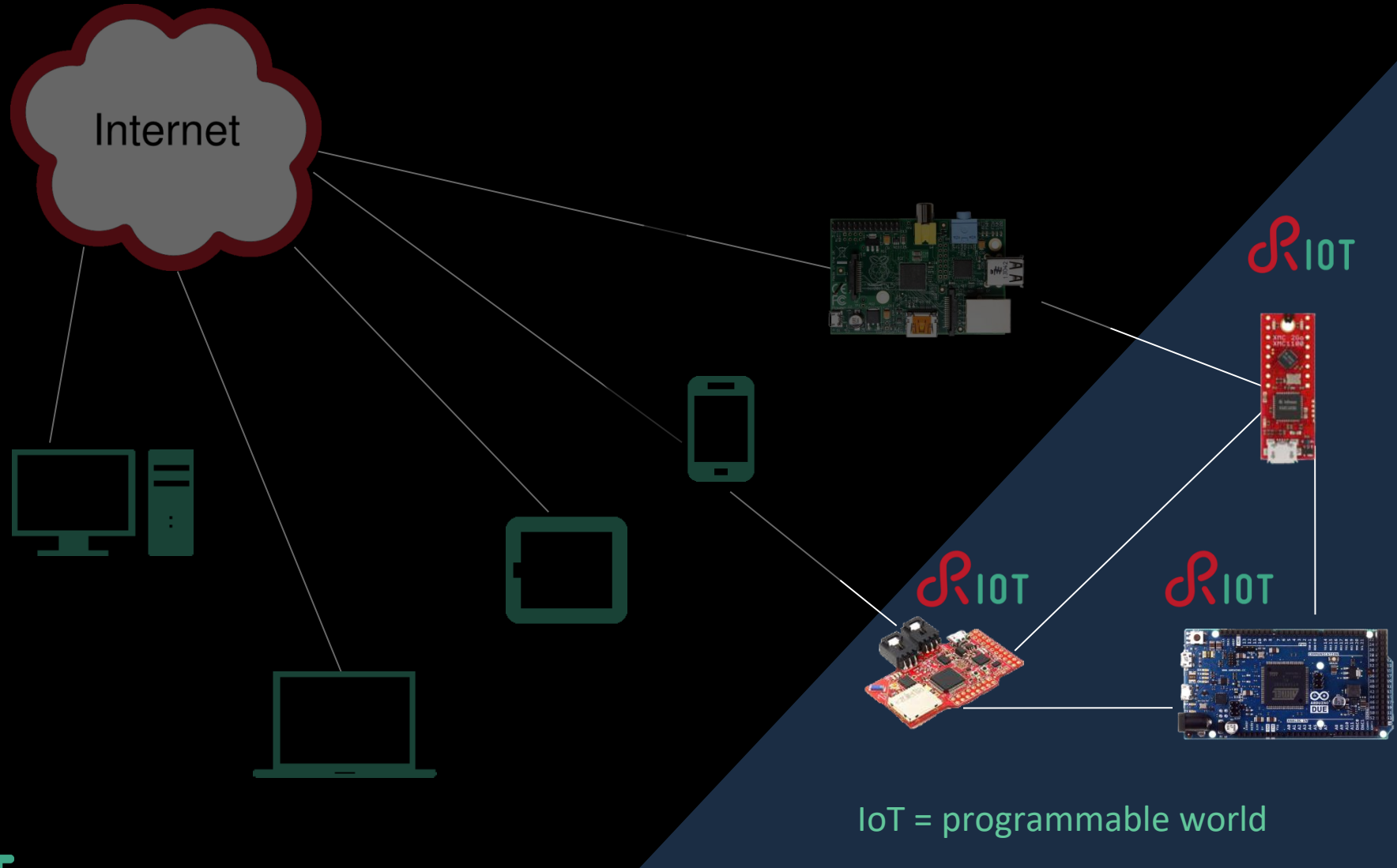
# No Internet without Open Standards



# The Constrained Internet of Things (IoT)



# RIOT: The Friendly OS for the IoT



# RIOT is the friendly OS for ...

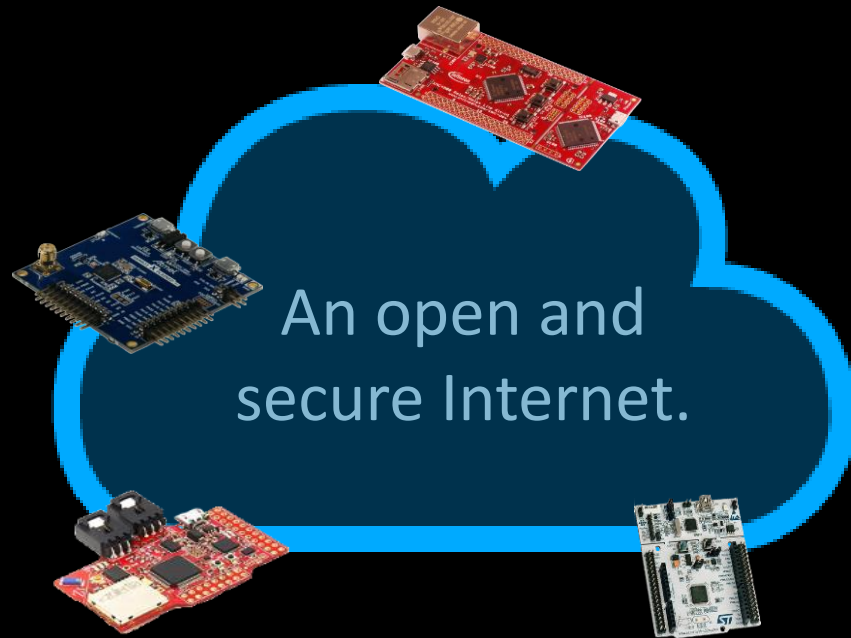
the smaller devices  
8, 16, 32 bit – 10+ kB RAM

