

# Constrained RESTful Environments WG (core)

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- **We assume people have read the drafts**
- **Meetings serve to advance difficult issues by making good use of face-to-face communications**
- **Note Well: Be aware of the IPR principles, according to RFC 3979 and its updates**
  - Blue sheets
  - Scribe(s):  
<http://tools.ietf.org/wg/core/minutes>

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# Agenda Bashing

All times are in time-warped KST

## Wednesday (90 min)

- **13:30–13:40 Intro, WG status**
- **13:40–14:10 CoAP over reliable (BR)**
- **14:10–14:20 Protocol negotiation (BS – remote)**
- **14:20–14:32 Resource Directory (chairs)**
- **14:32–14:52 Object Security (FP)**
- **14:52–15:00 dynlink (CG)**
- **15:00–15:00 interfaces (CG)**

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## **Thursday: hallway meeting (Park BR 3)**

- **13:30–13:30 Intro**
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- **14:10–14:20 Delegated Observe (ZC)**
- **14:20–14:30 CoAP over WebRTC DC (CG)**
  
- **14:30–15:00 Flextime**

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## Friday (120 min)

- **09:30–09:30 Intro**
- **09:30–09:50 SenML (AK)**
- **09:50–10:00 SenML BTO (CG)**
- **10:00–10:40 Management over CoAP (COMI/COOL)**
  - **10:00–10:10 YANG over CBOR (AP)**
  - **10:10–10:20 SIDs**
  - **10:20–10:40 COMI/COOL**
- **10:40–11:00 Redirect (DT)**
- **11:00–11:10 YANG/LWM2M (PV)**
- **11:10–11:20 RFC6690 update (prefixes) (CG)**
- **11:20–11:30 Flextime**

# Milestones (from WG charter page)

<http://datatracker.ietf.org/wg/core/charter/>

Mar 2017	CoRE Interfaces submitted to IESG	draft-ietf-core-interfaces
Dec 2016	Management over CoAP submitted to IESG for PS	draft-vanderstok-core-comi , draft-veillette-core-cool
Dec 2016	CBOR Encoding of Data Modeled with YANG submitted to IESG for PS	draft-ietf-core-yang-cbor
Oct 2016	CoAP over TCP, TLS, and WebSockets submitted to IESG for PS	draft-bormann-core-coap-tcp
Sep 2016	CoRE Resource Directory submitted to IESG for PS	draft-ietf-core-resource-directory
Aug 2016	WG adoption for Management over CoAP	draft-vanderstok-core-comi draft-veillette-core-cool
Aug 2016	Media Types for Sensor Measurement Lists (SenML) submitted to IESG for PS	draft-ietf-core-senml
Done	Patch and Fetch Methods for CoAP submitted to IESG for PS	draft-ietf-core-etch
Aug 2016	Representing CoRE Link Collections in JSON submitted to IESG	draft-ietf-core-links-json
Done	Best Practices for HTTP-CoAP Mapping Implementation submitted to IESG	draft-ietf-core-http-mapping
Done	Blockwise transfers in CoAP submitted to IESG	draft-ietf-core-block — RFC 7959

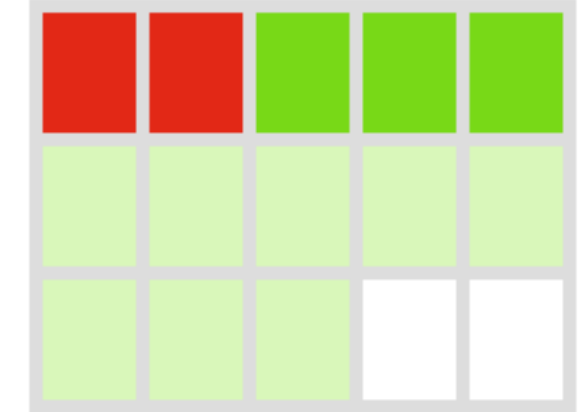


draft-ietf-core-block → RFC 7959



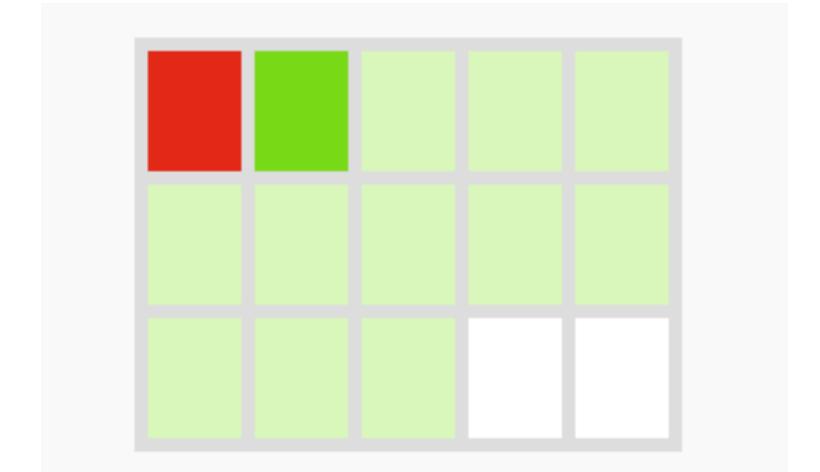
Published 2016-08-27

# draft-ietf-core-http-mapping



- **(Intended status: Informational)**
- **Most recent: –16 (reacts to apps-dir review)**
- **Brownian motion**
- **New appendix A with code for media type mapping**
- **Open DISCUSSEs:**
  - **Should this be anything else but informational?**
  - **Not enough security admonition**
- **Next steps after publishing this:**
  - **How does the HTTP mapping for FETCH/PATCH look like?**
  - **Maybe again gather some experience before writing this up.**

# draft-ietf-core-etch



- **(Intended status: Standards-Track)**
- **Recent -04 should answer all outstanding IESG comments**
  - **waiting for Alissa Cooper's DISCUSS to clear**
- **More explicit rules about choice between PATCH and iPATCH**
- **More text about media type choices for FETCH**
- **More explicit text about error handling for FETCH**
- **Better Security Considerations**
- **Next steps: get this into the implementations!**

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# *coap-tcp-tls @ IETF 97*

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Brian Raymor

## *Since IETF 96*

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- **coap-tcp-tls-04** – addressed all issues discussed at IETF 96
  - Added mandatory exchange of Capabilities and Settings messages after connecting
  - Added support for coaps+tcp port 5684 and more details on Application-Layer Protocol Negotiation (ALPN)
  - Added guidance on CoAP Signaling Ping-Pong versus WebSocket Ping-Pong
  - Updated references and requirements for TLS security considerations
- **coap-tcp-tls-05**
  - Added Appendix: Updates to [RFC7641](#) Observing Resources in the Constrained Application Protocol (CoAP)

# WGLC (*in progress*)

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<https://github.com/core-wg/coap-tcp-tls/issues/>  
<https://github.com/core-wg/coap-tcp-tls/pull/67> (editorial)

*Revisiting  
Security Considerations:  
Making TLS a MUST*

---

*<https://github.com/core-wg/coap-tcp-tls/issues/11>*



# Guidance

---

## [Security Challenges For the Internet Of Things](#) (2011):

*It is essential that IoT protocol suites specify a **mandatory to implement but optional to use security solution**. This will ensure security is available in all implementations, but configurable to use when not necessary (e.g., in closed environment).*

## [IAB Statement on Internet Confidentiality](#) (2014):

*Newly designed protocols should **prefer encryption to cleartext** operation.*

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## CoAP Protocol Negotiation

draft-silverajan-core-coap-protocol-negotiation

Bill Silverajan

TUT

# Main change from -03

- Previous drafts used `.well-known/core` to expose CoAP origin server's available alternative transports
- Discussions in Berlin led towards dropping `.well-known/core` and using CoRE Resource Directory and CoRE Link Format

# Current changes from -03:

## Removal: link attribute & relation type

- 'tt' link attribute and 'altloc' link relation type discontinued (see below in red)

```
REQ: GET /.well-known/core
```

```
RES: 2.05 Content
```

```
</sensors>;ct=40;title="Sensor Index", tt="tcp ws sms",  
</sensors/temp>;rt="temperature-c";if="sensor",  
</sensors/light>;rt="light-lux";if="sensor",  
<coap+tcp://server.example.com/>;rel="altloc",  
<coaps+tcp://server.example.net/>;rel="altloc",  
<coap+ws://server.example.com/ws-endpoint>; rel="altloc",  
<coap+sms://001234567>;rel="altloc"
```

# Changes in -04:

## New optional 'at' RD parameter

- Extend the Resource Directory's Registration and Update Interfaces

Name	Query	Validity	Description
CoAP Transport URI List	at	URI	Comma separated list of URIs (scheme, address, port, and path) available at the server

- Interaction: EP -> RD

Req: `POST coap://rd.example.com/rd?ep=node1&at=coap+tcp://server.example.com`

Content-Format: 40

Payload:

```
</sensors/temp>;ct=41;rt="temperature-f"; if="sensor",  
</sensors/door>;ct=41;rt="door";if="sensor"
```

Res: 2.01 Created

Location: /rd/4521

# Changes in -04: New optional 'tt' RD parameter

- Extend the Resource Directory's Lookup Interface

Name	Query	Validity	Description
CoAP Transport Type	tt		Transport type requested by the client

- Interaction: Client -> RD

**Req:** GET /rd-lookup/ep?ep=node5&tt=\*

**Res:** 2.05 Content

<coap+tcp://[FDFD::123]:61616>;ep="node5",  
<coap+ws://[FDFD::123]:61616>;ep="node5"

# Advantages

- RD provides well-defined interfaces with easy way to extend functionality
- Consistent API: Registrations and Updates managed by origin servers based on lifetime values
- Group function set provides new possibilities
- Support for commissioning tools (via 'con')
- RD also supports HTTP
- DNS SD and DNS-based Service Discovery may be possible



# Drawbacks

- Alternative transport lifetime currently bound to registration lifetime (unless we introduce a new RD parameter per transport, which is challenging)
- A simple means for clients to signal a server to temporarily enable an alternative transport (for energy-constrained origin servers) is missing

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# Questions and todos on RD

- Re-Registration keeps parameters unchanged (what does this mean?)
- “read” interface vs. lookup interface
- Fix merge-patch examples; examples with multiple endpoints, all using the same address
- "This can be done, for example by responding to wildcard lookups only over DTLS or TLS or TCP."
- Guidelines for IANA designated expert
- More minor technical, major editorial, ...

# RD usage today?

- **LWM2M: only the registration interface**
- **Need more feedback on lookup interface etc.**
- **Need feedback on DNS-SD adaptation**
  - **e.g., character sets, “href” vs. “path”, ...**

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# Object Security of CoAP (OSCOAP)

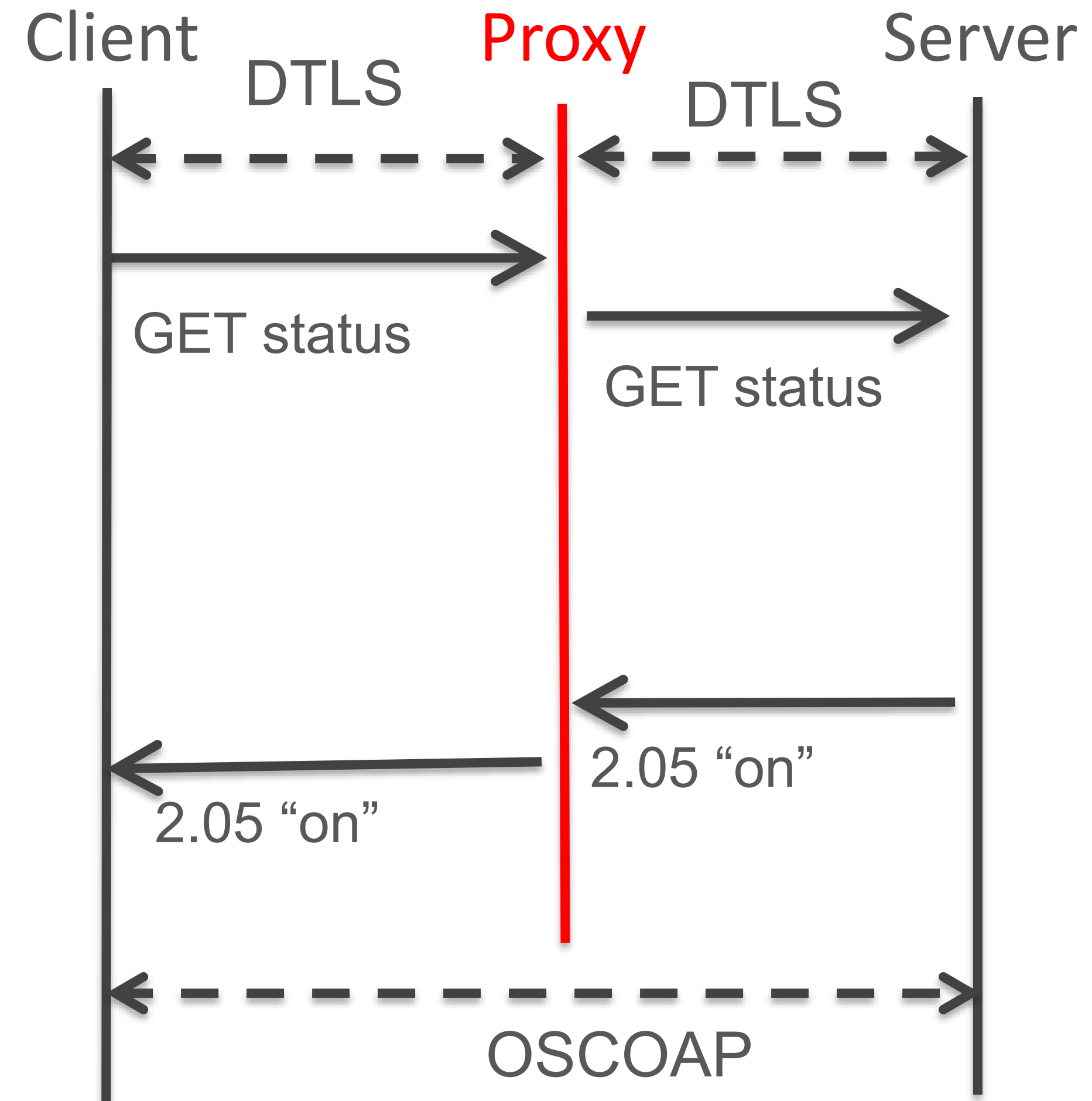
draft-ietf-core-object-security-00

Göran Selander, Ericsson  
John Mattsson, Ericsson  
**Francesca Palombini**, Ericsson  
Ludwig Seitz, SICS Swedish ICT

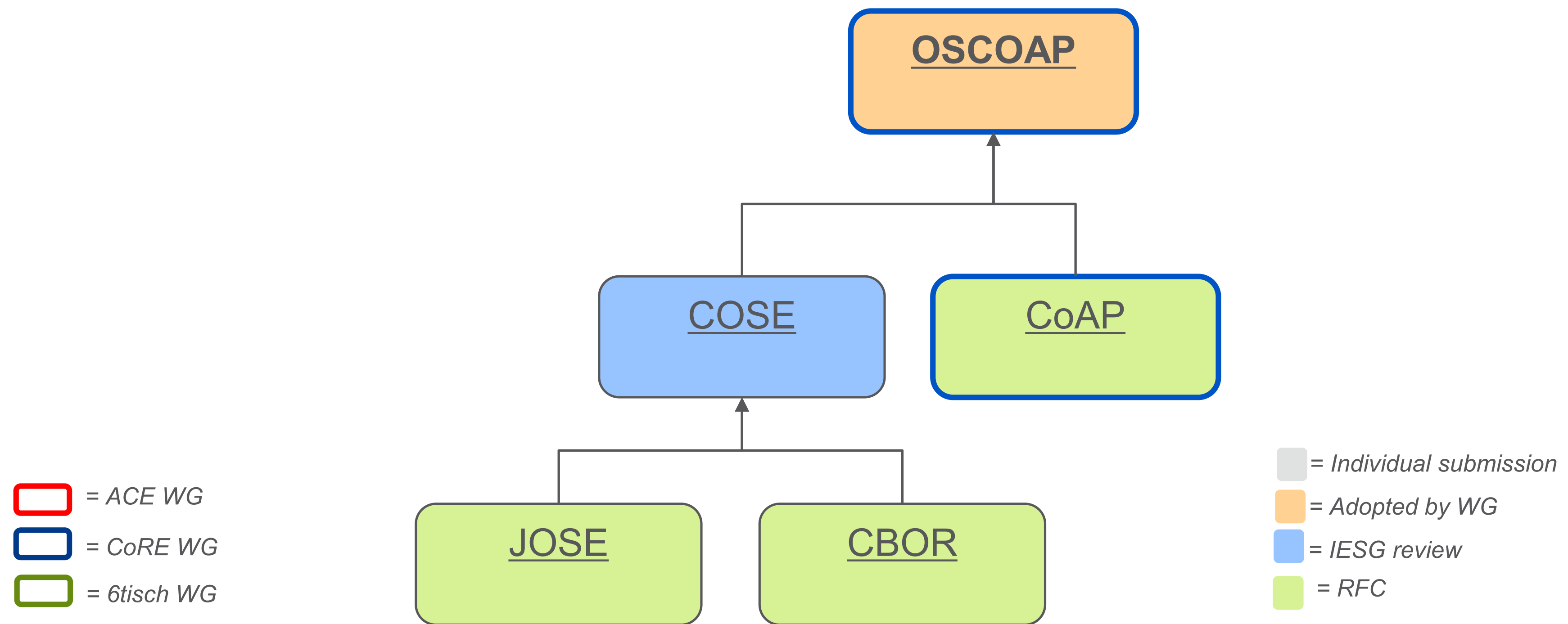
IETF 97, CORE WG, Seoul, Nov 16, 2016

# OSCOAP

- › OSCOAP defines a method for in-layer security of CoAP message exchanges using the COSE format.
- › OSCOAP protects CoAP end-to-end and can be used instead of DTLS
  - Allows legitimate proxy operations
  - Detects illegitimate proxy operations
- › Independent of how CoAP is transported (UDP, TCP, Bluetooth, 802.15.4, foo...)
- › Requirements:  
[draft-hartke-core-e2e-security-reqs](#)

