CCN-LoWPAN

draft-gundogan-icnrg-ccnlowpan-01

Cenk Gündoğan[1] Thomas Schmidt[1]
Matthias Wählisch[2]
Christopher Scherb[3] Claudio Marxer[3]
Christian Tschudin[3]

[1] HAW Hamburg

[2] Freie Universität Berlin

[3] University of Basel

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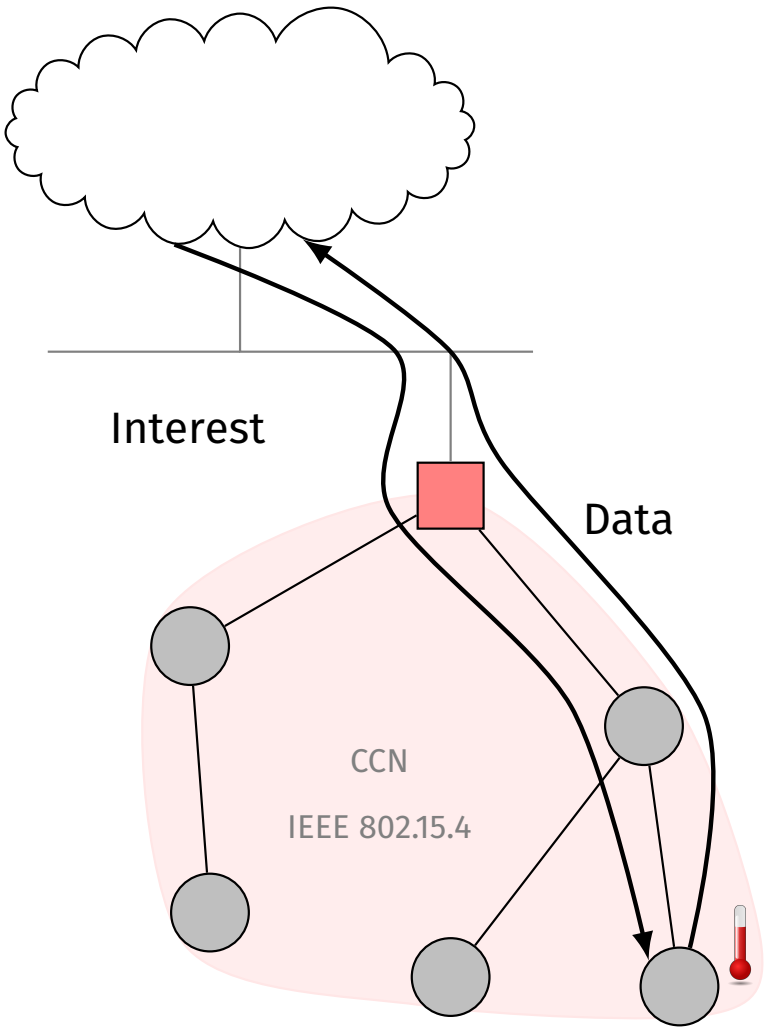
Agenda

Motivation

CCN-LoWPAN

Update & WIP

Motivation: Constrained CCN of Things

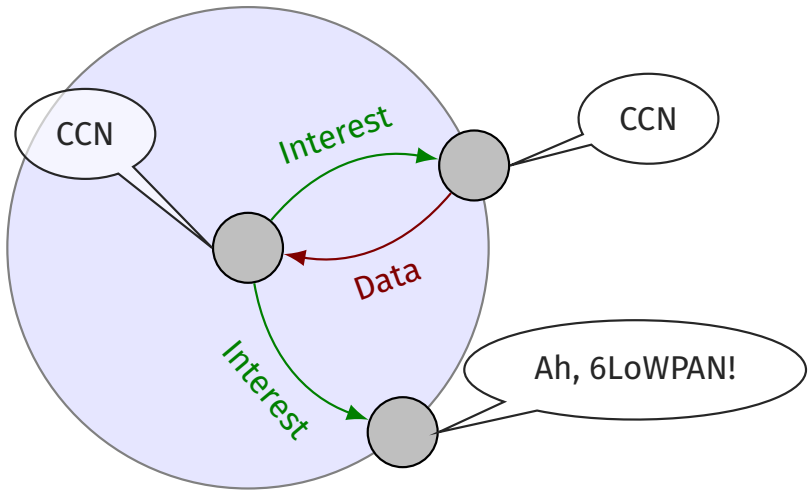


Objectives

- Connect `Things` to CCN
- Native CCN deployment
  - No ICN-over-X or X-over-ICN
- Benefit from caching in LLN
  - Content distribution
  - Retrans. using less hops
  - Longer sleep cycles

Problems: CCN on IEEE 802.15.4

1. No protocol identifier in IEEE 802.15.4 header
   - CCN–`foo` coexistence in wireless medium?
     `foo` $\in \{IPv4, IPv6, 6LoWPAN, \dots\}$



