SODA: 6TiSCH Open Data Action

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SODA: 6TiSCH Open Data Action

- One-year project led by University of Montenegro
- ”Large experiment” on FED4FIRE+ federation of testbeds
- Partners: Sorbonne Université, France and iMec, Belgium
- External partners and consultants: Inria-Paris, RISE-SICS and Cisco

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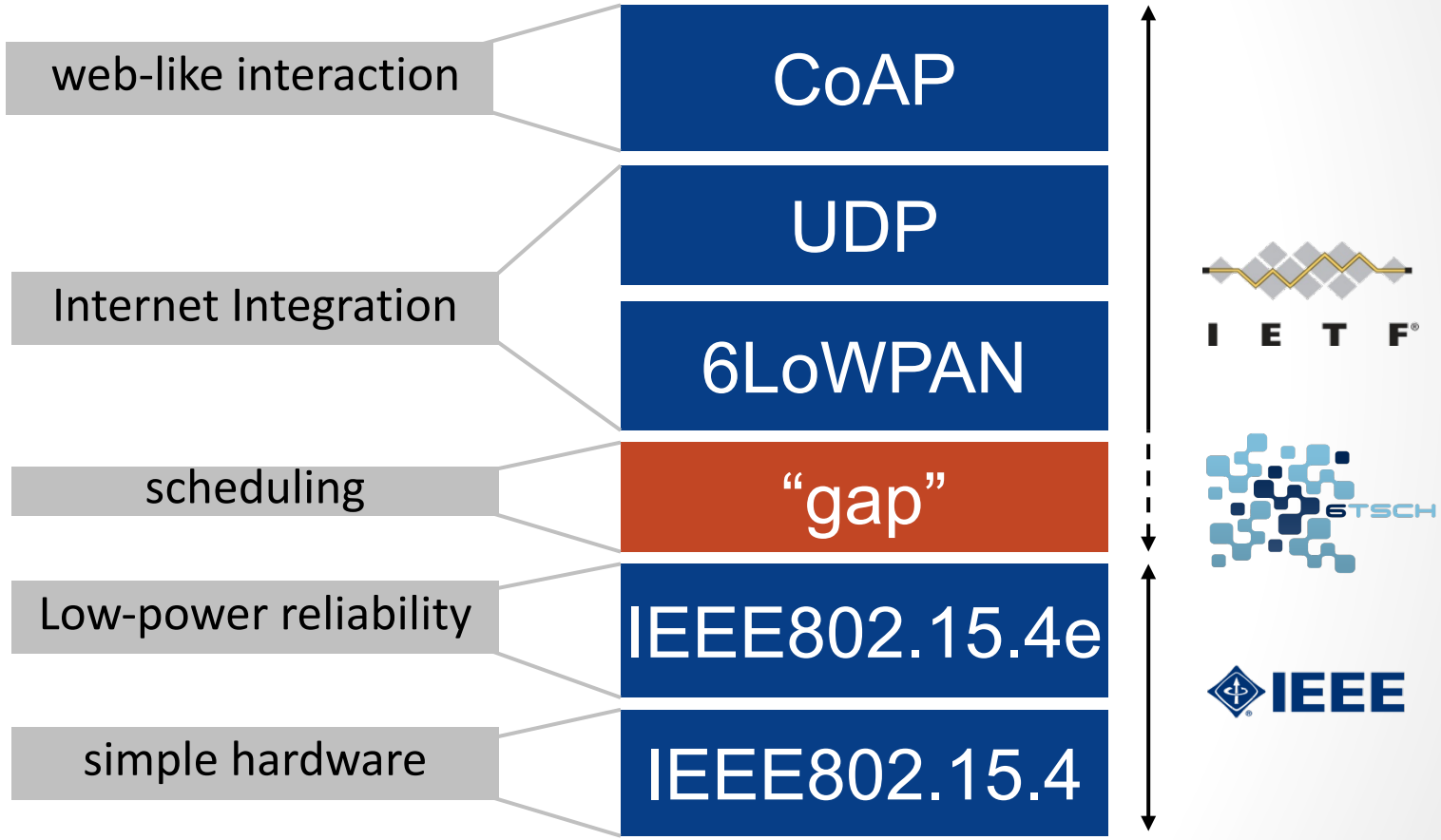
Benchmark 6TiSCH as standardized in the IETF, provide tools for “continuous delivery benchmarking”.