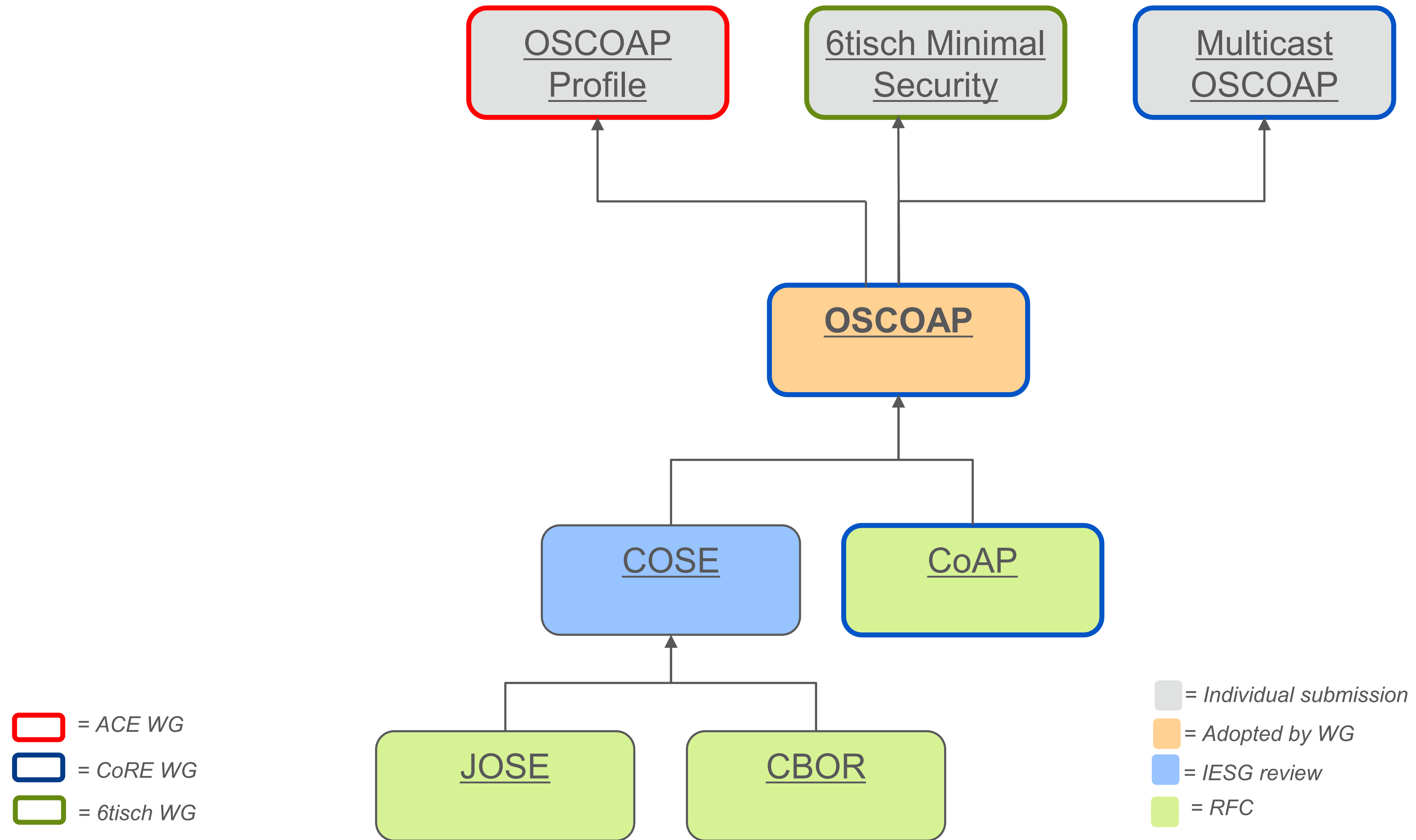


# Related Work

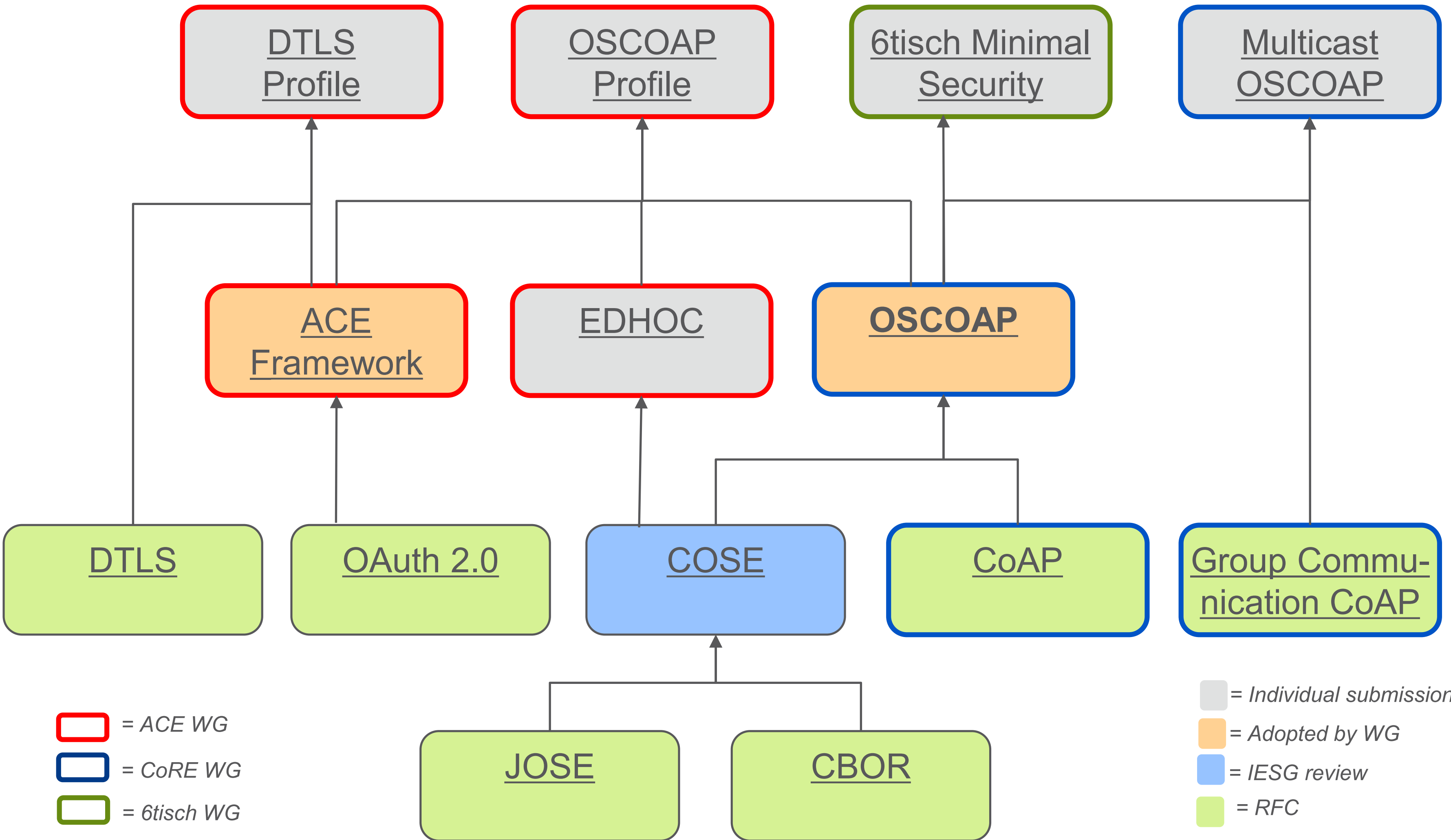




# Related Work



# Related Work



# Draft Status

- › Stable: <https://github.com/EricssonResearch/OSCOAP>
- › Some changes (next slide)
  
- › Used in secure join process in 6tisch ([draft-vucinic-6tisch-minimal-security](#))
- › Used in OSCOAP profile for ACE ([draft-seitz-ace-oscoap-profile](#))
- › Implementation: JAVA ([link](#)), C ([link](#)) released open source, work in progress

# What's new

(draft-ietf-core-object-security-00)

- › Context Definition
- › Context Derivation → Context Establishment
  - Derivation of Keys, IVs, initialization of Sequence Numbers
  - Context Identifier and Sender/Recipient ID
- › Cid is 64 bits pseudo-random → globally unique
  - Sender/Recipient ID are locally unique
- › Optionally, Sender ID is sent in the message
  - New COSE Header parameter, "sid"

# Context Definition

› The security context is the set of information elements necessary to carry out the cryptographic operations in OSCOAP.

› Security Context includes:

› Common Context:

- Context Identifier
- Algorithm
- Base Key

› Sender Context:

- **Sender Identifier:**  
Identifier of the endpoint itself
- Sender Key, IV
- Sender Seq Num

› Recipient Context:

- **Recipient Identifier:**  
identifier of the other endpoint
- Recipient Key, IV
- Recipient Seq Num
- Replay Window

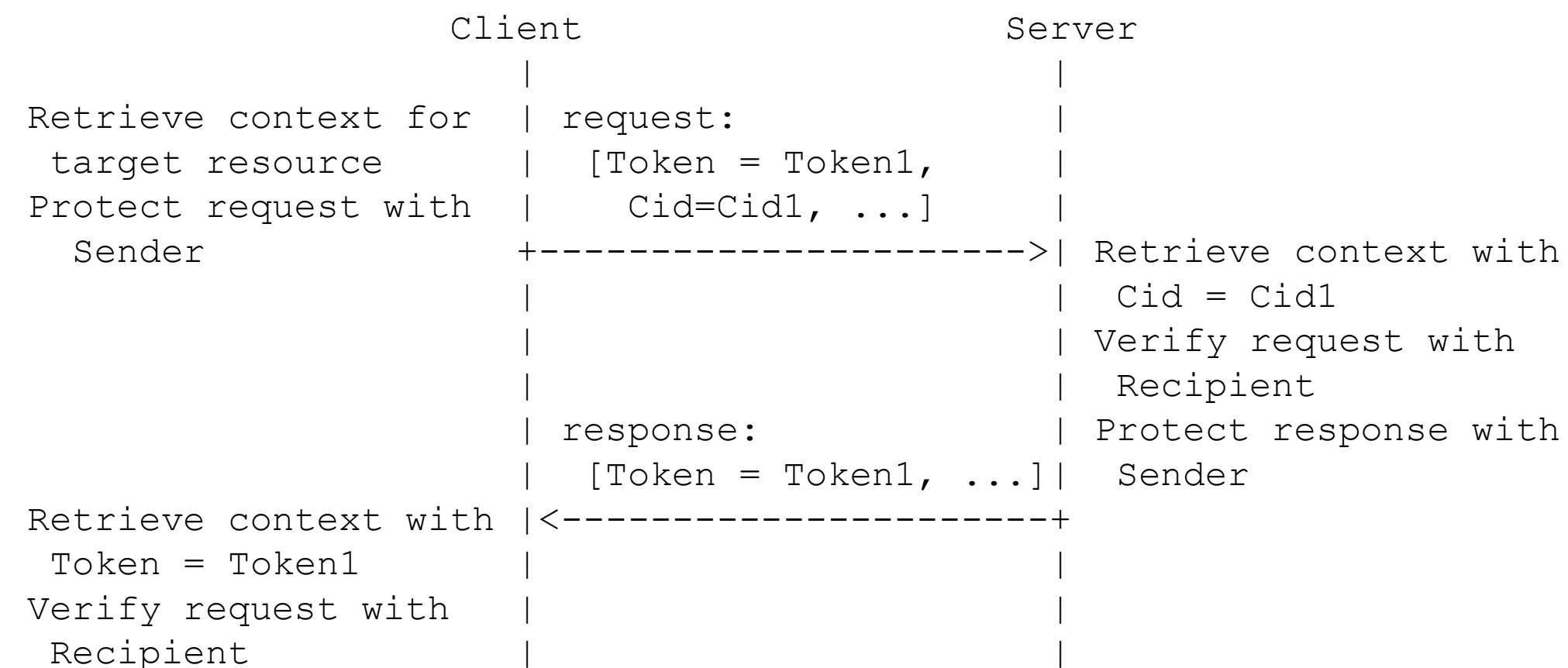
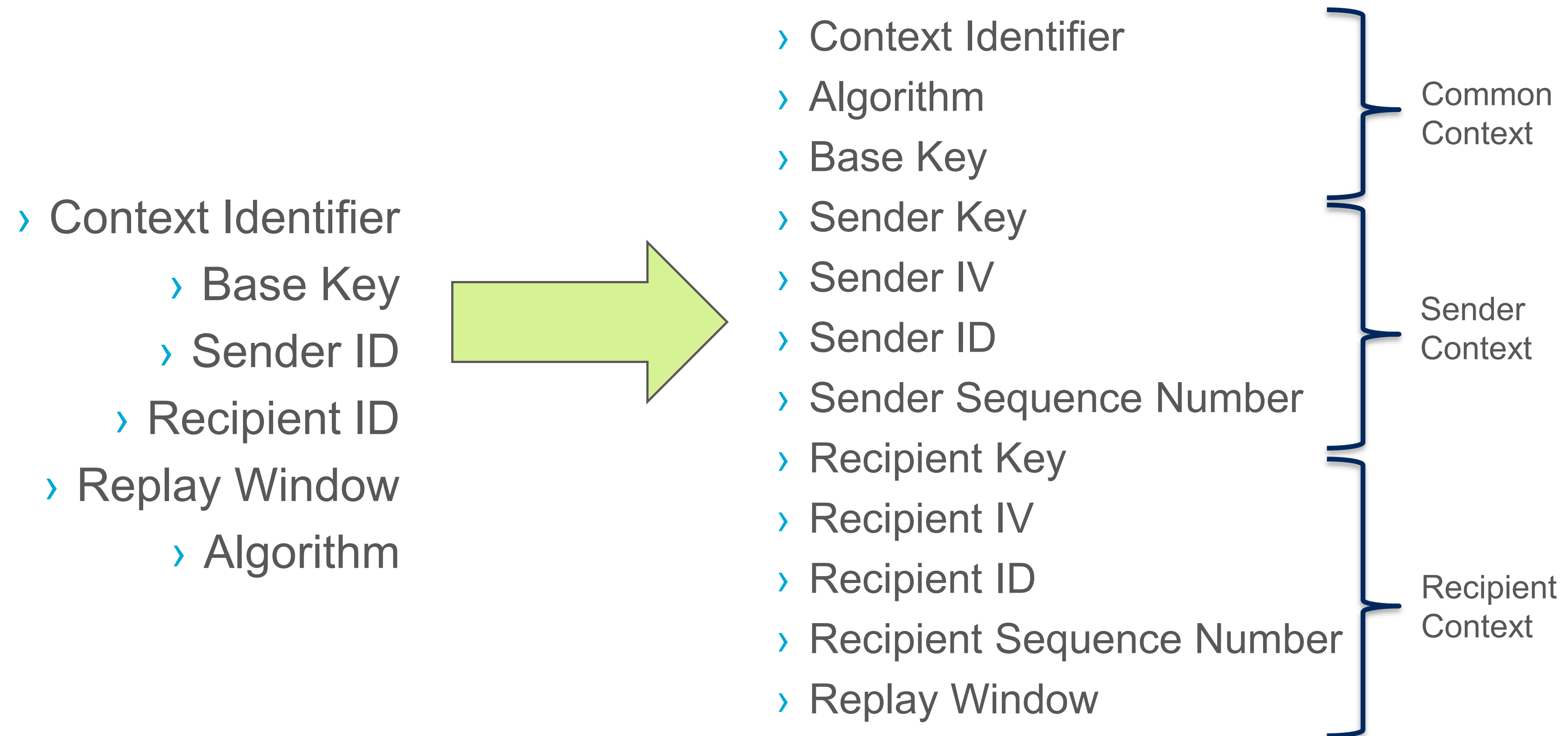
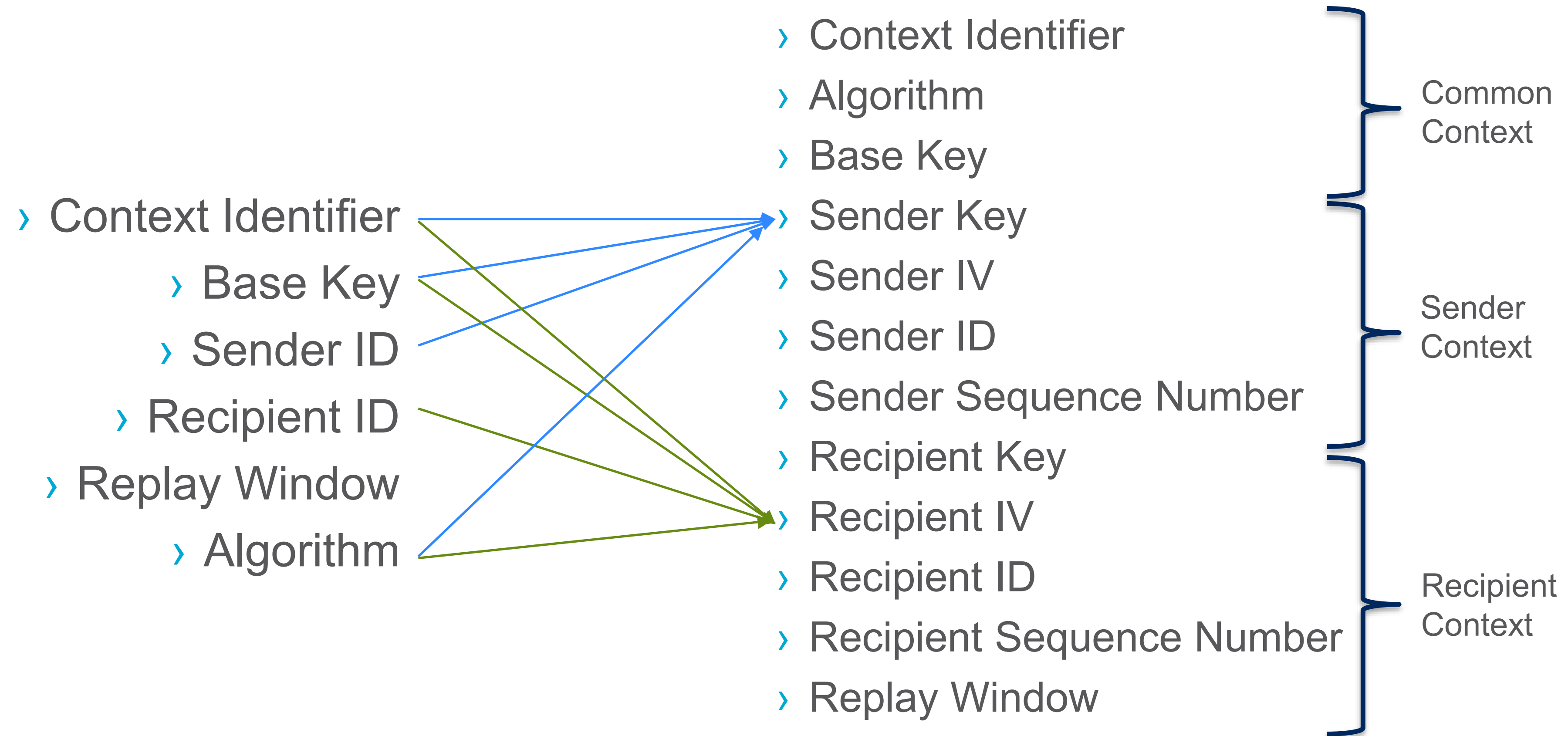