2. Small-sized MTU (127 bytes)
   a) Header overhead for `Interest` and `Data`
      - High verbosity & TLV-based header fields
      - Data: $\approx$ 40 bytes signature and TLVs for SHA-256 with HMAC
   b) No link fragmentation

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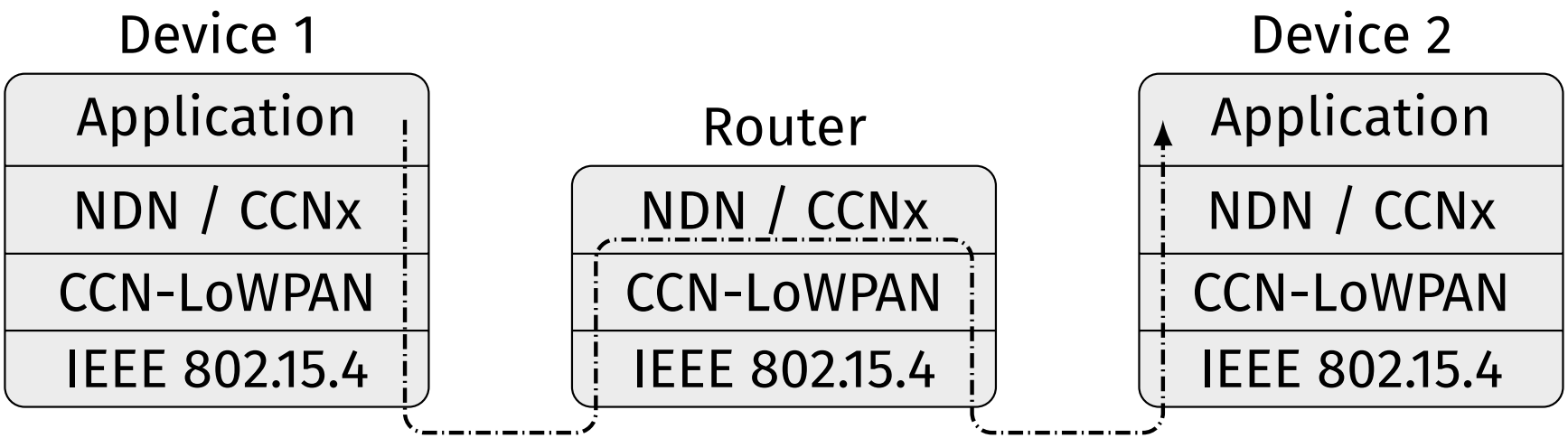
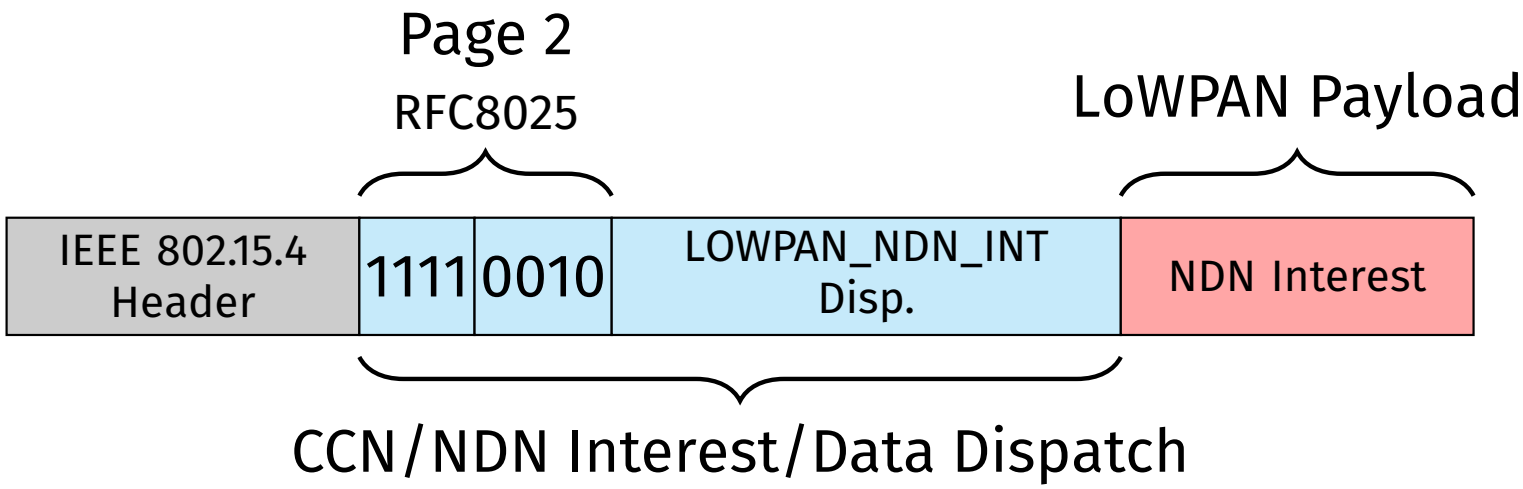
1) IEEE 802.15.4 dispatch types

