

# CCN-LoWPAN

draft-gundogan-icnrg-ccnlowpan-00

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July 29, 2017

# Agenda

Motivation

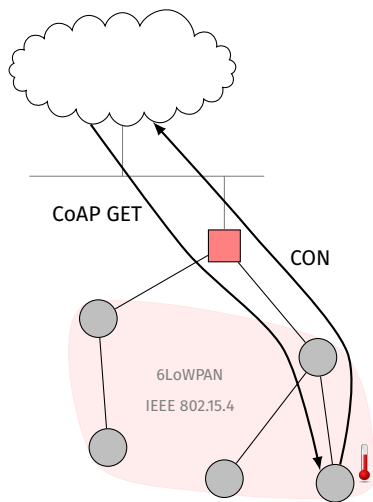
CCN-LoWPAN

Wrap Up

# Scenario: Constrained Internet of Things

## Objectives

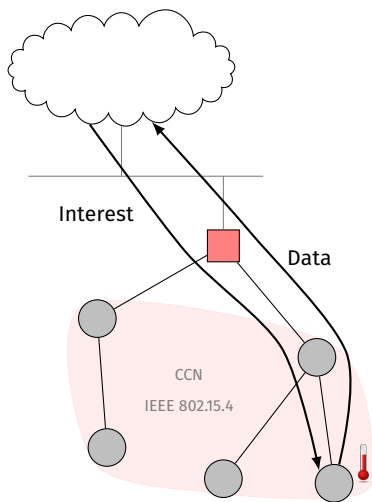
- ▶ Connect Things to Internet
- ▶ IEEE 802.15.4
  - ▶ 127 bytes MTU
  - ▶ 102 bytes max. frame size
  - ▶ AES-CCM-128 ⇒ **81 bytes**
- ▶ 6LoWPAN / RoLL / CoRE / T2TRG
  - ▶ IPv6 adaptation (6LoWPAN)
  - ▶ 6LoWPAN compr. & frag.
  - ▶ IPv6 ND ⇒ 6LoWPAN ND
  - ▶ RPL
  - ▶ CoAP



# Scenario: Constrained CCN of Things

## Objectives

- ▶ Connect Things to CCN
- ▶ IEEE 802.15.4
  - ▶ 127 bytes MTU
  - ▶ 102 bytes max. frame size
  - ▶ AES-CCM-128 ⇒ **81 bytes**
- ▶ Benefit from caching in LLN
  - ▶ Longer sleep cycles
  - ▶ Retrans. with less hops
- ▶ CCN all the way



# Problem: CCN on IEEE 802.15.4

## Problems

- ▶ No protocol identifier in IEEE 802.15.4 header
  - ▶ CCN-foo coexistence in wireless medium?  
 $foo \in \{IPv4, IPv6, 6LoWPAN, \dots\}$
- ▶ Small-sized MTU of 127 bytes ( $\approx$  81 bytes payload)
  - ▶ Length of Names
  - ▶ Verbose packet headers (TLVs)
  - ▶  $\approx$  40 bytes signature in Data packet
- ▶ No link fragmentation

# Agenda

Motivation

**CCN-LoWPAN**

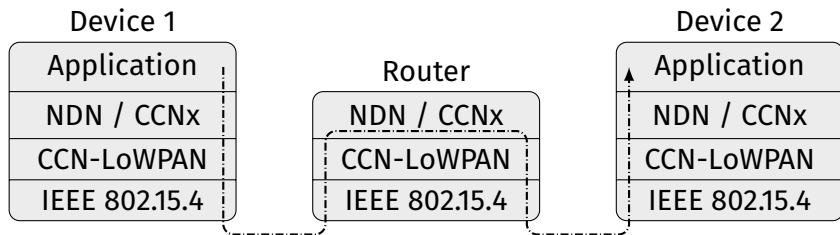
Wrap Up

# CCN-LoWPAN

1) Dispatch types for  
CCNx / NDN

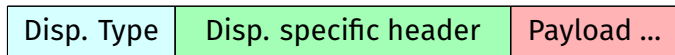
2) Packet header  
compression

3) Link  
fragmentation  
(6LoWPAN)

