

Static Context Header Compression (SCHC)

Laurent Toutain - Ana Minaburo

laurent.toutain@telecom-bretagne.eu
ana@ackl.io

IETF 97 - Seoul

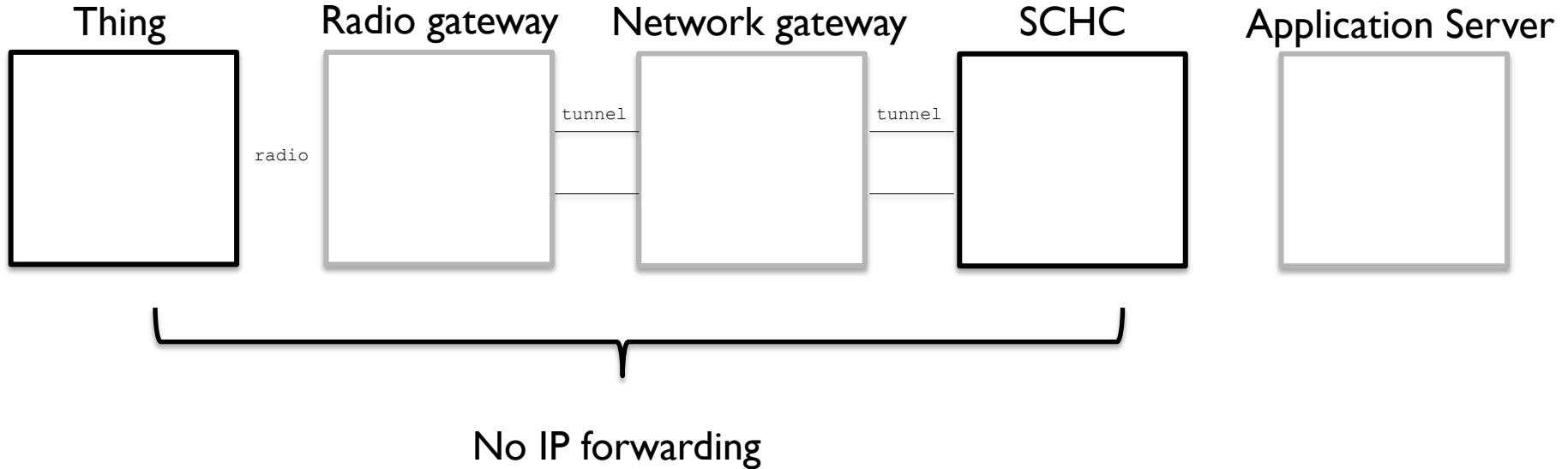
draft-toutain-lpwan-ipv6-static-context-hc-00
draft-toutain-lpwan-yang-static-context-hc-00

Compression for LPWAN



- Optimized for an architecture:
 - Star topology
- Optimized for traffic
 - Nodes have limited capacity
 - Predictable traffic
- Flexible compression