2a) Packet header compression

2b) Link fragmentation



CCN-LoWPAN – 1) Dispatch Types



- Paging dispatch for orthogonal types to 6LoWPAN

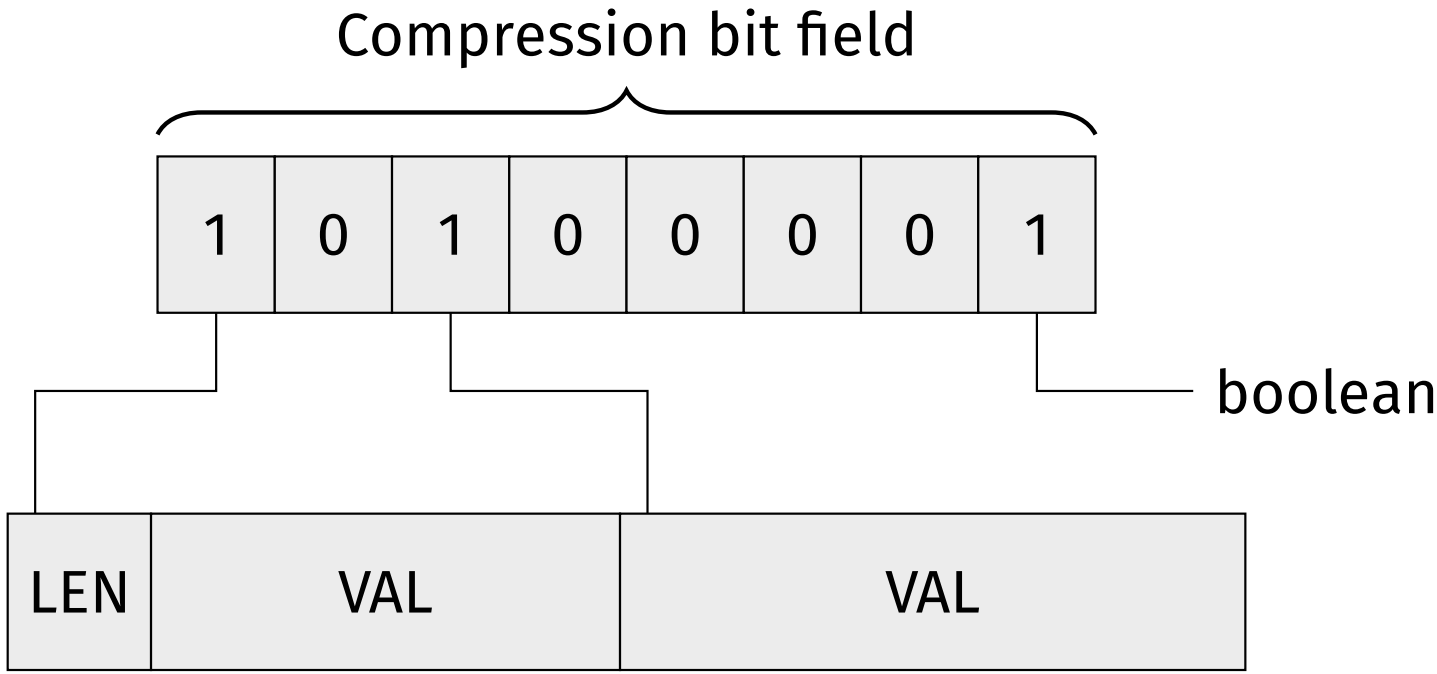
CCN-LoWPAN – 1) New Dispatch Types

Bit Pattern	Page	Header Type
0xxx xxxx	2	LOWPAN_CCNX
0000 0000	2	LOWPAN_CCNX_INT
0000 0xxx	2	reserved
0000 1xxx	2	LOWPAN_CCNX_INT_HC
0001 0000	2	LOWPAN_CCNX_DATA
0001 0xxx	2	reserved
0001 1xxx	2	LOWPAN_CCNX_DATA_HC
...	2	reserved
1xxx xxxx	2	LOWPAN_NDN
1000 0000	2	LOWPAN_NDN_INT
1000 0xxx	2	reserved
1000 1xxx	2	LOWPAN_NDN_INT_HC
1001 0000	2	LOWPAN_NDN_DATA
1001 0xxx	2	reserved
1001 1xxx	2	LOWPAN_NDN_DATA_HC
...	2	reserved