Figure 3: Retrieval and use of the Security Context

# Context Establishment

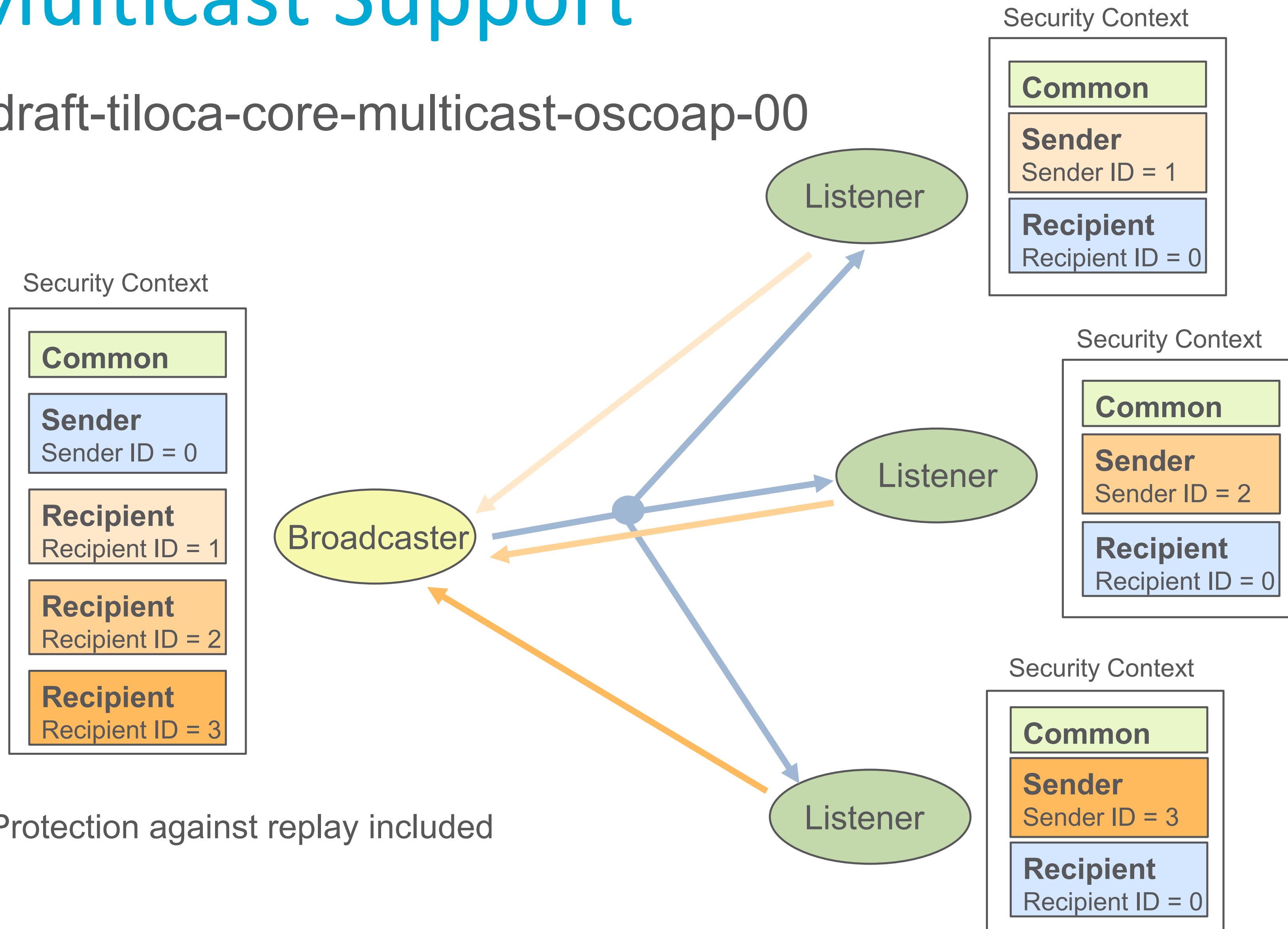


# Context Establishment



# Multicast Support

› draft-tiloca-core-multicast-oscoap-00



› Protection against replay included



# Minor Modifications

- › Transaction Identifier is now (Cid, **Sender ID**, Sender Seq Num)
- › Request URI is integrity protected and not encrypted;
  - Contains all URI-\* but Uri-Path/Query which are encrypted
  - When Proxy-Uri is used, it contains Proxy-Uri minus Uri-Path/Query
- › External AAD is now a CBOR array
  
- › Check the issue tracker!  
<https://github.com/EricssonResearch/OSCOAP/issues>
  
- › Thanks Malisa, Jim, Martin and Joakim for reviewing.

# Java implementation



- › <https://github.com/joakimb/OSCoAP>
- › Californium: a CoAP Java implementation\*
- › OSCOAP: patch for Californium, easy to maintain
- › Dependencies: COSE Java implementation (that uses CBOR and tinyDTLS)

\* <http://www.eclipse.org/californium/>

# C Implementation

- › <https://github.com/Gunzter/contiki-oscoap>
- › based on Erbium CoAP: a CoAP library in Contiki OS\*
- › v-04 of the draft, with some differences:
  - No protected Observe option
  - No sliding window for sequence numbers
- › Removed external dependencies:
  - COSE tailor made
  - Crypto libraries
- › Dynamic memory usage removed → better performance

\* <http://people.inf.ethz.ch/mkovatsc/erbium.php>

# Summary

- › Draft is stable and ready for implementation
- › We have had several security reviews
- › We have 2 implementations: JAVA ([link](#)), C ([link](#)) (from SICS)
  
- › Further reviews (from CoAP experts) are welcome
- › More implementations for interoperability testing appreciated

Thank you!

Comments/questions?

# OSCOAP vs OSCON

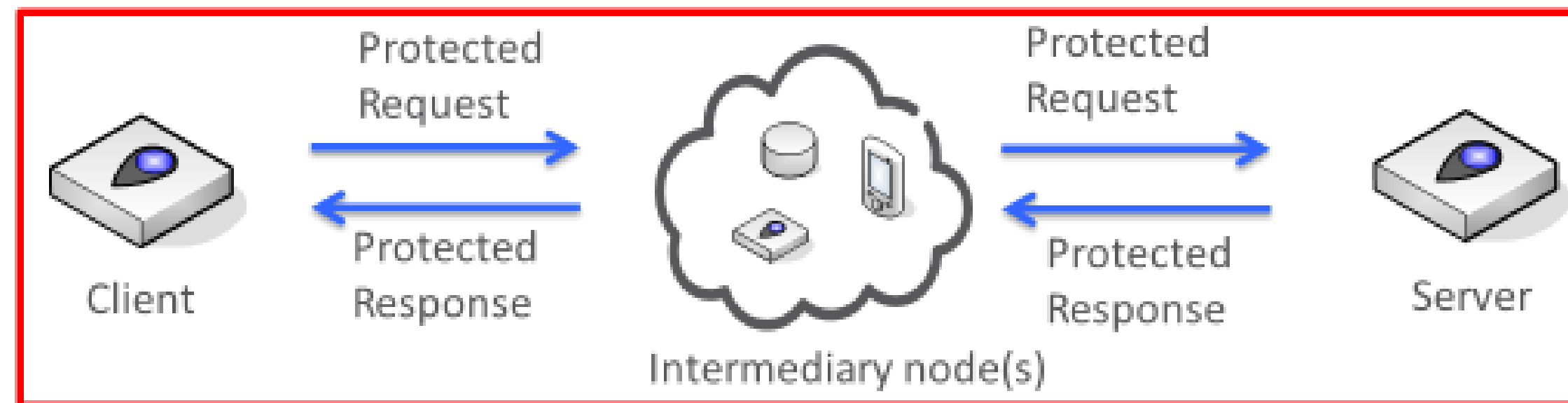
From IETF 93  
— Prague

## Object Secure CoAP (OSCOAP)

- › Wrapping a CoAP message in a compact COSE message
- › E2E confidentiality, integrity and replay protection

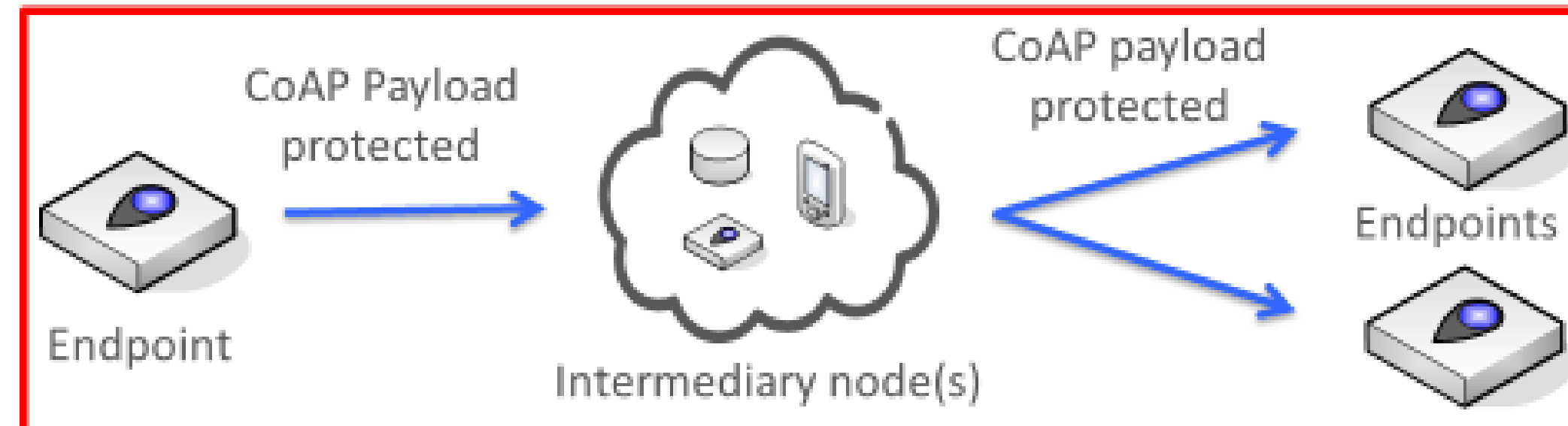
### › Mode:COAP

- › Protects CoAP request-response



### › Mode:PAYL

- › Protects CoAP Payload only
- › Supports one-to-many



- › More details in <https://www.ietf.org/proceedings/93/slides/slides-93-cose-6.pdf>

# OSCOAP vs OSCON

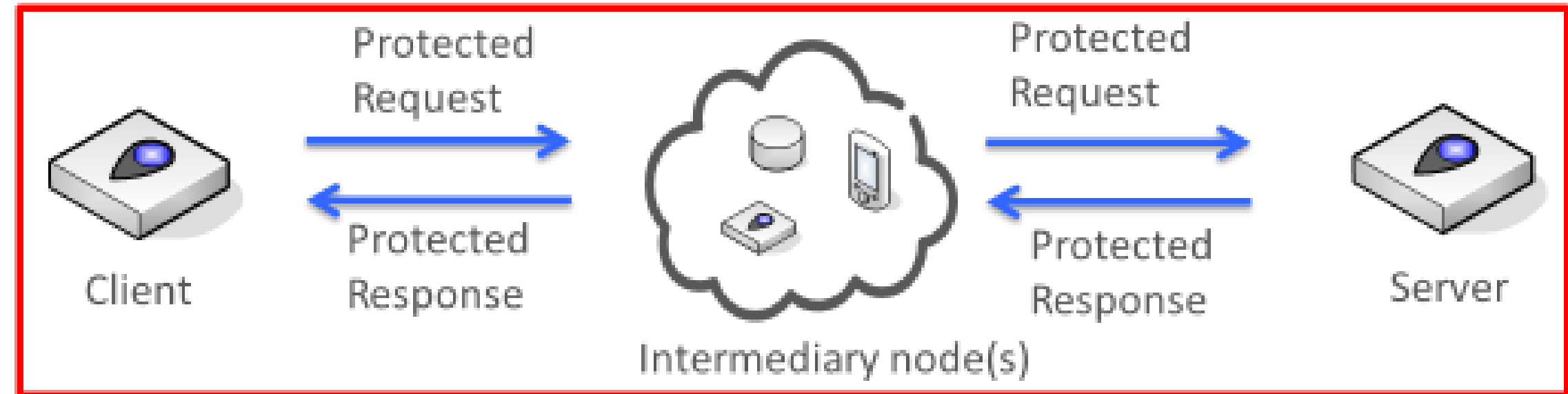
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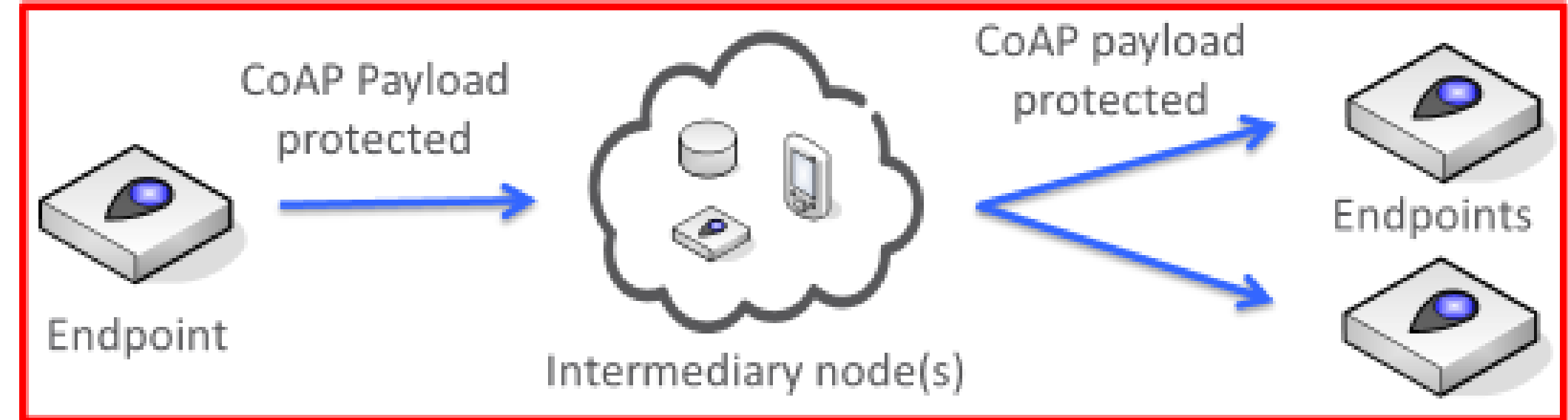
**OSCOAP**  
(main body)

- › Protected request
- › Protected response



**OSCON**  
(Appendix)

- › Protected payload only
- › Supports on...