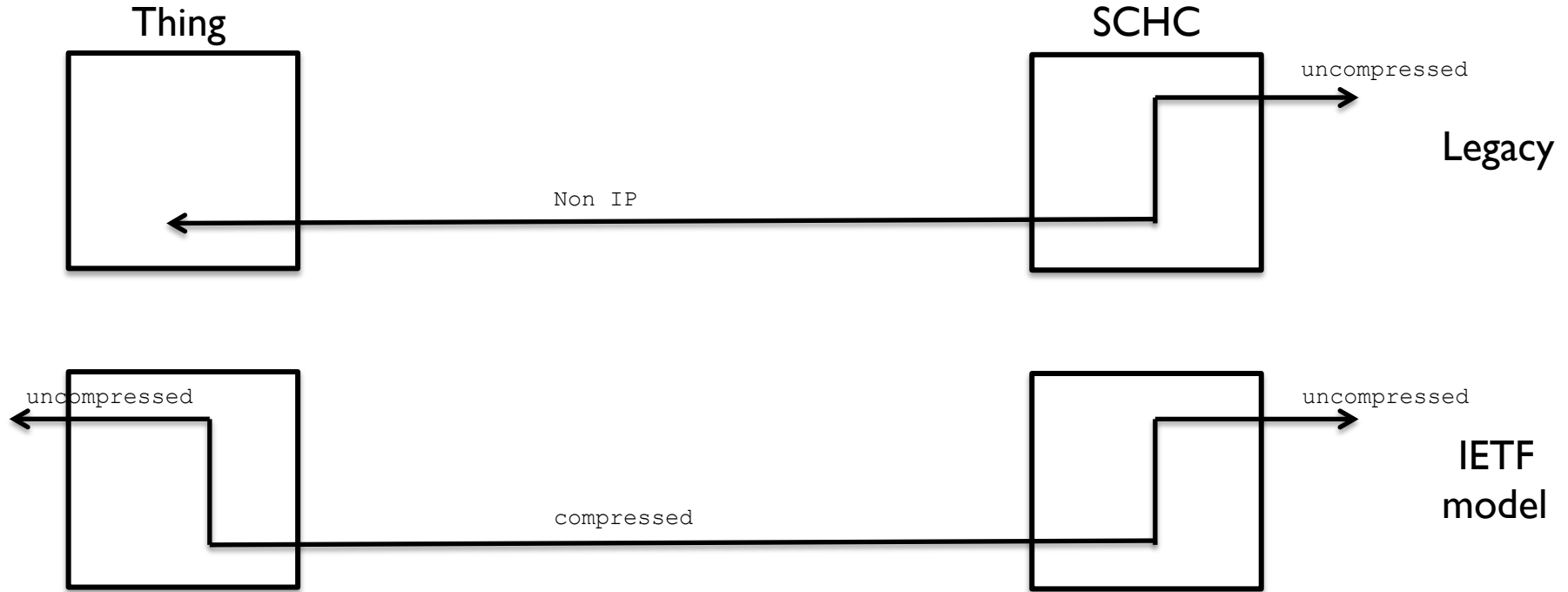
Target Architecture



Objective

- Compress up to 0 bytes well-known headers
- Cover legacy *Thing* with no IP
- ... but non-destructive compression
 - *Things* should be able to rebuilt IP stack

