# IETF 93 Hackathon


www.riot-os.org

# AGENDA

- Overview on RIOT
- Topic: HNCP
- Topic: ICN on RIOT
- Topic: RIOT Networking

# RIOT: Positioning

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

- RIOT requires only a few kB of RAM/ROM, and a 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)

# Meet RIOT

- Free, open source (LGPLv2.1) operating system for constrained IoT devices
  - Write your code in ANSI-C or C++
  - Compliant with the most widely used POSIX features like pthreads and sockets
  - No IoT hardware needed for development
    - Run & debug RIOT as native process in Linux




# RIOT in a Nutshell

- 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

E. Baccelli, O. Hahm, M. Günes, M. Wählisch, T. Schmidt. RIOT OS: Towards an OS for the Internet of Things. In *The 32nd IEEE International Conference on Computer Communications (INFOCOM 2013)*.

H. Will, K. Schleiser, J. Schiller. A Real-Time Kernel for Wireless Sensor Networks Employed in Rescue Scenarios. In *The 34th IEEE Conference on Local Computer Networks (LCN 2009).*

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# Implementing HNCP for RIOT

- Minimal implementation of HNCP (and DNCP) for RIOT
  - draft-ietf-homenet-hncp-07
  - Draft-ietf-homenet-dncp-07

Motivation

- Get a feeling if HomeNet (HNCP) is feasible on severely resource constrained devices

# Goals and Challenges

- Goals:
  - Implement HNCP over UDP using DNCP as library
  - Have RIOT respond to “Request Network State” and “Request Node State” TLVs with “Node-Name” TLV
  - BONUS: Cross-test against *hncpd*
- Challenges:
  - Implement without using dynamic memory allocation
  - Hook directly into RIOT's network stack

    → Start from scratch?!

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# ICN on RIOT

- “CCN-lite, a lightweight implementation of the CCNx protocol and its variations”

- “CCN-lite has been included in the RIOT operating system for the Internet of Things”

# Goals and Challenges

- Goals:
  - Port current CCN-lite to current RIOT
  - Hack together something cool using the new port
- Challenges:
  - Learn how to do low-level networking in RIOT
  - Make CCN-lite use RIOT as a base
  - Come up with a maintainable solution

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# Networking in RIOT

- Fix 6LoWPAN border router in RIOT

# Goals and Challenges

- Goals:
  - Adjust neighbor discovery to cope with multiple interfaces and plain IPv6

- Challenges:
  - Make IPv6 and 6LoWPAN neighbor discovery implementations peacefully co-exist


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