› More details in <https://www.ietf.org/proceedings/93/slides/slides-93-cose-6.pdf>

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# Dynamic Resource Linking for Constrained RESTful Environments

draft-ietf-core-dynlink-01

IETF #97 Seoul

Christian Groves

# Status update (1)

- Now a WG document
- V1 changes:
  - Tweaked document structure
  - Term “State synchronization” introduced to account for different update methods.
  - The description of binding attributes has been updated.
  - A new clause describing attribute interactions has been added.

## Status update (2)

- Duplication between binding and Observe attributes description has been removed.
- Updated text on deletion of item in a binding table
- Formalised the IANA considerations

# Next steps

- Confirm current understanding of the behaviour of the binding/observe attributes
- Need to add wrapping to gt/lt due to draft-koster-t2trg-hsml
- Confirm structure/direction of updates
- Binding Interface name should be core.bnd
- Add additional attributes related to initialization and bands.

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# Reusable Interface Definitions for Constrained RESTful Environments

draft-ietf-core-interfaces-06

IETF #97 Seoul

Christian Groves

# Updates

- Updated the abstract and introduction.
- Section 2: Removed the collections definition in favour of the complete definition in the collections section.
- Removed section 3 on interfaces in favour of an updated definition in section 1.3.
- General: Changed interface type to interface description as that is the term defined in [RFC6690](#).
- Removed section on future interfaces.
- Section 8: Updated IANA considerations.
- Added Appendix A “Current Usage of Interfaces and Function Sets”

# Appendix A – Issues (1)

- Seeks to survey the current landscape to see how collections, interfaces and function sets/profiles are being used.
  - Documentation of interfaces is not consistent.
  - Function descriptions even less so.
- RFC6690 introduces the “if” attribute and procedure about registration BUT is silent on what should be in a description document. Should this be elaborated on?



## Appendix A – Issues (2)

- ietf-core-resource-directory uses interfaces but does not assign interface description identifiers to them?
- OCF have defined several interfaces that are quite similar to the ones in the draft? Should we look to harmonise them?
- Update/versioning of interface descriptions?
- draft-vanderstok-core-comi needs to be added uses interface core.c and function set.
- draft-koster-t2trg-hsml also needs to be added due to interface usage.

# Next steps?

- Would function set be better as a separate draft or simply removed?
  - Function sets specification seem less defined
  - Whether to split probably depends on ambition level

- **We assume people have read the drafts**
- **Meetings serve to advance difficult issues by making good use of face-to-face communications**
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- ✓ Blue sheets
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</sensors/temp>;rt="temperature-c";if="sensor",  
</sensors/light>;rt="light-lux";if="sensor",  
<http://www.example.com/sensors/t|23>  
  ;anchor="/sensors/temp";rel="describedby",  
</t>;anchor="/sensors/temp";rel="alternate"
```



```
[{"href":"/sensors","ct":"40","title":"Sensor Index"},  
 {"href":"/sensors/temp","rt":"temperature-c","if":"sensor"},  
 {"href":"/sensors/light","rt":"light-lux","if":"sensor"},  
 {"href":"http://www.example.com/sensors/t|23",  
  "anchor":"/sensors/temp","rel":"describedby"},  
 {"href":"/t","anchor":"/sensors/temp","rel":"alternate"}]
```

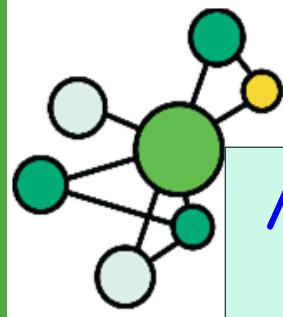
# Potential Issue: How to update

- **Structure: Array of links**
- **RD update might**
  - **add links: trivial**
  - **change links: replace on href as key?**
  - **remove links (how to indicate this?)**
- **draft-ietf-appsawg-json-merge-patch was defined to solve problems like this**
  - **but does not fit: only can update object (map), not array**
- **→ make sure that cbor-merge-patch works for this**



# Status

- **WGLC completed July 30th**
- **Christian Amsüss: what about JSON-LD?**
- **Michael Koster: “requirement for core-links-json to be a 1:1 bidirectionally lossless mapping to CoRE Link-Format” [ct=40]**
- **So what about other formats carrying links?**
  - e.g., Coral and HSML?



# Bridging relationship with oic/res

`/oic/res`

```
[  
  {"di": "bridge_device_id",  
   "links": [  
     { "href": "/oic/d",  
       "rt": "oic.d.bridge",  
       "if": "oic.if.r",  
       "rel": "hosts"}}  
   ],  
  {"di": "light_device_id",  
   "links": [  
     { "href": "0/oic/d",  
       "rt": "oic.d.light",  
       "if": "oic.if.r",  
       "rel": "contains external"},  
     { "href": "1/myLightSwitch",  
       "rt": "oic.r.switch.binary",  
       "if": "oic.if.a",  
       "rel": "contains external"}  
   ]},  
  {"di": "fan_device_id",  
   "links": [  
     { "href": "1/oic/d",  
       "rt": "oic.d.fan",  
       "if": "oic.if.r",  
       "rel": "contains external"},  
     { "href": "1/myFanSwitch",  
       "rt": "oic.r.switch.binary",  
       "if": "oic.if.a",  
       "rel": "contains external"}  
   ]  
]
```

`/oic/d`

```
{  
  "n": "myRoomBridgeDevice",  
  "rt": "oic.d.bridge",  
  "if": "oic.if.r",  
  "di": "bridge_device_id",  
  "icv": "oic.1.5",  
}
```



`/oic/d`

```
{  
  "n": "myRoomLightDevice",  
  "rt": "oic.d.light",  
  "if": "oic.if.r",  
  "di": "light_device_id",  
  "icv": "oic.1.5",  
}
```

`/oic/d`