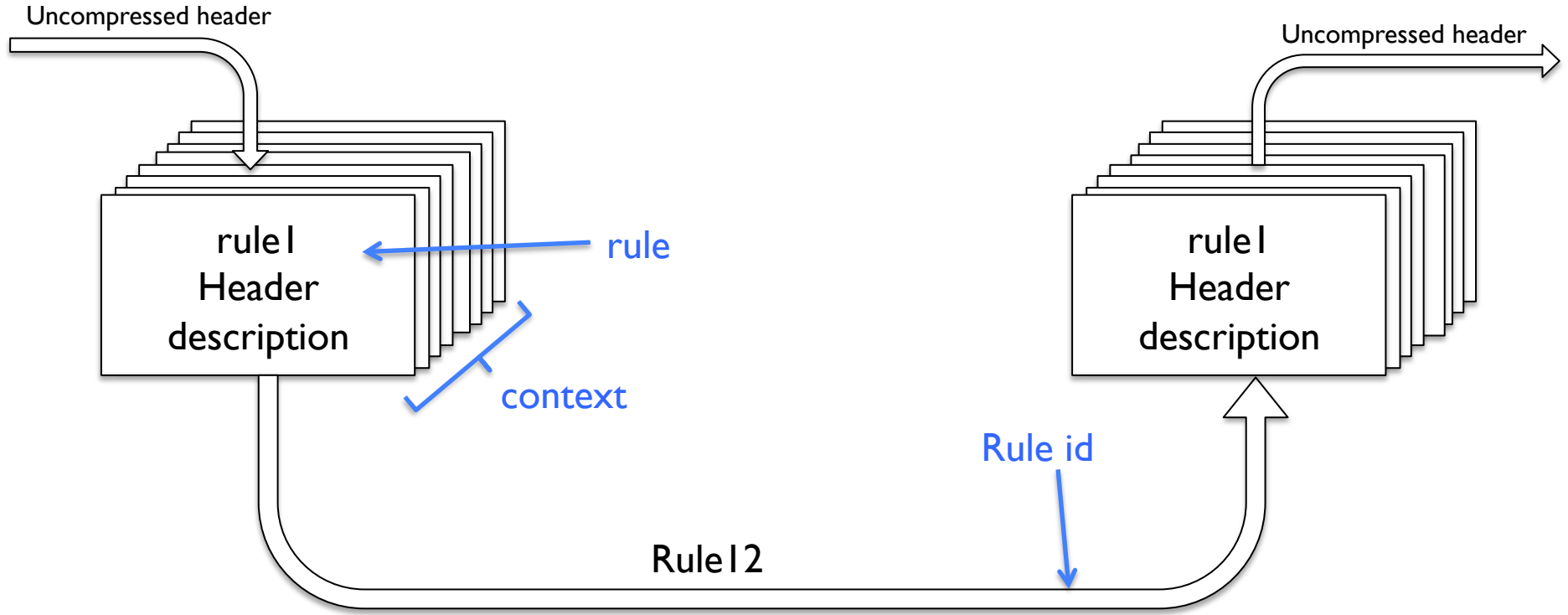
Target Architecture



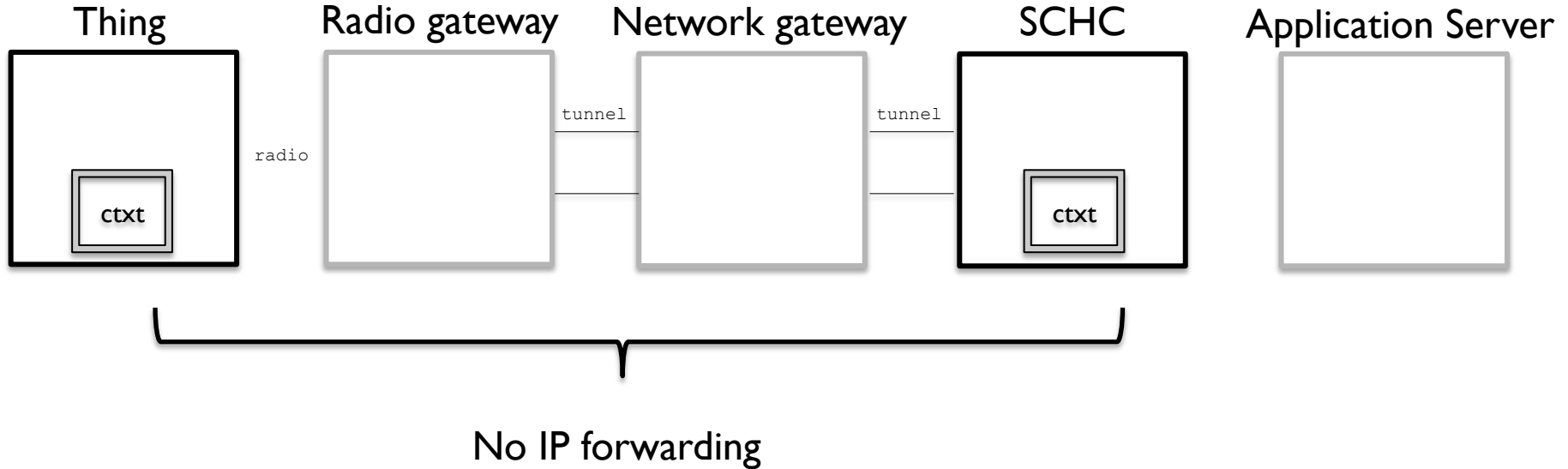
Predictable traffic

- Applications on a *Thing* are controlled
 - Traffic is known
- Fields are classified:
 - Static: well-known
 - Dynamic: send on the link
 - Computed: rebuilt from other information

Static Context Header Compression



Target Architecture



Vocabulary

Rule N			
Rule i			
Rule 1			
Field 1	Target Value	Matching Operator	Comp/Decomp Fct
Field 2	Target Value	Matching Operator	Comp/Decomp Fct
...
Field N	Target Value	Matching Operator	Comp/Decomp Fct

- Context is the same at both ends
- Provisioned with the node

Matching Operators (MO)

- Compare the Target Value to the field value.
- A rule is selected if all the MO match
 - If no rules, packet is dropped
- Draft defines 3 MO:
 - Ignore: always true
 - Equal: compare TV to FV
 - MSB(L): compare the \perp Most Significant Bit