6TiSCH Overview

- **IPv6 over Time Synchronized Channel Hopping (TSCH)**
- **Scheduled communication**
- **Existing deployments of WirelessHart, ISA100.11a**
- **Five-nines reliability demonstrated**



SODA: A Benchmark

- Test scenario(s)
- Set of KPIs
- Test environment(s)
- 6TiSCH implementation

Test scenario(s)

Parameter	Challenge
Number of nodes	Upper-bound set by a testbed
Application traffic pattern and load	Within firmware
Coverage requirement (e.g. in number of hops)	Testbed-dependent transmit power
Interference pattern and load	Testbed-dependent

TABLE I
A TEST SCENARIO.

- Define scenarios corresponding to industry-relevant use cases
  - Smart Factory
  - Smart City
  - Smart Agriculture

Set of KPIs

- We know by now the industry-relevant KPIs
  - End-to-end reliability
  - Latency
  - Radio duty cycle
  - Network formation time (important from the installation point of view)
- We want our tools to be used by researchers
  - Other KPIs?

Test environment(s)

- IoT-lab Testbed
  - Saclay, France
  - most-realistic propagation conditions of all IoT-lab sites
  - STM32F + AT86RF231 radio
  - Slow hardware-accelerated encryption -> no link-layer security with default timings
- w-iLab.t Testbed
  - Ghent, Belgium
  - Zolertia Re-Motes (CC2538-based)
- The 6TiSCH Simulator
  - https://bitbucket.org/6tisch/simulator
  - Python-based discrete-event simulator
  - Quick performance estimation

w-iLab.t facilities

6TiSCH Implementation

- We will use OpenWSN
  - http://openwsn.org
  - ETSI's reference implementation of 6TiSCH
  - Up to date with latest developments in IETF 6TiSCH
  - Protocol stack with a lightweight scheduler
  - Demonstrated integration with other operating systems
    - RIOT
    - FreeRTOS

Experimentation Tools

- *A user should ideally select a scenario, upload/select a firmware image, and click "play" [1].*
  - We want to make it happen for 6TiSCH
  - Web page allowing to
    - Select a scenario, upload firmware, select a testbed, click "play", receive an email that your results are ready.
- Over-the-air statistics collection module for OpenWSN
  - Bypass testbed-specific serial logging
  - Gather the information required and send periodically over the network
- Define APIs and data format for other implementations of 6TiSCH to be easily integrated
  - If you want to integrate your implementation of 6TiSCH with our tools, reach out!

[1] Duquennoy et al., "A benchmark for low-power wireless networking," in Proceedings of the 14th ACM Conference on Embedded Network Sensor Systems. ACM, 2016, pp. 332–333.

Users

- Research community
  - Allow the proposed optimizations to be evaluated quickly, using standardized methodology
  - Share the results or keep them proprietary
- Standards bodies
  - IETF 6TiSCH needs feedback to improve the next generation of standards
- Industry
  - *Does 6TiSCH meet my requirements?*

Community Involvement

- Scenario definition
  - *Are we missing some important parameter to describe a scenario?*
- Development process
  - *How to best capture the firmware development and corresponding network debugging within a generic graphical interface?*
- Staying up to date
  - *How to ensure that the benchmark and the tools are up-to-date with the state of 6TiSCH standards and trending research topics?*
- Extending our tools
  - Additional testbeds?
  - Additional implementations?

Hvala*!

*Thank you!