the better hardware support  
> 200 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

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 ....



2013.08	2014.01	2015.09	2016.04	2017.01	2018.01	2019.01	2020.01
	2014.05	2015.12	2016.07	2017.04	2018.04	2018.04	2020.04
	2014.12		2015.10	2017.07	2018.07	2018.07	2020.07
				2017.10	2018.10	2018.10	2020.10

10 years of RIOT – 32 Releases – 7 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



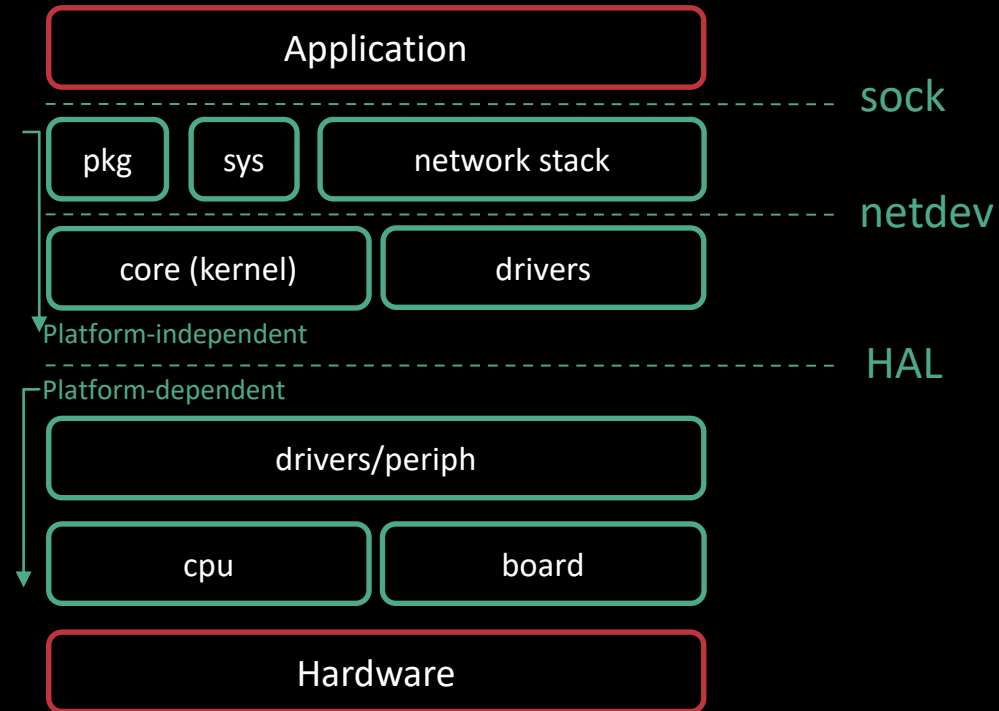
# Some commercial supporters





# An active and strong community

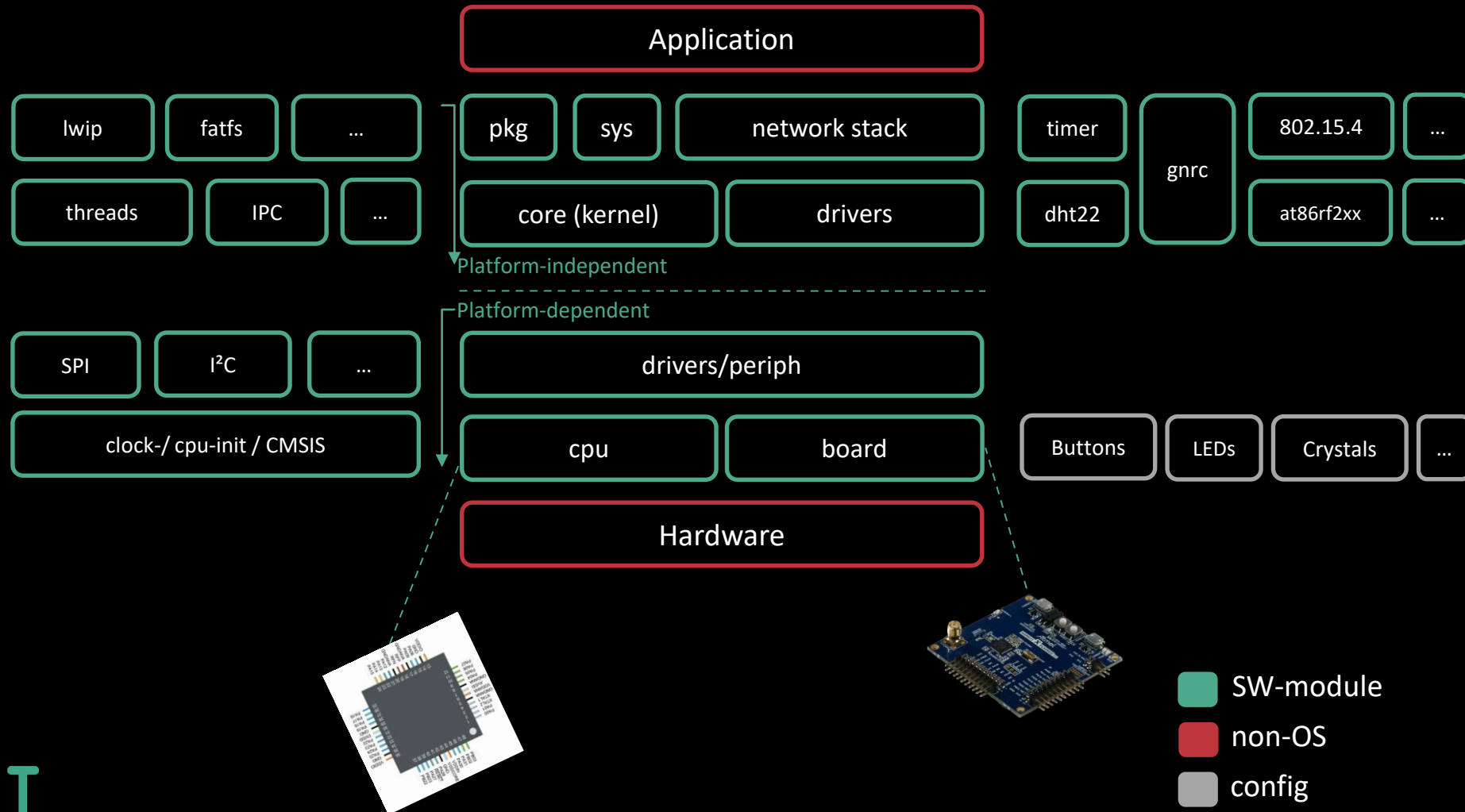


# RIOT Software Components



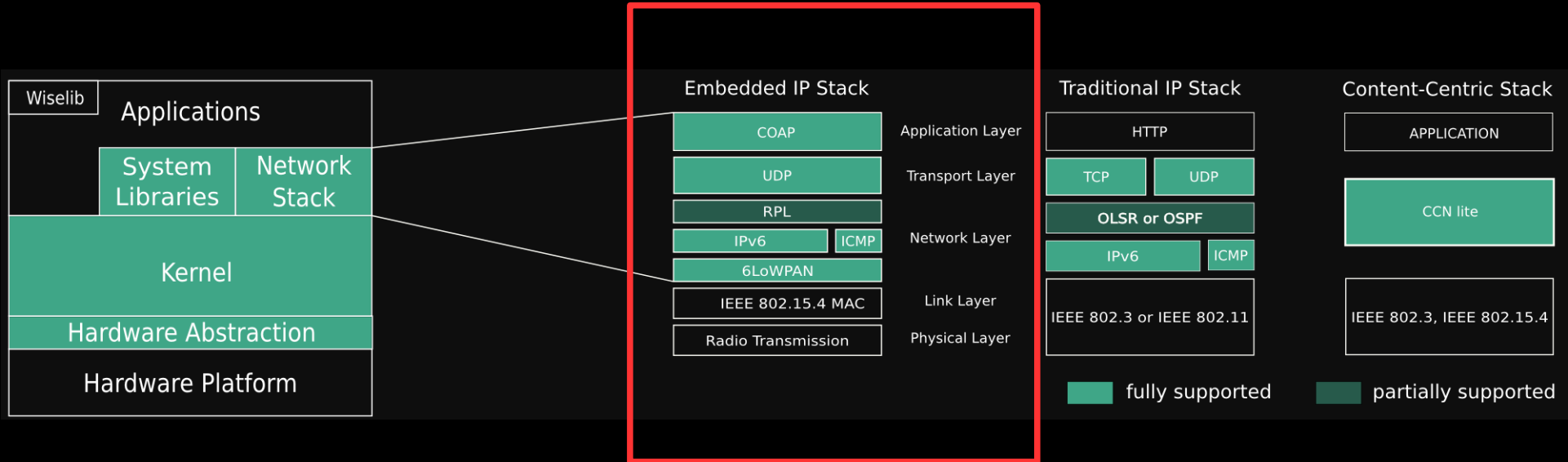
 SW-module  
 non-OS

# 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

# Three Milestones

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

# Final Presentation