Compression Decompression (LPWAN)

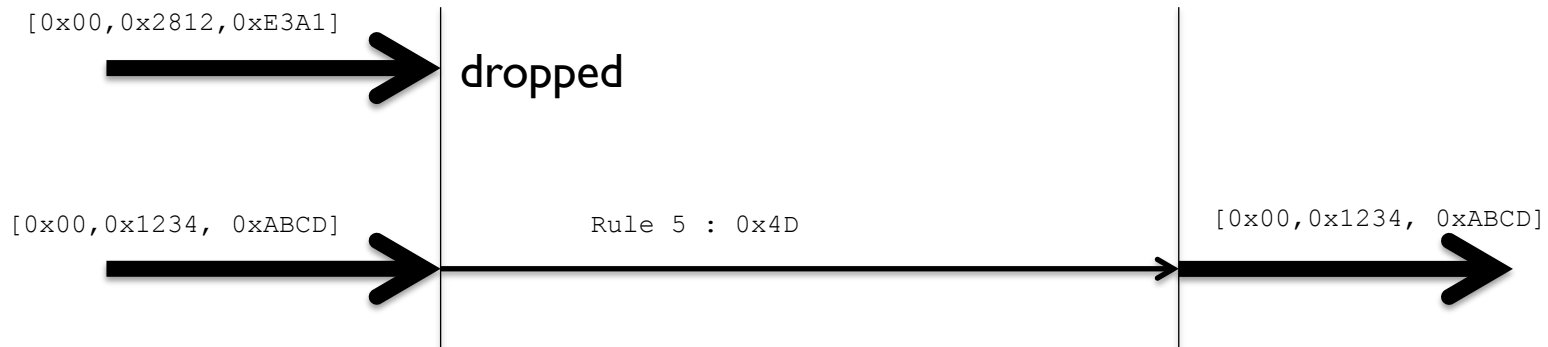
Functions (CDF)

- How to compress/decompress a field if the rule is selected.
- Draft IPv6/UDP defines 6 CDF:

Function	Compression	Decompression
not-sent	elided	use value stored in ctxt
value-sent	send	build from received value
LSB(length)	send LSB	ctxt value OR rcvd value
compute-IPv6-length	elided	compute IPv6 length
compute-UDP-length	elided	compute UDP length
compute-UDP-checksum	elided	compute UDP checksum
ESiid-DID	elided	build IID from L2 ES addr
LAiid-DID	elided	build IID from L2 LA addr

Example

Rule 5			
	Target Value	Matching Operator	Comp/Decomp Fct
F1	0x00	Ignore	not-sent
F2	0x1230	MSB (12)	LSB (4)
F3	0xABC0	MSB (12)	LSB (4)



IPv6/UDP

Field	Comp Decomp Fct	Behavior
IPv6 version	not-sent	The value is not sent, but each end agrees on a value.
IPv6 DiffServ		
IPv6 NH	value-sent	Depending on the matching operator, the entire field value is sent or an adjustment to the context value
IPv6 Length	compute-IPv6-length	Dedicated fct to reconstruct value
IPv6 Hop Limit	not-sent+MO=ignore	The receiver takes the value stored in the context. It may be different from one originally sent, but in a star topology, there is no risk of loops
	not-sent+matching	Receiver and sender agree on a specific value.
	value-sent	Explicitly sent

IPv6/UDP

IPv6 ESPrefix	not-sent	The 64 bit prefix is stored on	
IPv6 LAPrefix		the context	
	value-sent	Explicitly send 64 bits on the link	
+-----+-----+-----+-----+			
IPv6 ESiid	not-sent	IID is not sent, but stored in the	
IPv6 LAiid		context	
	ESiid-DID LAiid-DID	IID is built from the ES/LA Dev. ID	
	value-sent	IID is explicitly sent on the link.	
		Size depends of the L2 technology	
+-----+-----+-----+-----+			
UDP ESport	not-sent	In the context	
UDP LAport	value-sent	Send the 2 bytes of the port number	
	LSB(length)	or least significant bits if MSB	
		matching is specified in the	
		matching operator.	
+-----+-----+-----+-----+			
UDP length	compute-UDP-length	Dedicated fct to reconstruct value	
+-----+-----+-----+-----+			
UDP Checksum	compute-UDP-checksum	Dedicated fct to reconstruct value	
	value-sent		
+-----+-----+-----+-----+			

