RIOT - 6TiSCH and ICN

IETF94 - Hackathon

Thomas Eichinger and Oliver "Oleg" Hahm

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Agenda

1. Start the RIOT
2. Topic: 6TiSCH
3. Topic: ICN

Agenda

An Operating System for the IoT

"If your IoT device cannot run Linux, then use 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)

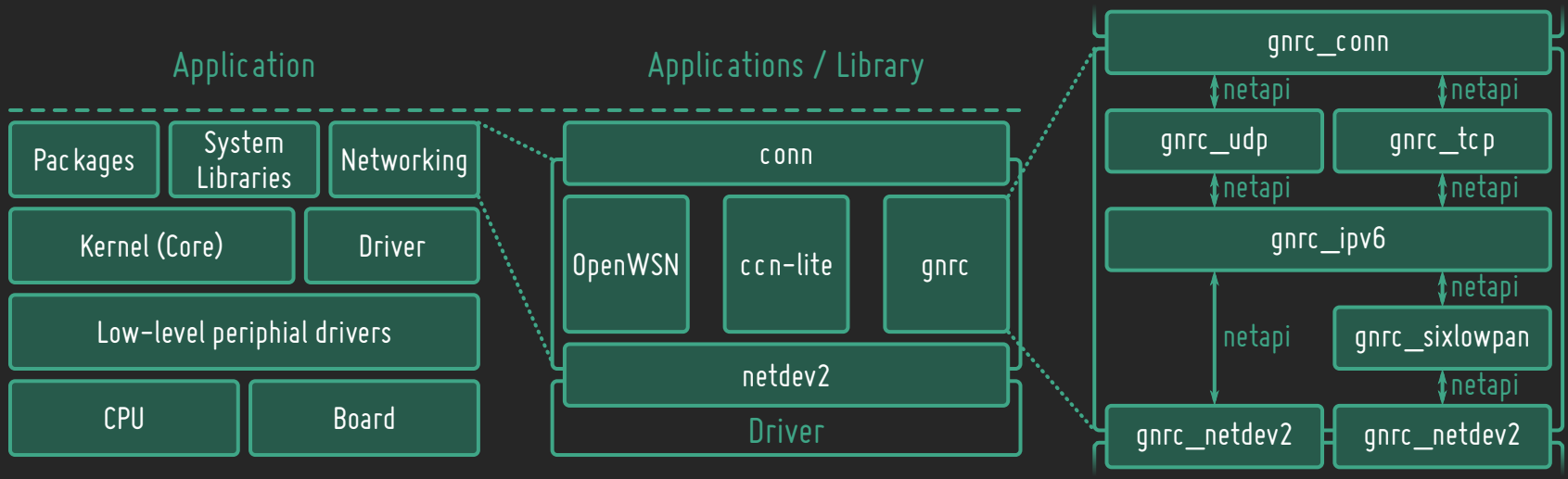
RIOT in a Nutshell

- 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

Open Standards, Open Source

- 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

The Structure



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Goals and Challenges

- Goals
  - Goal 1
  - Goal 2
- Challenges
  - Challenge 1
  - Challenge 2

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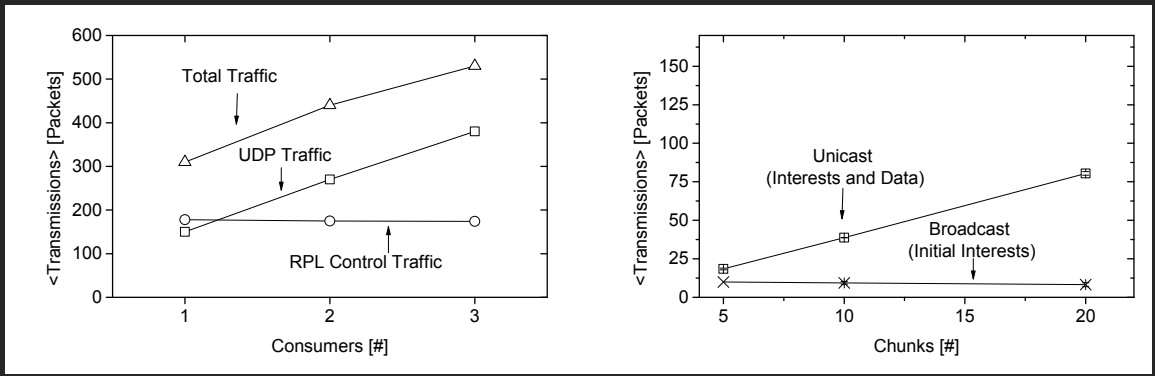
Why using ICN in IoT Scenarios?