```
{  
  "n": "myRoomFanDevice",  
  "rt": "oic.d.light",  
  "if": "oic.if.r",  
  "di": "fan_device_id",  
  "icv": "oic.1.5",  
}
```

# To Do

- **Make extensibility of link-format more explicit in the CDDL**
- **Fix the Content-Format IANA registrations**
- **Remove material that discusses JSON-LD and friends**
  - **But do make use of Christian's input for some improved explanation**

All times are in time-warped KST

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- 13:30–13:40 Links-JSON (CB)
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- 14:30–15:00 Flextime

# CoRE working group

EST over CoAPs

draft-vanderstok-core-coap-est-00

69

P. van der Stok, K. Sandeep

# Motivation

ANIMA WG works on:

Bootstrapping of Remote Secure Key Infrastructures (BRSKI)

- BRSKI specifies how a new node joins a secure network
- Also interesting for constrained devices on constrained networks.
- A constrained network (CN) in enterprise settings will often be managed by an IT department.
- That department is responsible for a larger network including CN.
- Relying on one similar protocol to accept devices securely is for many IT departments a condition for connecting the CN to the managed network

# EST-coaps why

Enrollment over Secure Transport (EST) is basic building block of BRSKI

EST uses https from joining node to the Registrar (certificate providing node)

The provision of EST over DTLS secured CoAP (EST-coaps) between joining node and Registrar makes BRSKI deployable on a larger set of CNs.

# EST-coaps contents

- Uses DTLS over CoAP instead of TLS over HTTP
- Reduces number of supported message types
- Introduces content formats to CoAP registry
- Explains use of block and DTLS
- Uses binary instead of base64 encoding
- CoAP response code 2.06<sup>72</sup> specified for delayed answers



## Very similar: draft-pritikin-coap-bootstrap

- Discusses DTLS instead of TLS for BRSKI/EST transactions
- Provides bindings of BRSKI/EST messages to COAP
- Address fragmentation with COAP Blocks
- Addresses HTTP Proxying
- Addresses COAP and DTLS session parameters

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Potentially have one draft in the end that incorporates everything.

# Questions

1. Interest in BRSKI for CN?
2. Agree with EST over CoAPs with BRSKI or something new?
3. Full EST or subset of EST for EST-coaps?
4. Interest to implement, comment,....?

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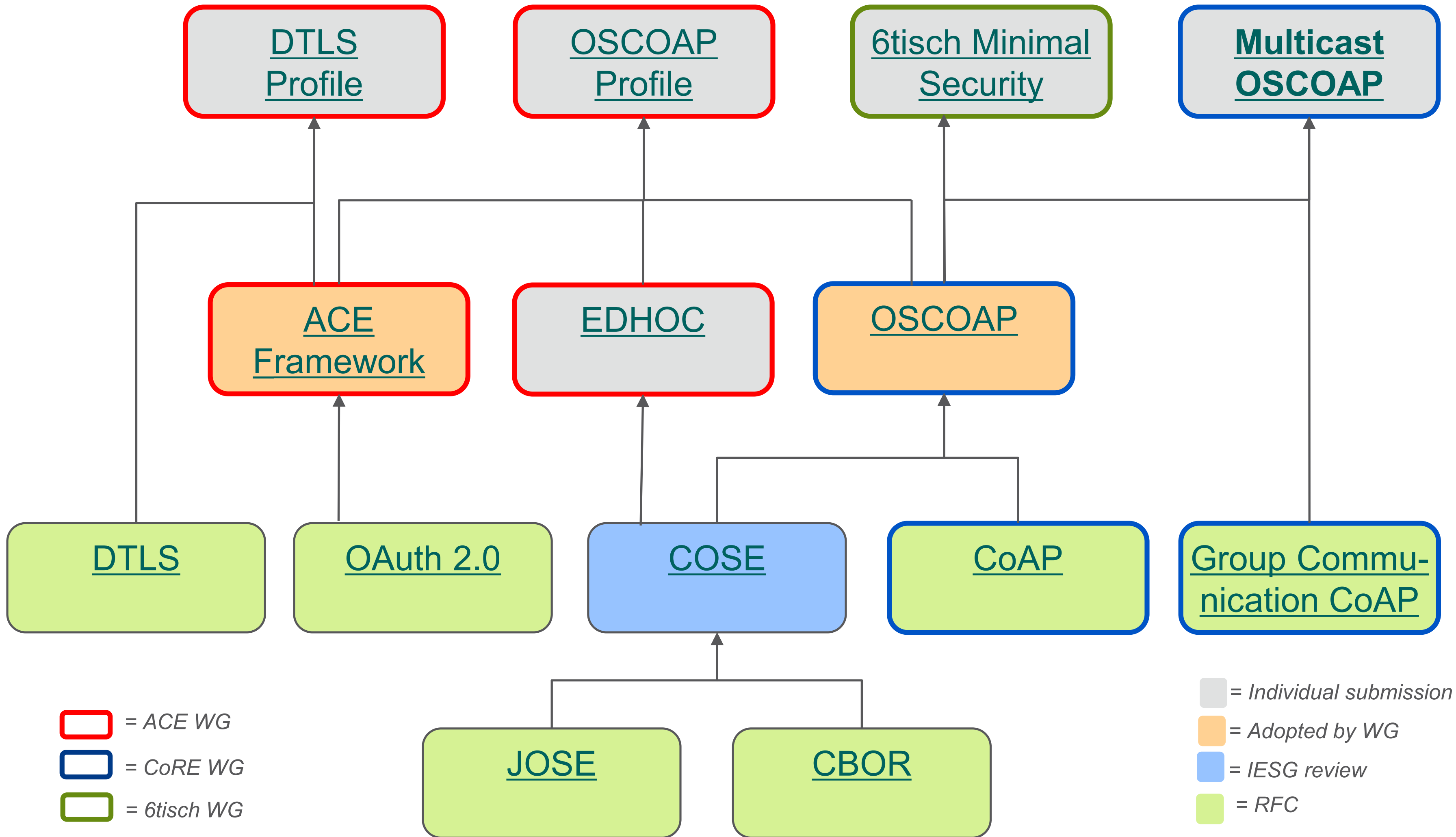
# Secure group communication for CoAP

draft-tiloca-core-multicast-oscoap-00

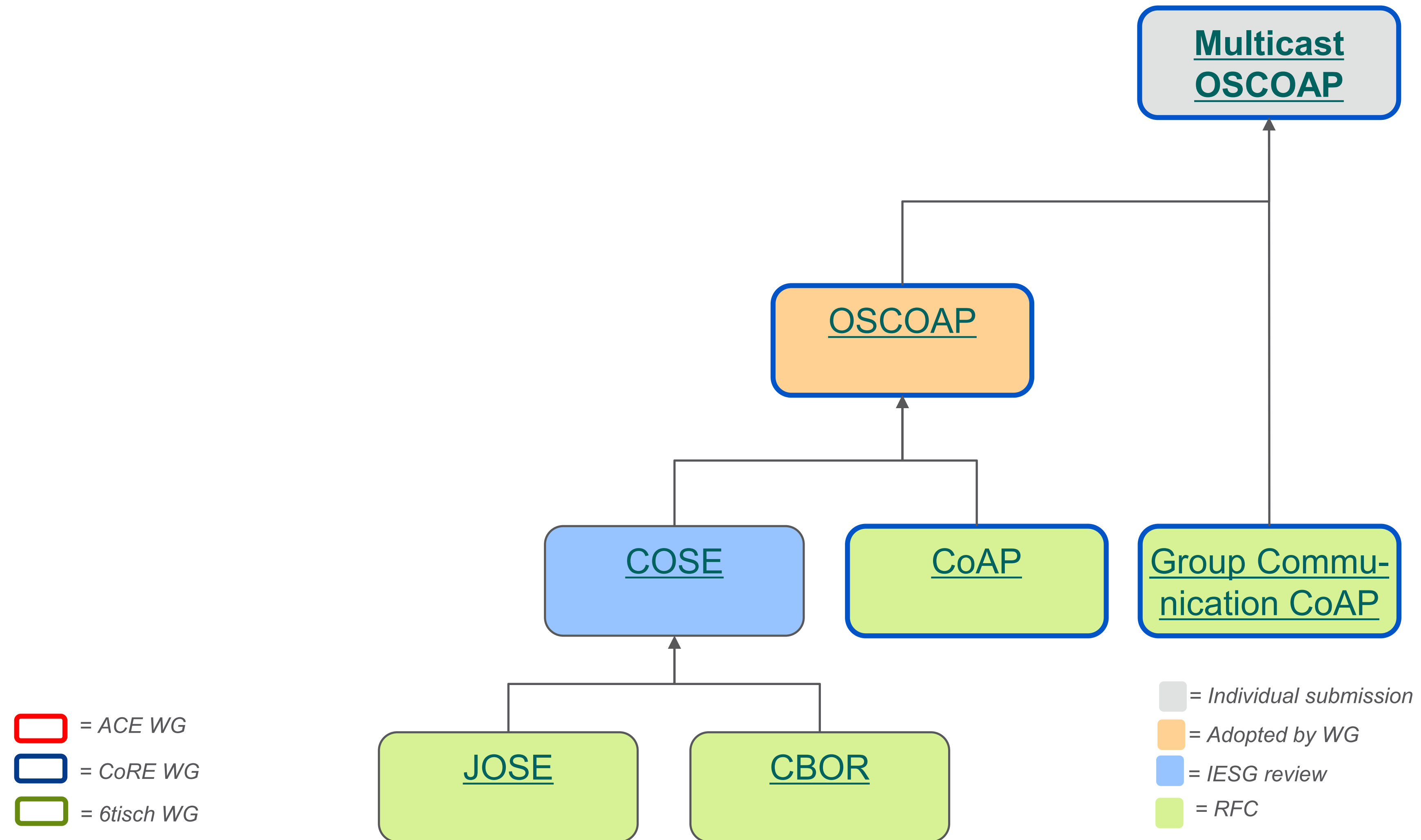
Marco Tiloca, SICS Swedish ICT  
Göran Selander, Ericsson  
**Francesca Palombini**, Ericsson

IETF 97, CORE WG, Seoul, Nov 17, 2016

# Related Work

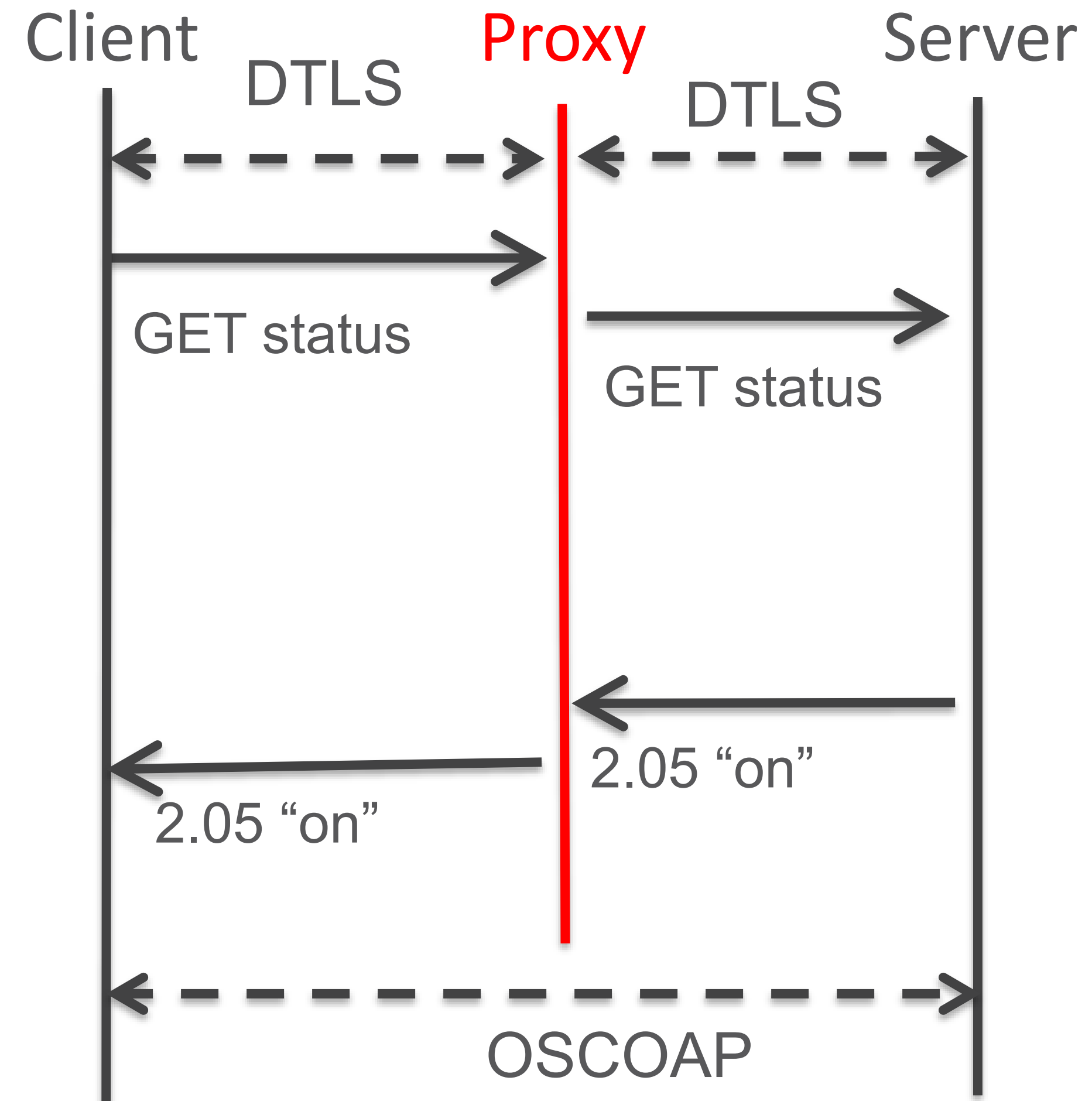


# Related Work



# OSCOAP

- › OSCOAP defines a method for in-layer security of CoAP message exchanges using the COSE format.
- › OSCOAP protects CoAP end-to-end and can be used instead of DTLS
  - Allows legitimate proxy operations
  - Detects illegitimate proxy operations
- › Independent of how CoAP is transported (UDP, TCP, Bluetooth, 802.15.4, foo...)
- › Requirements:  
[draft-hartke-core-e2e-security-reqs](#)



# Motivation

- › RFC7390\* Section 5.3.3: ” In the future, to further mitigate the threats, security enhancements need to be developed at the IETF for group communications.”
- › CoRE WG requested Multicast OSCOAP (IETF95, mailing list, ...)
- › draft-somaraju-ace-multicast relies on OSCOAP to secure group messages, but doesn't define how.
- › Multicast OSCOAP fills this gap and is use case independent

\*RFC7390: Group Communication for the Constrained Application Protocol (CoAP)

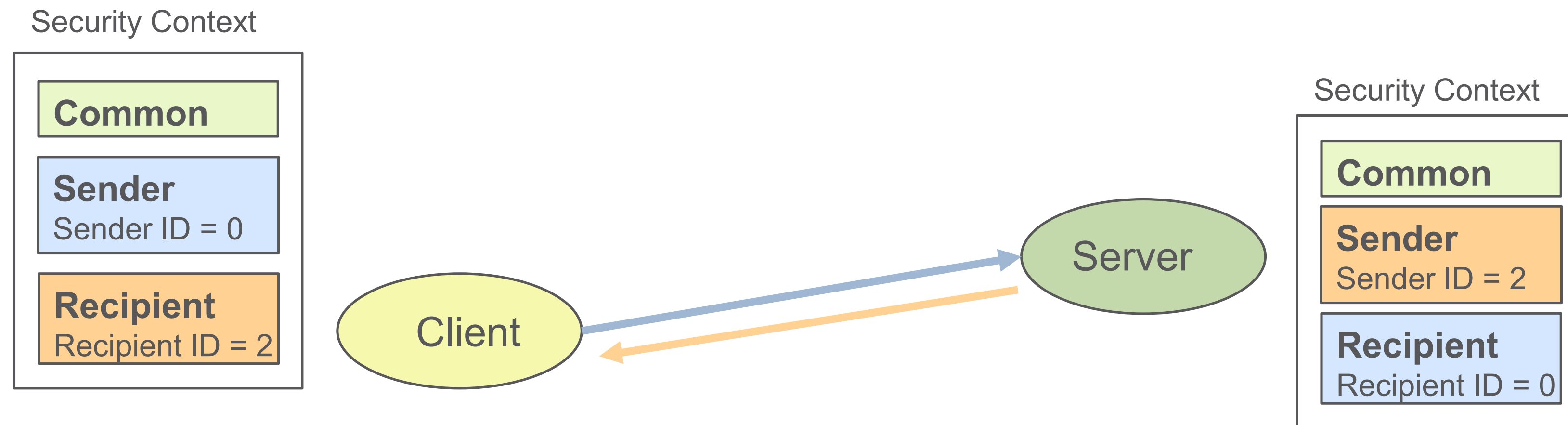


# Main Features

- › How to use OSCOAP in group communication
- › Confidentiality and Integrity: Shared keying material to protect communication within the group (using OSCOAP mechanisms)
- › Source authentication:
  - Asymmetric-key counter signatures
  - Embedded in the COSE object
- › Same structures, constructs, mechanisms of OSCOAP

# OSCOAP

› draft-ietf-core-object-security-00

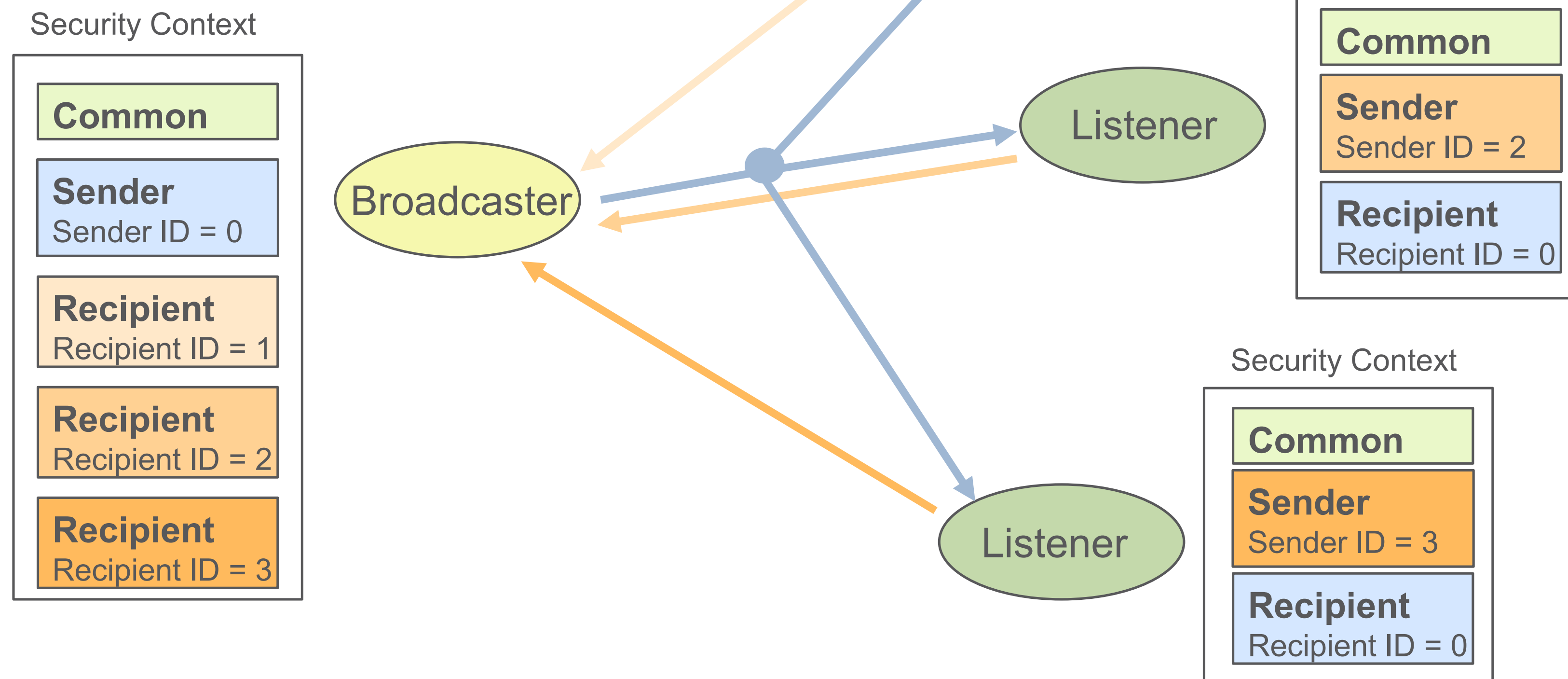


- › Secure end-to-end communication in the presence of intermediaries (Protection against replay included)
- › Uniquely bind the CoAP response to the CoAP request
- › Protects payload and parts of CoAP metadata (header, options....)

# Multicast Support

## › draft-tiloca-core-multicast-oscoap-00

- › Sender Context stores the endpoint's asymmetric public-private key pair
- › Recipient Context stores the public key associated to the endpoint from which messages are received
- › Recipient Context derived at runtime



# What's Different from OSCOAP

- › Adds asymmetric keys in Sender/Recipient Context
- › Sender ID is always sent in the message (Optional in OSCOAP) and is used to retrieve the right Recipient Context
- › Recipient Contexts created at runtime upon receiving the first message from the respective endpoint
- › Counter Signature added to COSE\_Encrypt0 object

Thank you!

Comments/questions?

<https://ericssonresearch.github.io/Multicast-OSCOAP/>

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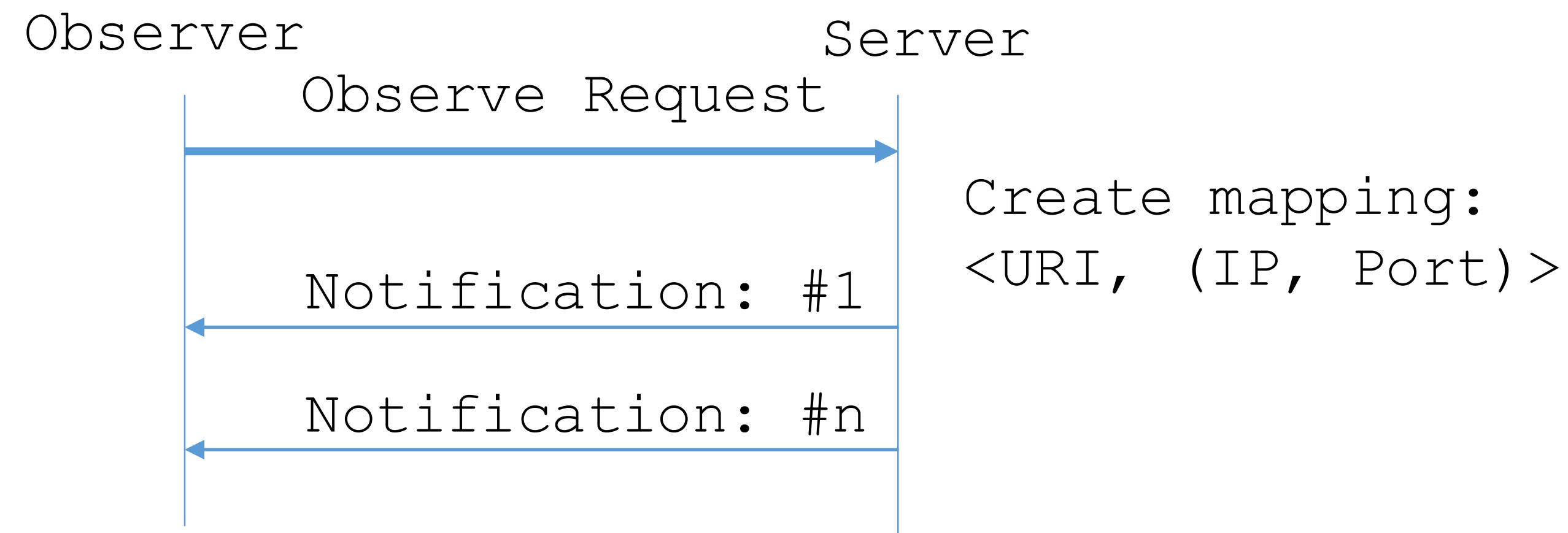
# CoAP Delegated Observation

draft-cao-core-delegated-observe-00

Zhen Cao & Rahul Jadhav

Huawei

# Recap: direct Observe



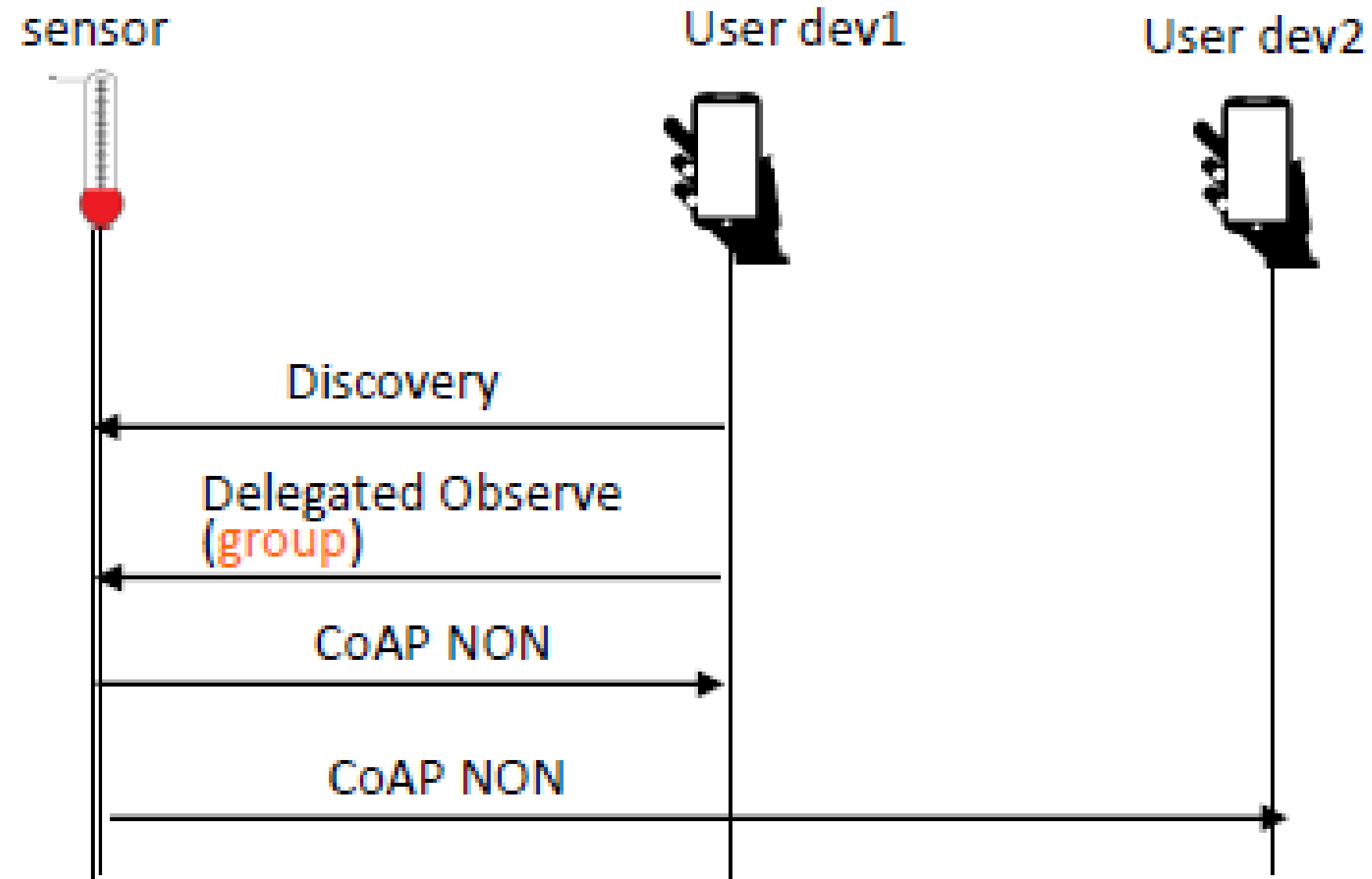
The<sup>88</sup> notification mapping is created between the URI and (IP, Port) of the Observer.

The IP &Port are from the IP&UDP header.

If the Observer hide behind any NAT,  
notification will normally fail.



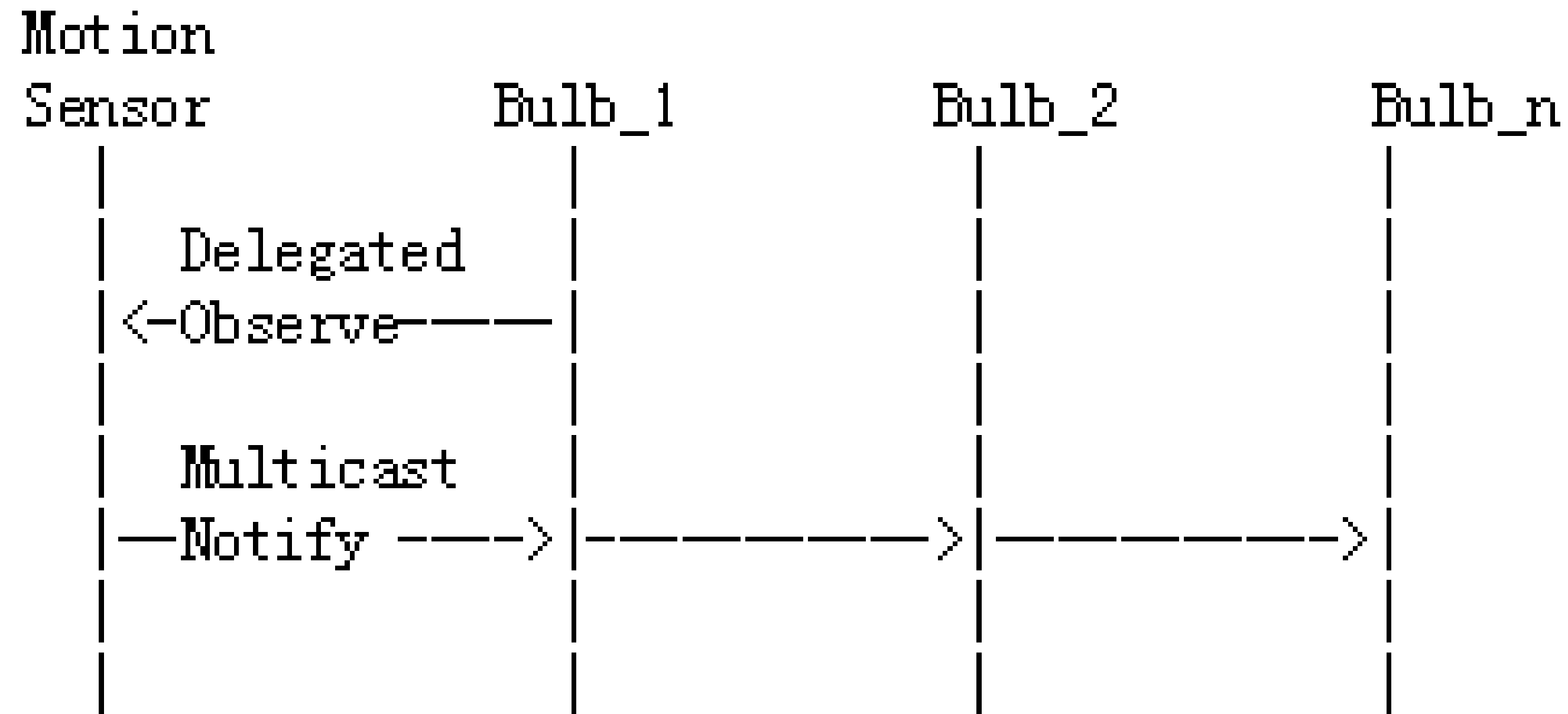
# Delegated Observe Scenario: Multi-Devices



89

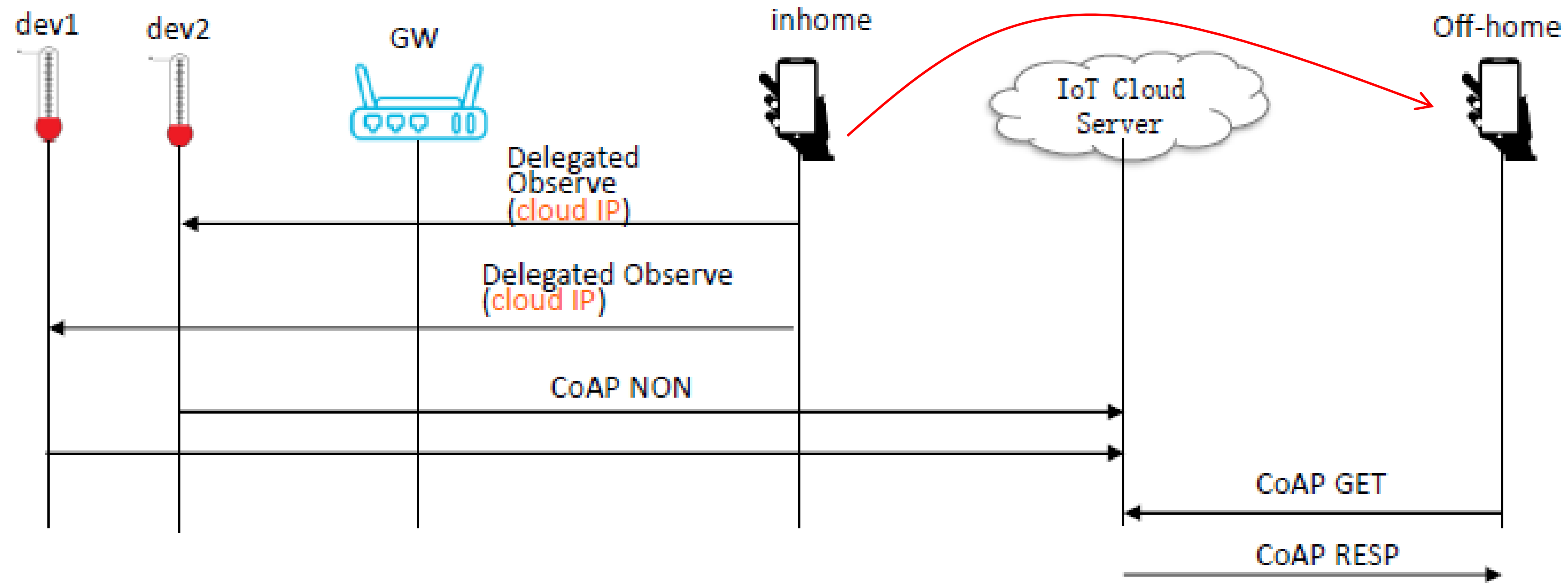
- The user has multiple devices (it's a common scenario nowadays) and need to subscribe the information on the sensor
- Avoiding the need of sending observe request on the group of devices, one could just delegate
- The notification will send to the subscribed Group