YANG

- SCHC is designed to be managed with YANG
- For instance:
 - Assign a prefix to a *Thing*
 - A *Thing* sets the Destination Address

draft-toutain-lpwan-yang-static-context-hc-00

YANG model for SCHC

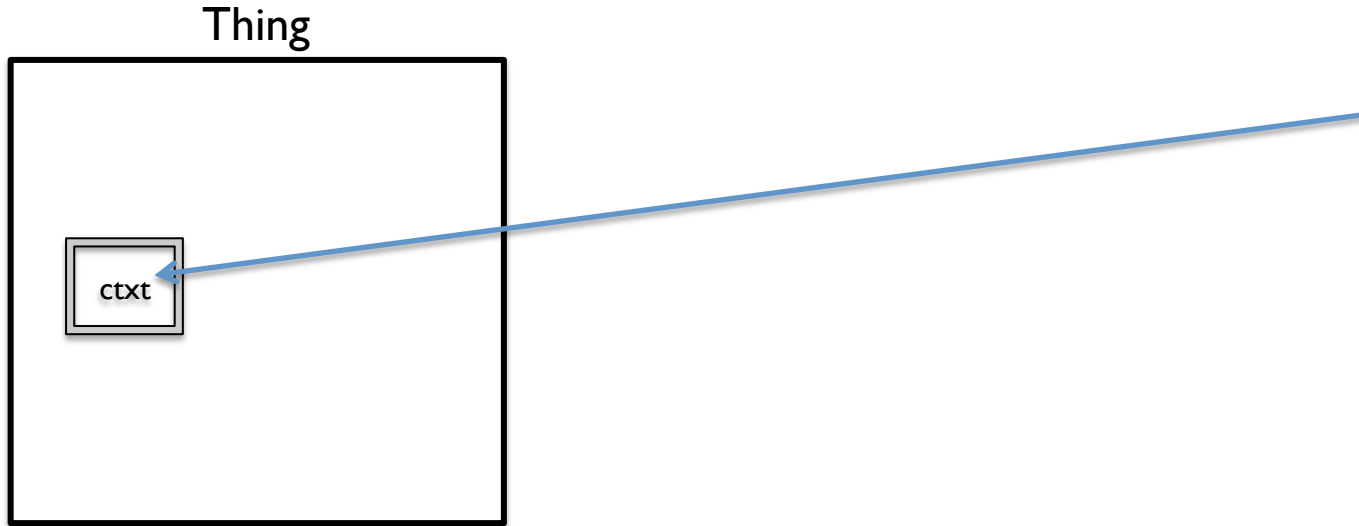
```
module: ietf-lpwan-compression
+--rw compression-context
  +--rw context-rules* [rule-id]
    +--rw rule-id          uint8
    +--rw rule-fields* [position]
      +--rw name?          string
      +--rw position       uint8
      +--rw target-value?  lpwan-types
      +--rw matching-operator?  matching-operator-type
      +--rw matching-operator-value  lpwan-types
      +--rw compression-decompression-function?
                                     compression-decompression-function-type
      +--rw compression-decompression-function-value?  lpwan-types
```


CoMI

SID	Assigned to
1000	Module ietf-lpwan-compression
1001	identity /compression-decompression-function
1002	identity /compression-decompression-function/cdf-compute-ipv6-length
1003	identity /compression-decompression-function/cdf-compute-udp-checksum
1004	identity /compression-decompression-function/cdf-compute-udp-length
1005	identity /compression-decompression-function/cdf-esiid-did
1006	identity /compression-decompression-function/cdf-laiid-did
1007	identity /compression-decompression-function/cdf-lsb
1008	identity /compression-decompression-function/cdf-not-sent
1009	identity /compression-decompression-function/cdf-value-sent
1010	identity /matching-operator
1011	identity /matching-operator/mo-equal
1012	identity /matching-operator/mo-ignore
1013	identity /matching-operator/mo-msb
1014	node /compression-context
1015	node /compression-context/context-rules
1016	node /compression-context/context-rules/rule-fields
1017	node /compression-context/context-rules/rule-fields/compression-decompression-function
1018	node /compression-context/context-rules/rule-fields/compression-decompression-function-value
1019	node /compression-context/context-rules/rule-fields/matching-operator
1020	node /compression-context/context-rules/rule-fields/matching-operator-value
1021	node /compression-context/context-rules/rule-fields/name
1022	node /compression-context/context-rules/rule-fields/position
1023	node /compression-context/context-rules/rule-fields/target-value
1024	node /compression-context/context-rules/rule-id