CCN-LoWPAN – 2a) Packet Header Compression

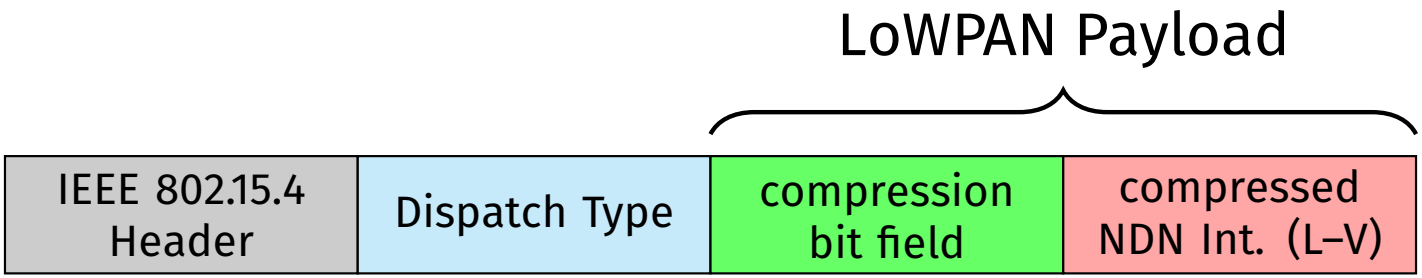
Compression Scheme

- Compression bit field marks presence of TLVs



- Remove LEN for fixed-length TLV, e.g. `Nonce`, `Signature`
- Remove TYP, VAL for boolean values, e.g. `MustBeFresh`

CCN-LoWPAN – 2a) NDN Compr. Interest Example



- compression bit field and compressed NDN Interest
- CCN-LoWPAN parser decompresses NDN Interest
  - $\Rightarrow$ CCN-LoWPAN parser consumes compression bit field
  - $\Rightarrow$ NDN parser consumes decompressed NDN Interest

CCN-LoWPAN – 2a) Extensibility

TLV Support

- CCNx / NDN support overwhelming amount of TLVs
- Few TLVs are defined, remaining ID-fields reserved

Current State

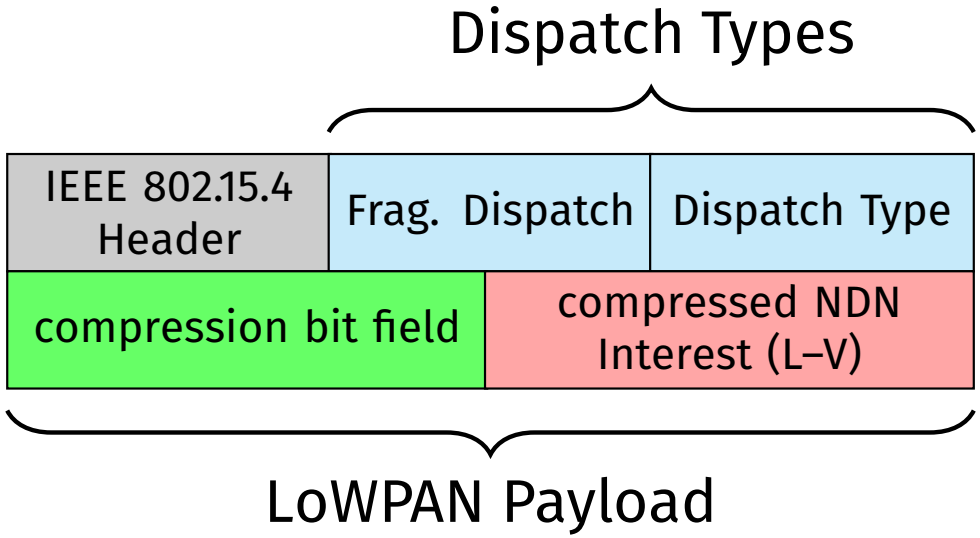
- Compression defined for existing TLVs of CCNx and NDN
- Custom / organizational TLVs remain decompressed

Compression Extensibility

- CCN-LoWPAN reserves further dispatch types
- Define flexible compression bit field (Work-In-Progress)

CCN-LoWPAN – 2b) Link Fragmentation

- Hop-by-Hop link fragmentation for IEEE 802.15.4 MTU
  - Link fragmentation for header and payload
  - In contrast: packet fragmentation for payload (routable)



- Fragmentation dispatch of 6LoWPAN is reused
- Packet is reassembled by IEEE 802.15.4 LoWPAN parser
- CCN-LoWPAN parser receives reassembled packet

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Update & WIP

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Update since -00

- Editorial restructuring
- Added theoretical evaluation
- Reordered dispatch types table
- Extended compression bit field for `signature` TLVs

Work-In-Progress

- Integrate `LEN` into compression bit field
- Stateful compr.: Name compr. and prefix eliding
- Evaluate applicability of GHC
- Implementation in RIOT & CCN-lite