# Multicast



- E.g., A number<sup>90</sup> of light bulbs need to adjust its lighting intensity based on the location of the observed motion object.
- Instead of let each device register an interest on the motion sensor, one of them could simply delegate the observe to this multicast group, so that the location update notifications will be send to the multicast address that they belong to.

# Delegate to the Cloud



- The mobile device want to keep notified about its home sensor information both in-home and off-home;
- But while off-home<sup>91</sup>, its reachability will be broken due to NAT
- Let the mobile-dev send a delegated observe request while at home, instructing the home sensors send notifications to the device's representative cloud server, so that the device can always fetch the information from it cloud service while off-home.

# Discussion

- Delegated observe may increase the risk of amplification attacks
- This negative effect can be controlled by several implementation considerations:
  - a) the delegating node can negotiate with the delegated node before sending delegated observe, out of band;
  - b) the source node will strictly control the rate of the notifications, so that flooding will be avoided;
  - c) the delegated node can block any notifications beyond a certain data rate.

# Next steps

- Anyone else identify similar problems ?
- Anyone would like to work together or review the current draft?
- Interest to continue working on this in the CORE WG?
- **Acknowledgement:** comments & suggestion by Christian Amsüss

# Appendix: What else in the draft

Proposed Delegated<sup>94</sup> Observe Option

Examples

# Proposed Delegated Observe Option in the draft

The properties of the Delegated Observe Option are defined in Fig. 4.

In a GET request:

No.	C	U	N	R	Name	Format	Length	Default
TBD		x	-		Delegated Observe	string	0-256	(none)

C=Critical, U=Unsafe, N=No-Cache-Key, R=Repeatable

In a Response:

No.	C	U	N	R	Name	Format	Length	Default
TBD		x	- <sup>95</sup>		Delegated Observe	uint	0-3 B	(none)

C=Critical, U=Unsafe, N=No-Cache-Key, R=Repeatable

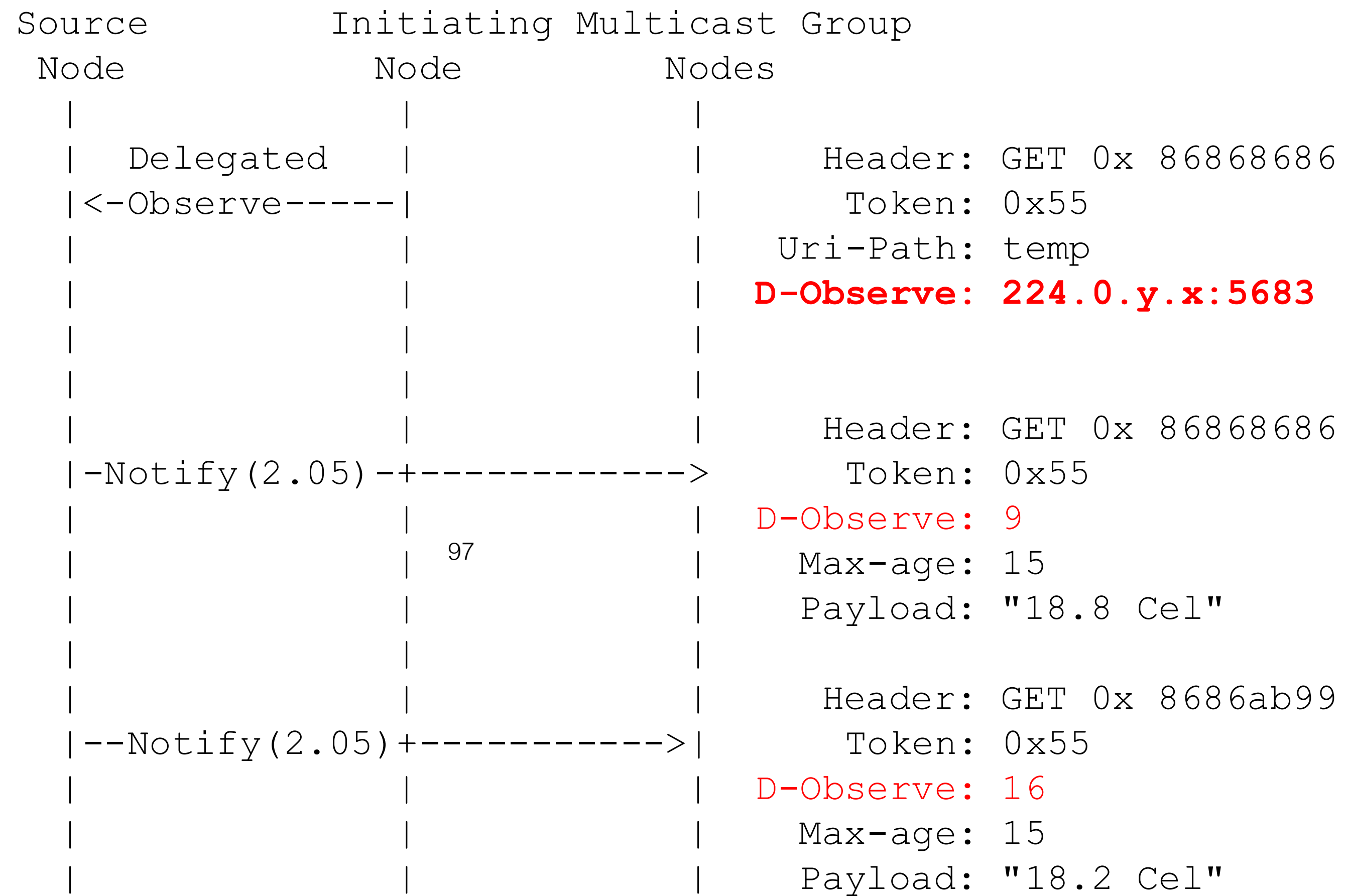
Figure 4: CoAP Delegated Observe Option

# Example

Source Node	Initiating Node	Cloud Node
Delegated		Header: GET 0x 86868686
<-Observe-----		Token: 0x55
		Uri-Path: temp
		<b>D-Observe: 10.0.0.2:5683</b>
		Header: GET 0x 86868686
--Notify(2.05)----->		Token: 0x55
	96	<b>D-Observe: 9</b>
		Max-age: 15
		Payload: "18.8 Cel"
		Header: GET 0x 8686ab99
--Notify(2.05)----->		Token: 0x55
		<b>D-Observe: 16</b>
		Max-age: 15
		Payload: "19.2 Cel"



# Example: multicast



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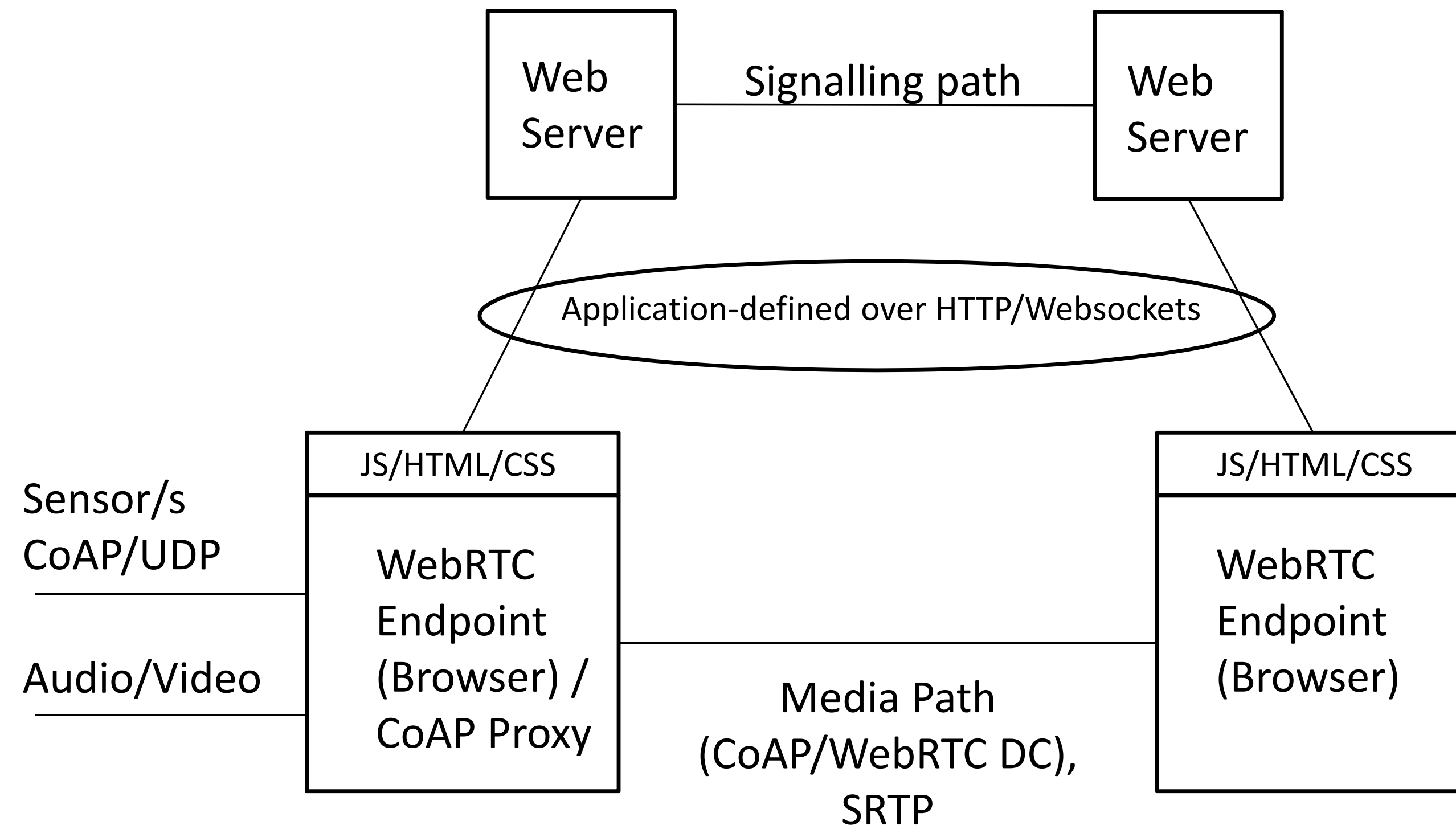
# CoAP over WebRTC Datachannel

draft-groves-coap-webrtcdc-01

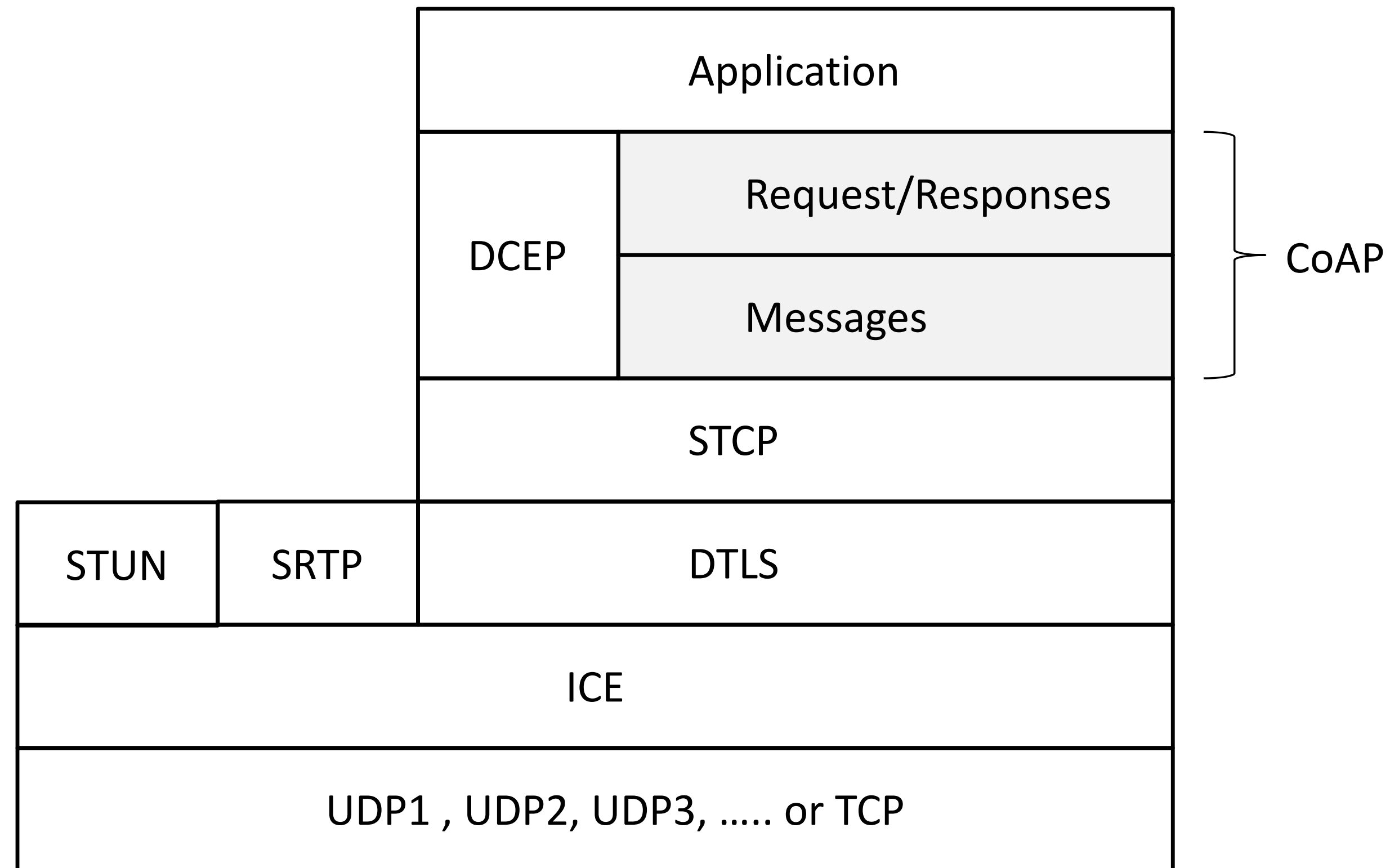
IETF #97 Seoul

Christian Groves

# Architecture



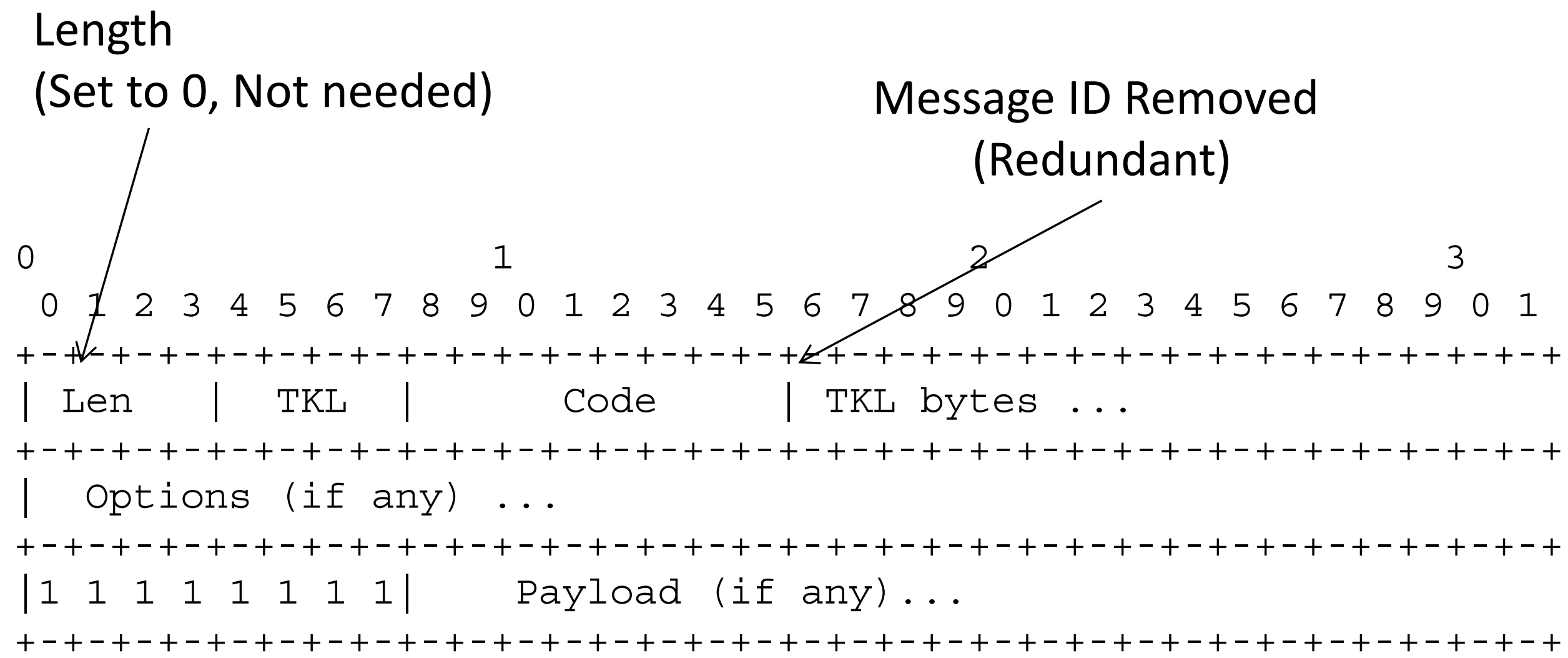
# Stack



# Features

- Allows peer to peer CoAP message exchange
- NAT traversal & security provided by WebRTC
- Allows multiplexing over a single DTLS connection
- DC allows reliable and partial reliable modes similar to CoAP
- Like CoAP/TCP, CoAP reliability mechanisms aren't needed (e.g. ACK and duplicate detection).
- Provides transport keepalive.
- WebRTC DC manages establishment / release

# V1 Update: Message Design



**Now uses same format as TCP/TLS and Websockets  
(draft-ietf-core-coap-tcp-tls)**

## V1 Updates: cont.

- Added description of opening handshake to align with draft-ietf-core-coap-tcp-tls.
- Added CoAP capability setting message (CSM) and BERT support.



# Next steps









Is this something interesting for the CoRE WG?

All times are in time-warped KST

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  - **14:20–14:30 CoAP over WebRTC DC (CG)**
- **14:30–15:00 Flextime**
    - **TCP nits**
    - **CoCoA ACC**
    - **DTLS over COAP**

# CoAP/TCP design nits

- ⓘ RFC7595 obsoletes RFC4395 **editorial**  
#79 opened 2 days ago by brianraymor
- ⓘ "Harmonize" URI scheme registrations **editorial** **IANA**  
#78 opened 2 days ago by brianraymor
- ⓘ Clarify registration criteria for CoAP Signaling Option Numbers Registry **editorial** **IANA** 1  
#77 opened 2 days ago by brianraymor
- ⓘ CoAP Signaling Option Numbers Registry should use signal code rather than name **editorial** **IANA** 1  
#76 opened 2 days ago by brianraymor
- ⓘ "Harmonize" definitions of URI schemes **editorial**  
#75 opened 2 days ago by brianraymor
- ⓘ Clarify Diagnostic Payload **capabilities and settings** **editorial**  
#74 opened 2 days ago by brianraymor
- ⓘ WebSockets and mandatory CSM exchange on connection **capabilities and settings** **editorial**  
#73 opened 2 days ago by brianraymor
- ⓘ Clarification needed for CoAP over Websockets - Connection Health **editorial** 1  
#71 opened 22 days ago by brianraymor  coap-tcp-tls-06
- ⓘ UDP-to-TCP gateways **editorial** 1  
#70 opened 22 days ago by juanjperez  coap-tcp-tls-06
- ⓘ Ping and Pong Messages: ... a single Pong message MUST be returned?  
**capabilities and settings**  
#69 opened 22 days ago by brianraymor  coap-tcp-tls-06
- ⓘ Security Considerations: TLS does not protect the TCP header **editorial** **TLS**  
#68 opened 22 days ago by brianraymor  coap-tcp-tls-06
- ⓘ Incorrect reference to Uri-Host Option **editorial**   
#66 opened 23 days ago by brianraymor  coap-tcp-tls-06
- ⓘ Informative reference to cocoa **cocoa** **editorial** **revisit-upon-change** 1  
#31 opened on Jul 7 by brianraymor  coap-tcp-tls-06
- ⓘ Should we consider making TLS a Must **design** **TLS** 5  
#11 opened on Jun 25 by Areontar  coap-tcp-tls-06

# Ping and Pong Messages: ... a single Pong message **MUST** be returned? #69

 Open

brianraymor opened this issue 22 days ago · 1 comment



brianraymor commented 22 days ago

IETF CoRE WG member



In [Section 4.4 Ping and Pong Messages](#):

*Upon receipt of a Ping message, a single Pong message is returned with the identical token.*

This should be **MUST** be returned ?



brianraymor added the **capabilities and settings** label 22 days ago