File ietf-lpwan-compression@2016-11-01.sid created
 Number of SIDs available : 200
 Number of SIDs assigned : 25

Target Architecture



```
iPATCH /c Content-Format(application/cool-value-pairs+cbor)
[
  [field-SID, rule-id, field-pos], value
]
```

Next step

- **Adopt**

`draft-toutain-lpwan-ipv6-static-
context-hc-00`

as a working group item ?

SCHC for CoAP

Laurent Toutain - Ana Minaburo

laurent.toutain@telecom-bretagne.eu
ana@ackl.io

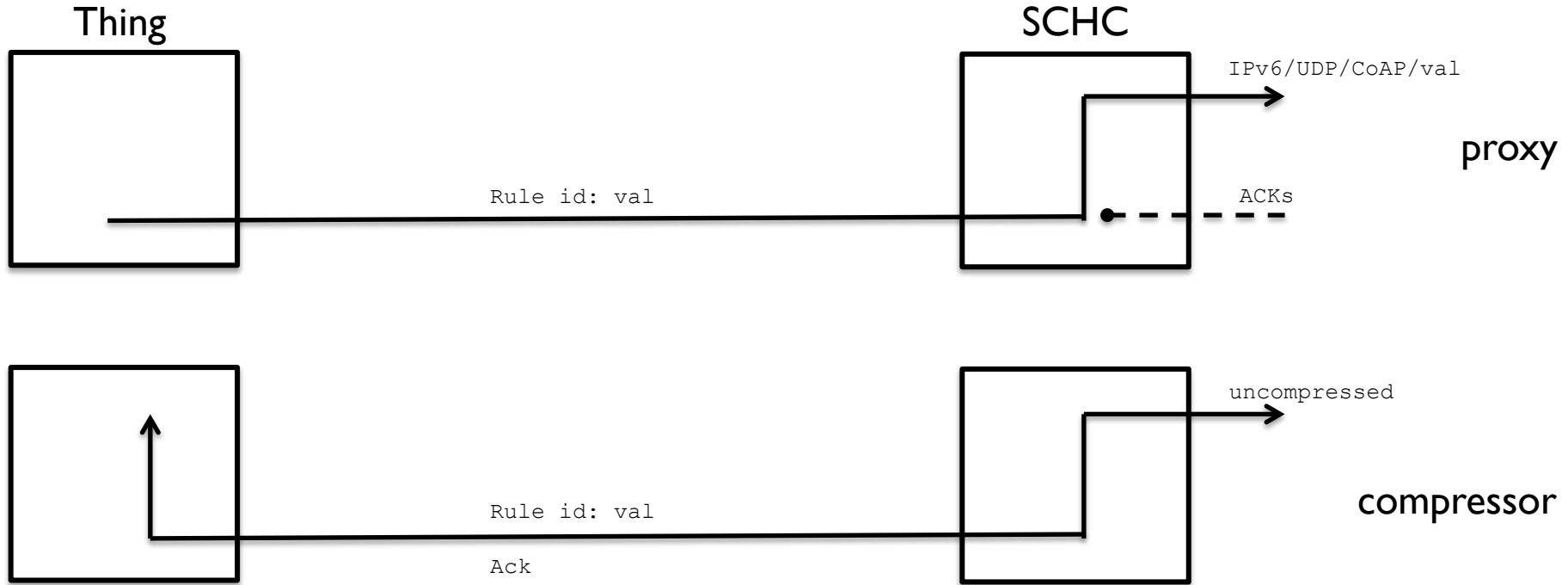
IETF 97 - Seoul

draft-toutain-lpwan-coap-static-context-hc-00

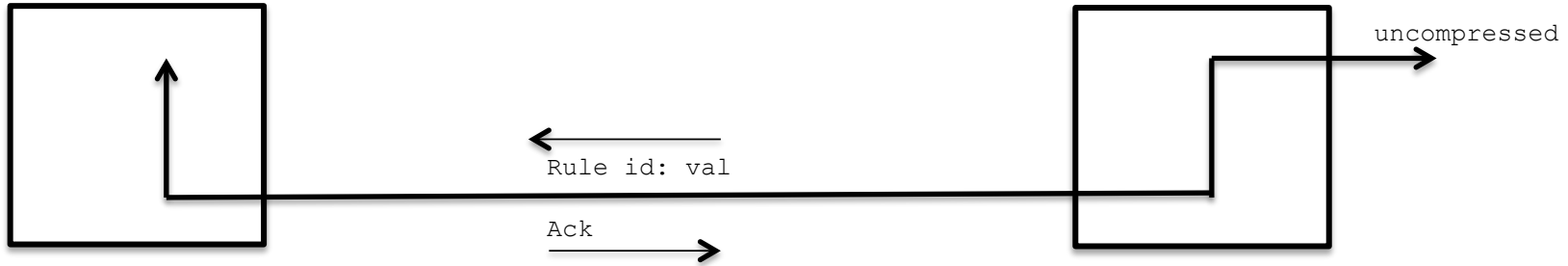
CoAP is different from IPv6/UDP

- Flexible list of fields
 - Options, Token
- Request and response do not contain the same fields
- *Thing* can be a client or a server
 - If server do not control the field size sent by the client
 - E.g. 8 byte token
- Different level of acknowledgements
 - CON/ACK and REST code

CoAP as a client



CoAP as a server



Compression Decompression Fcts ((LPWAN)) (CDF)

- Static-mapping (client/server)
 - Bi-directional mapping between two values
 - For code, path,...
- Remapping (server)
 - Allocate a smaller value
 - For MSG id,Token
 - non conservative
- Entropy-reduction (server)
 - Limit value increase to 1
 - For Observe
 - Non conservative
- Compute-token-length (client/server)