- Less complexity and smaller memory footprint in comparison to a full IPv6/6LoWPAN stack
- Increased dependability and decreased energy consumption by in-network caching



Module	ROM	RAM
RPL + 6LoWPAN	53412 bytes	27739 bytes
CCN-Lite	16628 bytes	5112 bytes

ccn-lite - Lightweight CCN Implementation

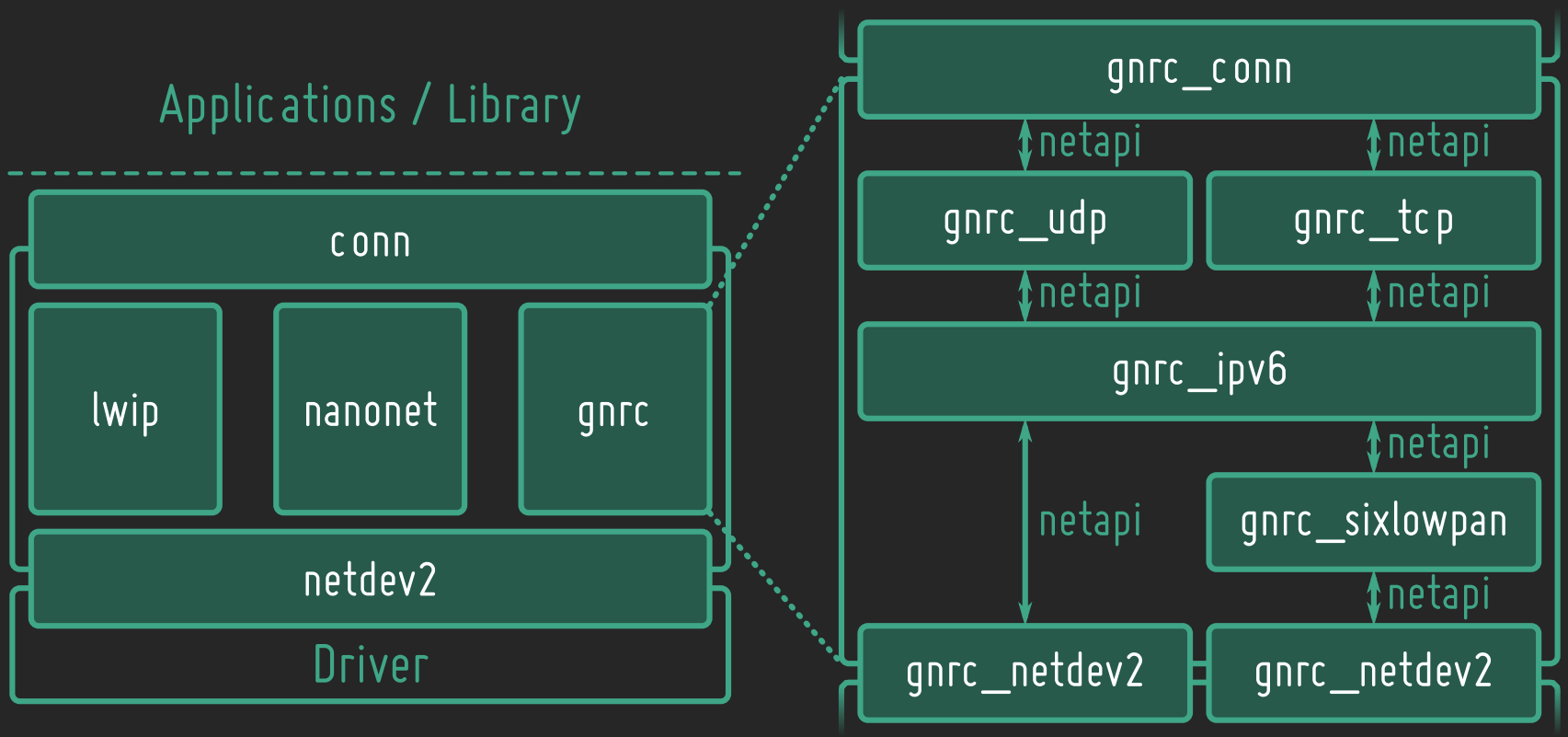
"CCN-lite is a lightweight (no bells & whistles), and functionally interoperable implementation of the Content Centric Networking protocol CCNx of XEROX PARC."