brianraymor modified the milestone: **coap-tcp-tls-06** 22 days ago



cabo commented just now

IETF CoRE WG member



One of the problems with this **MUST** is that it is hard to verify -- the responder has any amount of time to do this. But, yes, the intention is that responders do this (that's why it's phrased as a statement of fact right now).

Projects

None yet

Labels

**capabilities and settings**

Milestone

**coap-tcp-tls-06**

Assignees

No one assigned

2 participants



Notifications

# CSM Mandatory?

- Before summer, there were no CSM
  - existing implementations just start exchanging messages
- Now, CSM mandatory
  - Both MUST send as first message
  - “Client” need not wait for “server” CSM (but v.v.?)  
(still not quite clear what the permissible waiting behaviors are.)
- Do we want an OCF 1.0 compatibility mode?

# Scheme names (as an application developer would view it)

**COAP**

**COAPS**

**?**

**coap**<sub>+udp</sub>

**coaps**<sub>+udp</sub>

*coap+dtls*

**coap+tcp**

**coaps+tcp**

coap+tls

**coap+ws**

coaps+ws

**coap+wss**

# Evaluation of Aggregate Congestion Control

(Appendix of draft-ietf-core-cocoa-00 )

Carsten Bormann (Universität Bremen TZI)

August Betzler, Carles Gomez, Ilker Demirkol (UPC/i2cat)

Jon Crowcroft (University of Cambridge)

*carlesgo@entel.upc.edu*



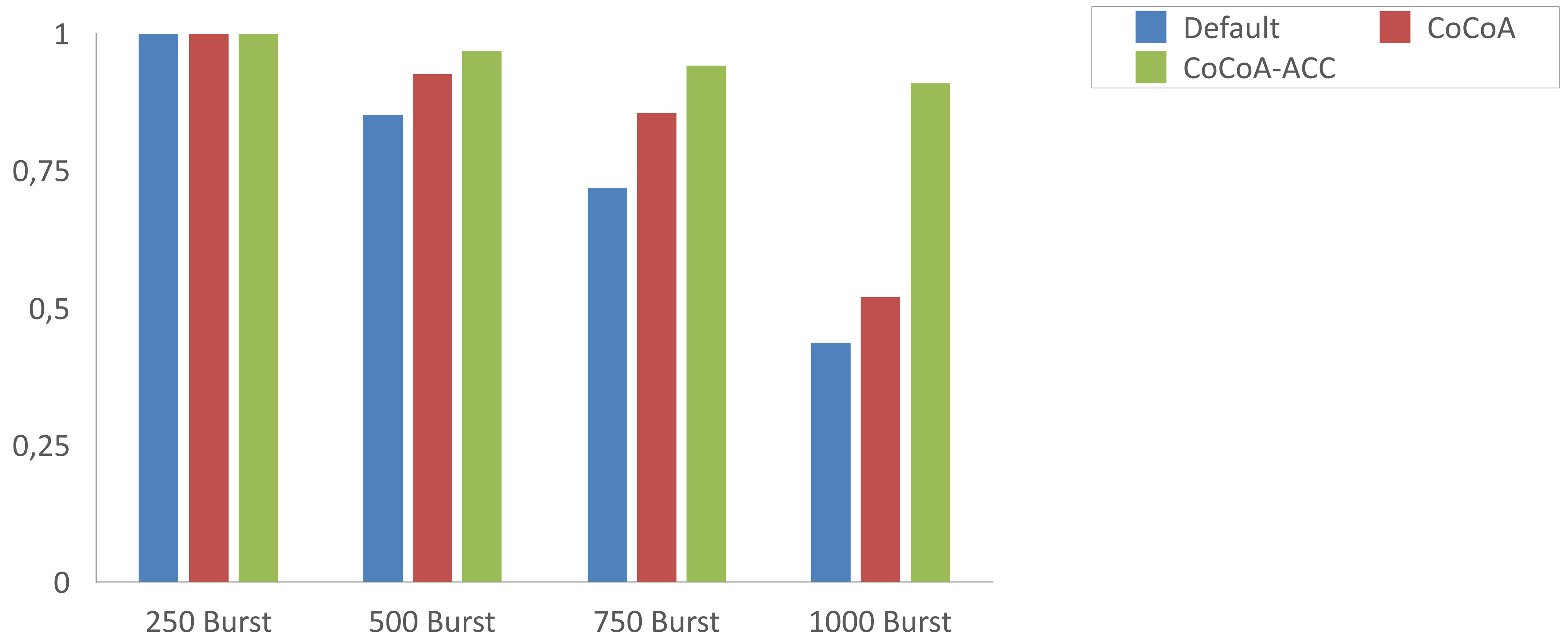
# Introduction

- CoCoA provides adaptive congestion control for CoAP
  - Specifically designed considering CNN features
- Appendix: Aggregate Congestion Control (ACC)
  - Control burstiness of aggregate traffic from unconstrained device talking to many other endpoints
- Performance evaluation in GPRS emulated scenario
  - Californium CoAP implementation
  - Transmission of requests to several devices
  - Default CoAP, CoCoA, CoCoA-ACC

# Results (I/IV)

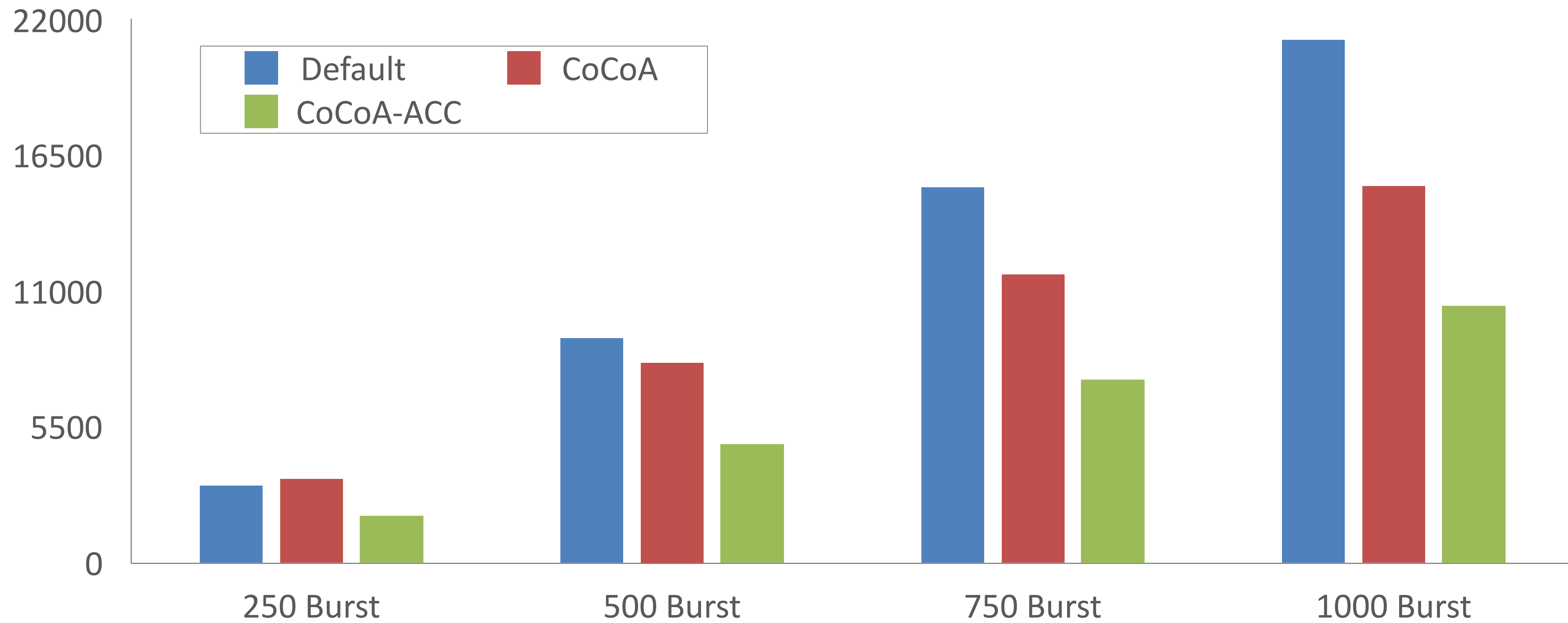
- Burst-only traffic

– PDR



# Results (II/IV)

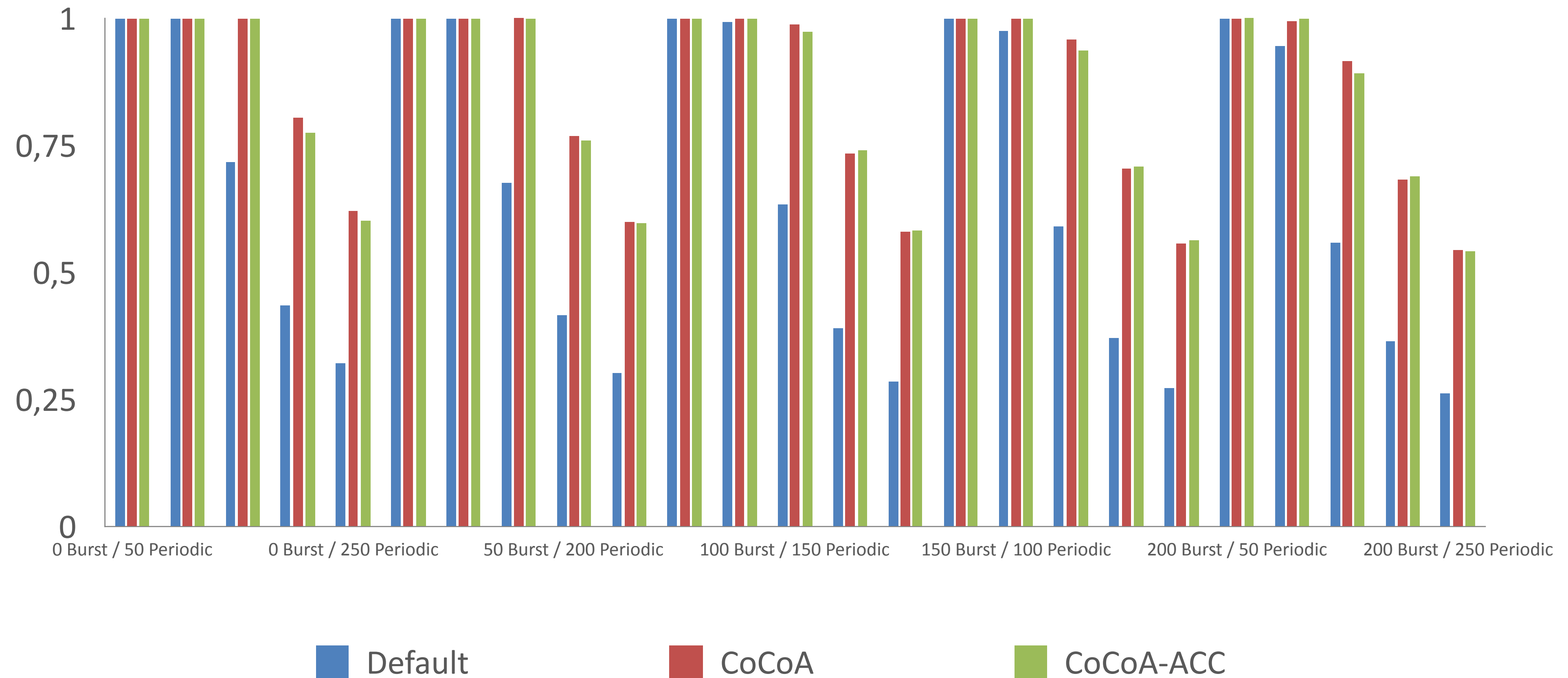
- Burst-only traffic
  - Retries



# Results (III/IV)

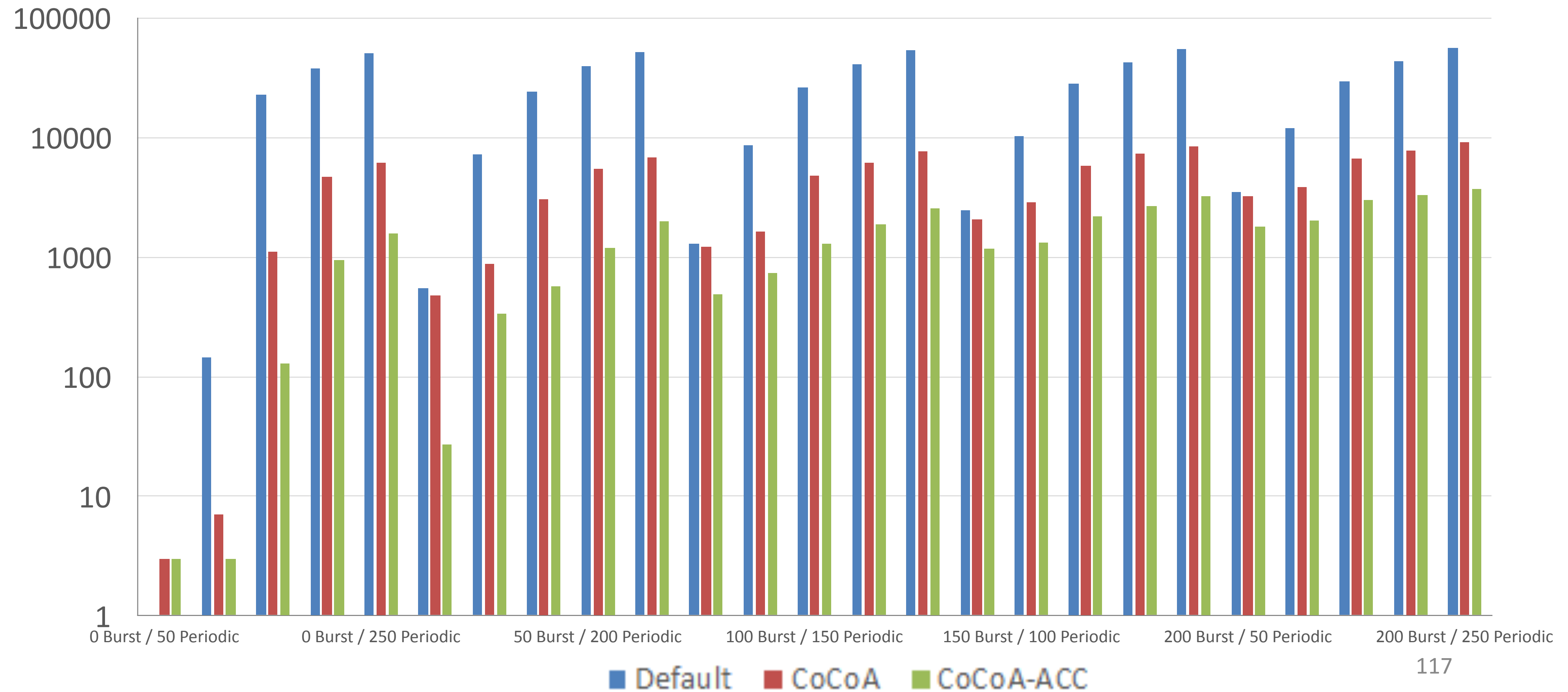
- Mixed traffic (periodic/burst)

– PDR



# Results (IV/IV)

- Mixed traffic (periodic/burst)
  - Retries



# Conclusions

- Burst traffic
  - CoCoA-ACC: greater PDR than CoCoA
  - CoCoA-ACC: lower number of retries
- Mixed traffic
  - CoCoA-ACC: same PDR as CoCoA
  - CoCoA-ACC: very low number of retries
- Benefits at the expense of greater delay
  - CoCoA-ACC: greater than default CoAP
  - CoCoA-ACC: lower than CoCoA for high traffic

# Future work

- Perform experiments in the IoT-Lab
  - IEEE 802.15.4 multihop testbed

# Questions ?

Carsten Bormann (Universität Bremen TZI)

August Betzler, Carles Gomez, Ilker Demirkol (UPC/i2cat)

Jon Crowcroft (University of Cambridge)

*carlesgo@entel.upc.edu*



# Back-up slide: ACC algorithm

- If no RTO info available for a destination

$$PLIMIT = LAMBDA$$

- Otherwise

$$PLIMIT = \max(LAMBDA, LAMBDA * ACK\_TIMEOUT / \text{mean}(RTO)) \quad (4)$$

- LAMBDA is computed as

$$LAMBDA = \max(4, KNOWN\_DEST\_ENDPOINTS / 4) \quad (5)$$

# DTLS over CoAP

draft-schmertmann-dice-codtls-01.txt

Lars Schmertmann, Klaus Hartke,

Carsten Bormann

# DTLS = Handshake + Record

- DTLS handshake assumes reasonably good UDP connectivity
- Timeouts inflexible; no “stop retransmitting”
- → Use CoAP for handling the handshake
  
- Side-effect: This can be run over proxies  
→ nice e2e key agreement protocol...

# Handshake 1: ClientHello

Client

-----

POST /  
ClientHello

----->

POST /  
ClientHello

----->

Server

-----

<-----  
4.01 Unauthorized  
HelloVerifyRequest

<-----  
2.01 Created /dCST0E  
ServerHello  
Certificate\*  
ServerKeyExchange\*  
CertificateRequest\*  
ServerHelloDone<sup>124</sup>

# Handshake 2: ClientHello

Client  
-----

PATCH /dCST0E  
Certificate\*  
ClientKeyExchange  
CertificateVerify\*  
[ChangeCipherSpec]  
Finished

Server  
-----

----->

<-----

2.04 Changed  
[ChangeCipherSpec]  
Finished

# Implementation

Size (KiB)	Function
2.41	ECC functions
0.95	AES modes (CCM + CMAC)
0.80	Storage management
0.79	Session management
0.15	PRF
1.78	CoAP Resource implementing handshake
0.32	Parse & Send

# Issues

- Document defines compression of DTLS fields
- Finished messages still would need to compute the hash from the expanded header
- or would they?

- **We assume people have read the drafts**
- **Meetings serve to advance difficult issues by making good use of face-to-face communications**
- **Note Well: Be aware of the IPR principles, according to RFC 3979 and its updates**

- ✓ Blue sheets
- ✓ Scribe(s)



draft-tcs-coap-no-response-  
option → RFC 7967



Published 2016-08-30  
Independent Submission

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All times are in time-warped KST

## Friday (120 min)

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# Media Types for Sensor Markup Language (SenML)

draft-ietf-core-senml-04

IETF 97, Seoul, South Korea

Ari Keränen

[ari.keranen@ericsson.com](mailto:ari.keranen@ericsson.com)

# Updates since -02

- New name: Media Types for Sensor **Measurement Lists** (SenML)
- Added text and examples about actuator use
- Added base sum
- Lots of clarifications, including
  - "resolved records"
  - why no new CBOR labels
- Media type registration considerations

# Extensibility

- Schema (RelaxNG to XSD, CDDL) extensions
  - Always include full schema with all extensions defined so far with RelaxNG
  - CBOR: extension point

# Metadata

- Free form text (full UTF-8) describing a Pack and/or Records
  - Example:  
`{"n":"temp", "v":23, "u":"Cel", "m": "München"}`
- But we need proper internationalization (language tags?) – "it is more complicated than you think" [RFC1925]
- Some use cases, but not a top priority: let's do as extension and ship SenML base spec now



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# SenML Base Time Offset Attribute

draft-groves-core-senml-bto-00

IETF #97 Seoul

Christian Groves

# Issue

- Aim: to minimise SenML pack size when multiple constant time increasing (or decreasing) records are contained. E.g.