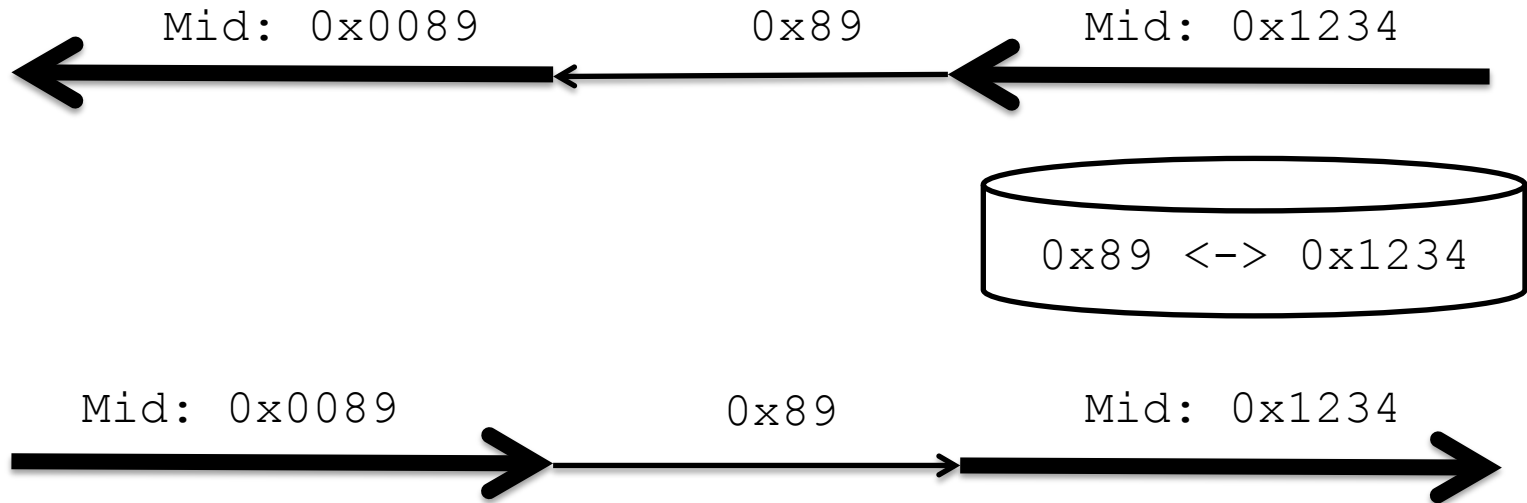
Static-mapping

Code	Description	Mapping
0.00		0x00
0.01	GET	0x01
0.02	POST	0x02
0.03	PUT	0x03
0.04	DELETE	0x04
0.05	FETCH	0x05
0.06	PATCH	0x06
0.07	iPATCH	0x07
2.01	Created	0x08
2.02	Deleted	0x09
2.03	Valid	0x0A
2.04	Changed	0x0B
2.05	Content	0x0C

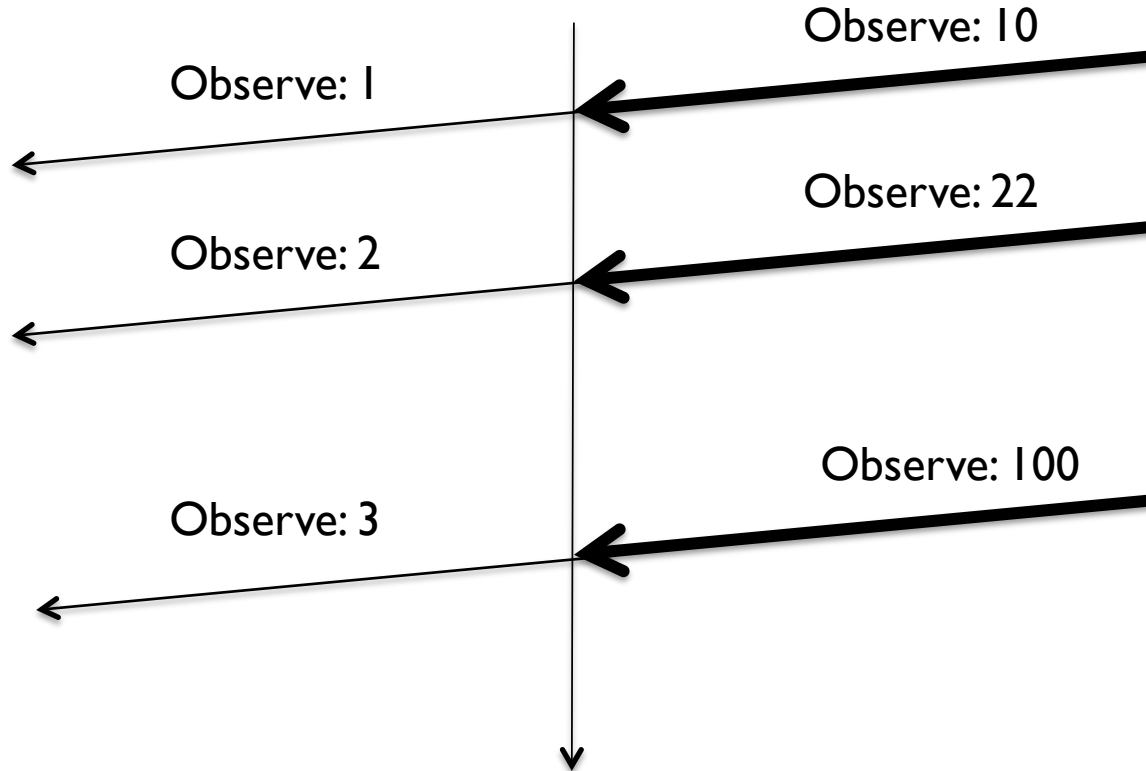
...

remapping

Thing



Entropy-reduction



Example

```
rule id 1
```

Field	TV	MO	CDF	Sent
CoAP version	01	=	not-sent	
CoAP Type			value-sent	TT
CoAP TKL	0000	=	not-sent	
CoAP Code			static-map	CC CCC
CoAP MID			dynamic-map	M-ID
CoAP Path	/path		not-sent	