- tiny code base: core has less than 2.000 LoC, pure C, runs over UDP and raw Ethernet
- multiple Platforms: the same code runs in (UNIX) user space, Linux kernel, OMNeT++, Android, Arduino, and Docker
- multiple packet formats: ccnb, NDN, CCNx1.0, IoT-TLV, Cisco-TLV

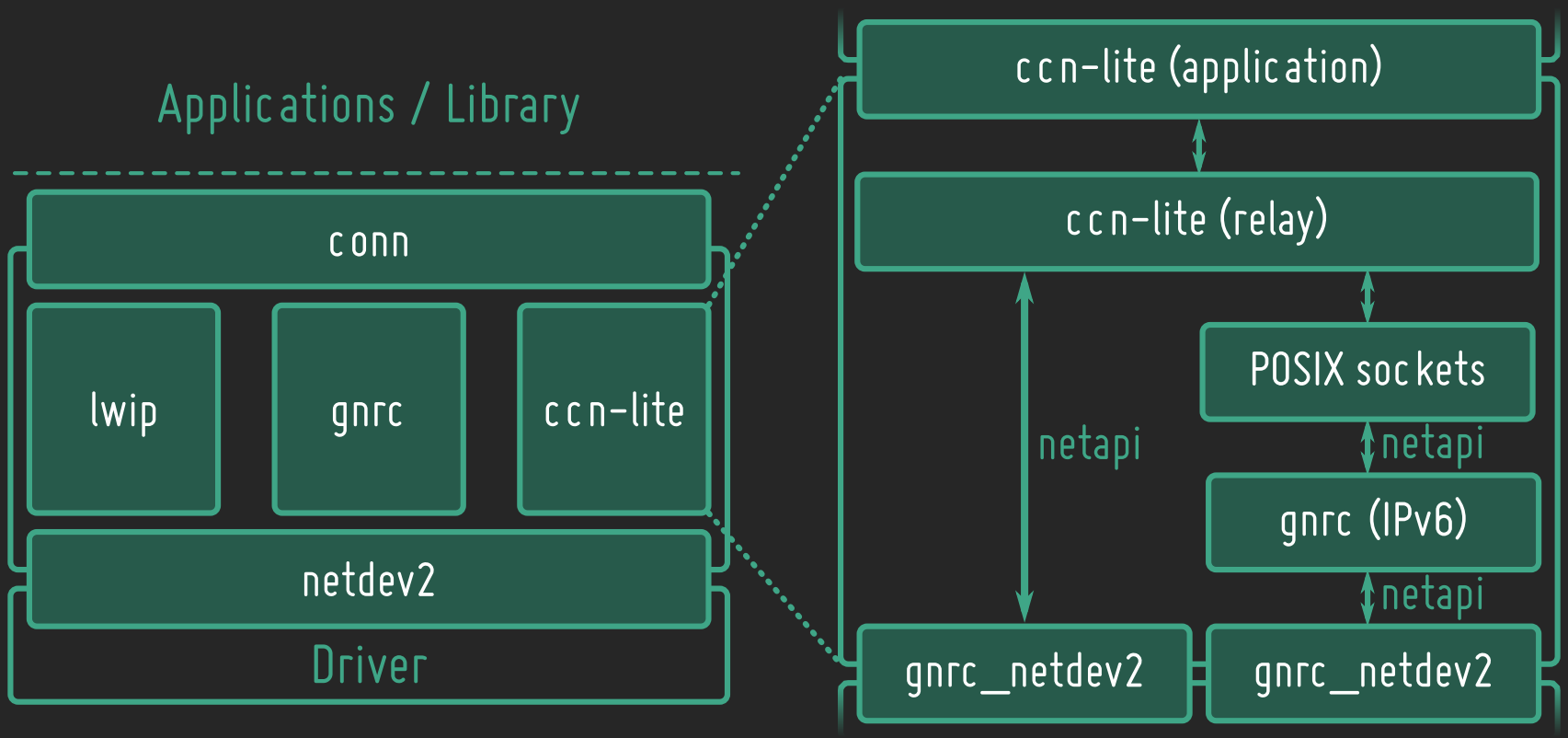
CCN-lite

www.ccn-lite.net

GNRC stack


Applications / Library
conn
lwip
nanonet
gnrc
netdev2
Driver
gnrc_conn
netapi
netapi
gnrc_udp
gnrc_tcp
netapi
netapi
gnrc_ipv6
netapi
netapi
gnrc_sixlowpan
netapi
gnrc_netdev2
gnrc_netdev2

Concept for ccn-lite integration



Goals and Challenges

- Goals
  - CCN over L2
  - CCN over netapi
- Challenges
  - Get to know RIOT's netapi
  - Deal with different address types
  - Come up with a generic solution

www.riot-os.org