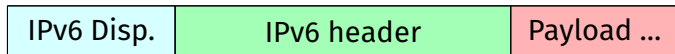


# CCN-LoWPAN: 1) Dispatch Types (6LoWPAN)

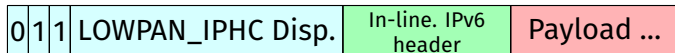
## LoWPAN Dispatch Format



## LoWPAN encapsulated IPv6



## LoWPAN encapsulated IPv6 (compressed)





## CCN-LoWPAN: 1) Existing Dispatch Types (RFC8025)

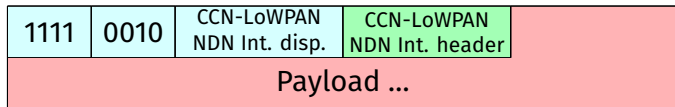
Bit Pattern	Header Type	Page
00 xxxxxx	NALP	0
	Unassigned	1-14
	Reserved	15
01 000000	ESC	0
	Unassigned	1-14
	Reserved	15
...	...	...
01 1xxxxx	LOWPAN_IPHC	0-1
	Unassigned	2-14
	Reserved	15
...	...	...
11 11xxxx	Page Switch	0-15

## CCN-LoWPAN: 1) New Dispatch Types

Bit Pattern	Header Type	Page
0000 0000	Uncompr. CCNx Header (Interest)	2
0000 0001	Uncompr. CCNx Header (Data)	2
0000 0010	Uncompr. NDN Header (Interest)	2
0000 0011	Uncompr. NDN Header (Data)	2
0001 0000	CCN-LoWPAN CCNx Header (Interest)	2
0001 0001	CCN-LoWPAN CCNx Header (Data)	2
0001 0010	CCN-LoWPAN NDN Header (Interest)	2
0001 0011	CCN-LoWPAN NDN Header (Data)	2

# CCN-LoWPAN: 1) Dispatch Types Example

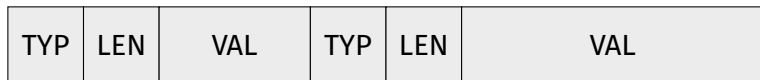
LoWPAN encapsulated CCN-LoWPAN (Page 2 Dispatch)



## CCN-LoWPAN: 2) Packet Header Verbosity

### CCNx / NDN

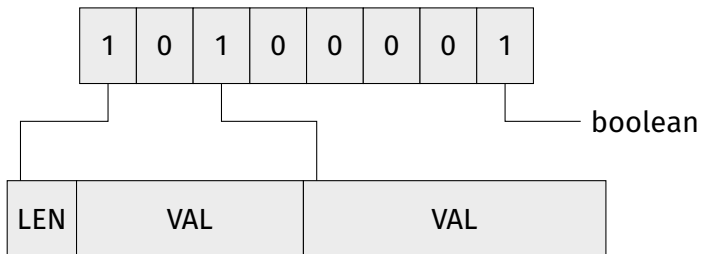
- ▶ Type–Length–Value (TLV) based
- ▶ Fixed order of TLVs
- ▶ Verbose, e.g. name components & boolean TLV



# CCN-LoWPAN: 2) Packet Header Compression

## Compression Scheme

- ▶ Remove superfluous TYP, LEN and VAL



## CCN-LoWPAN: 2) Packet Header Compression (cont.)

### Example: NDN Interest

Interest ::= INTEREST-TYPE TLV-LENGTH

- Name
- Selectors?
- Nonce
- InterestLifetime?
- ForwardingHint?

Selectors ::= SELECTORS-TYPE TLV-LENGTH

- MinSuffixComponents?
- MaxSuffixComponents?
- PublisherPublicKeyLocator?
- Exclude?
- ChildSelector?
- MustBeFresh?

# CCN-LoWPAN: NDN Int. Specific Compression

## CCN-LoWPAN Header for NDN Interest

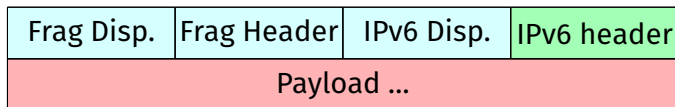
minSx	maxSx	ppk	excl	ChSel	fresh	IntLt	resv
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## CCN-LoWPAN for NDN Interest

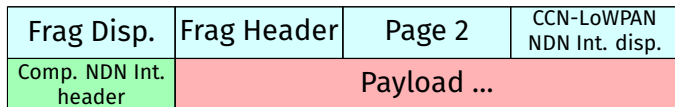
Page 2	CCN-LoWPAN NDN Int. disp.	CCN-LoWPAN NDN Int. header	
Length-Value Payload			

## CCN-LoWPAN: 3) Link Fragmentation

Fragmented, LoWPAN encapsulated IPv6



Fragmented CCN-LoWPAN





# Agenda

Motivation

CCN-LoWPAN

Wrap Up

# Wrap Up

## Summarized highlights of CCN-LoWPAN

- ▶ Specific dispatch types for IEEE 802.15.4
- ▶ Header compression scheme
- ▶ Link fragmentation from 6LoWPAN

# Draft Status

- ▶ -00 submitted on 2017-09-23
- ▶ Question: Split into parts ?
  - ⇒ LoWPAN adaptation & compression