```
[ {"bn": "urn:dev:ow:10e2073a01080063",  
  "bt": 1320067464,  
  "bu": "%RH",  
  "v": 21.2},  
  { "v": 21.3, "t": 10},  
  { "v": 21.4, "t": 20},  
  { "v": 21.4, "t": 30},  
  { "v": 21.5, "t": 40}, ...
```

# Proposal: new “Base Time Offset” (bto) attribute.

- Bto attribute specifies the time interval between records.

```
[ { "bn": "urn:dev:ow:10e2073a01080063",  
    "bt": 1320067464,  
    "bto": 10,  
    "bu": "%RH",  
    "v": 21.2 },  
  { "v": 21.3 },  
  { "v": 21.4 },  
  { "v": 21.4 },  
  { "v": 21.5 }, ...
```

# Issues (bto)

- Using bto two SenML records in a pack cannot have the same time. E.g. 2 sensors cannot have the same time.
- Negative time offset with the last record equal to  $t=0$  is not possible.
- Usage of time “t” within a record not possible.
- There are potential work arounds for the above but would introduce complexity.
- Need to add text on what happens if bto is not understood (time will be missing).

# Issues (SenML Extension)

- CBOR and XML/EXI extension are different.
- For CBOR just register string map key “bto”
- XML need to extend XML to add attribute and then update EXI XSD schema and introduce new schemaID options value indicating new version. Must include all previously registered attributes.
- The later seems to imply that all attributes are supported. The CBOR seems to imply optionality.
- How to indicate which attributes are actually supported?

# Next steps

- Is there support to continue with the proposal?

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# CoRE working group

CoAP Management Interface  
draft-vanderstok-core-comi-10

147

P. van der Stok, A. Bierman, A. Pelov, M. Veillette

# State with respect to version 9

## Current version 10

- Conversion of names to SID from ietf-core-sid with delta encoding
- Use iPATCH and FETCH from ietf-core-etch
- YANG to CBOR from ietf-core-yang-cbor
- List instance access simplified
- Content-format in construction e.g. bormann-appsawg-cbor-merge-patch
- query parameters changed.
- default handling<sup>148</sup> changed

CoMI specifies basic access to YANG servers

Extensions will be proposed as CoOL.

# Syntax examples (1)

GET /c/<instance-identifier>

[retrieve a data node]

2.05 Content

<data node value>

<instance-identifier> can be leaf, leaf-list, container, list, list instance  
or anyxml, anydata (under discussion)

For example:

GET coap://example.com/c/a1

[retrieves “clock” node]

GET coap://example.com/c/Bf4?k=“eth0”

[retrieves “description” leaf  
of “interface” list instance]

Same syntax for DELETE, POST, PUT

a1= 1717; Bf4=1537

## Syntax examples (2)

iPATCH /c

[delete/replace/add set of data node instances  
of datastore]

<set of (identifier:value) pairs>

2.04 Changed

FETCH /c

[retrieve part(s) of datastore]

<CBOR array of instance identifiers>

2.05 Content

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Instance identifier is SID or CBOR array of list SID, followed by key values

Example: [1717, [-186, "eth0"]]

1719-186=1533

## Syntax examples (3)

POST /c/<instance identifier>  
<input node value>  
2.05 Content  
<output node value>

[execute RPC or ACTION ]

GET /c/s observe(0)  
2.05 Content  
<set of data node <sup>151</sup>instances>

[receive notification from default stream]

# Differences with RESTCONF

RESTCONF	CoMI
HTTP/TCP	CoAP/UDP
JSON/XML	CBOR
YANG names	Numeric identifiers (SID)
Insert, Insertion - modes	No ordering
Start/Stop events	No timing assumed
Fields parameter	Not supported
Filter query (content, depth, ....)	Not supported
3 default values	Only trim mode
URI .... /instance=number/....	URI .....?k=number



# Next steps and to be discussed

- Remove “TODOs”
- Error handling extended
- Discuss notification/stream functionality
- Data model discovery (CoOL ?)
- Remove mistakes and Typooes

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# Privacy and CoAP Redirects

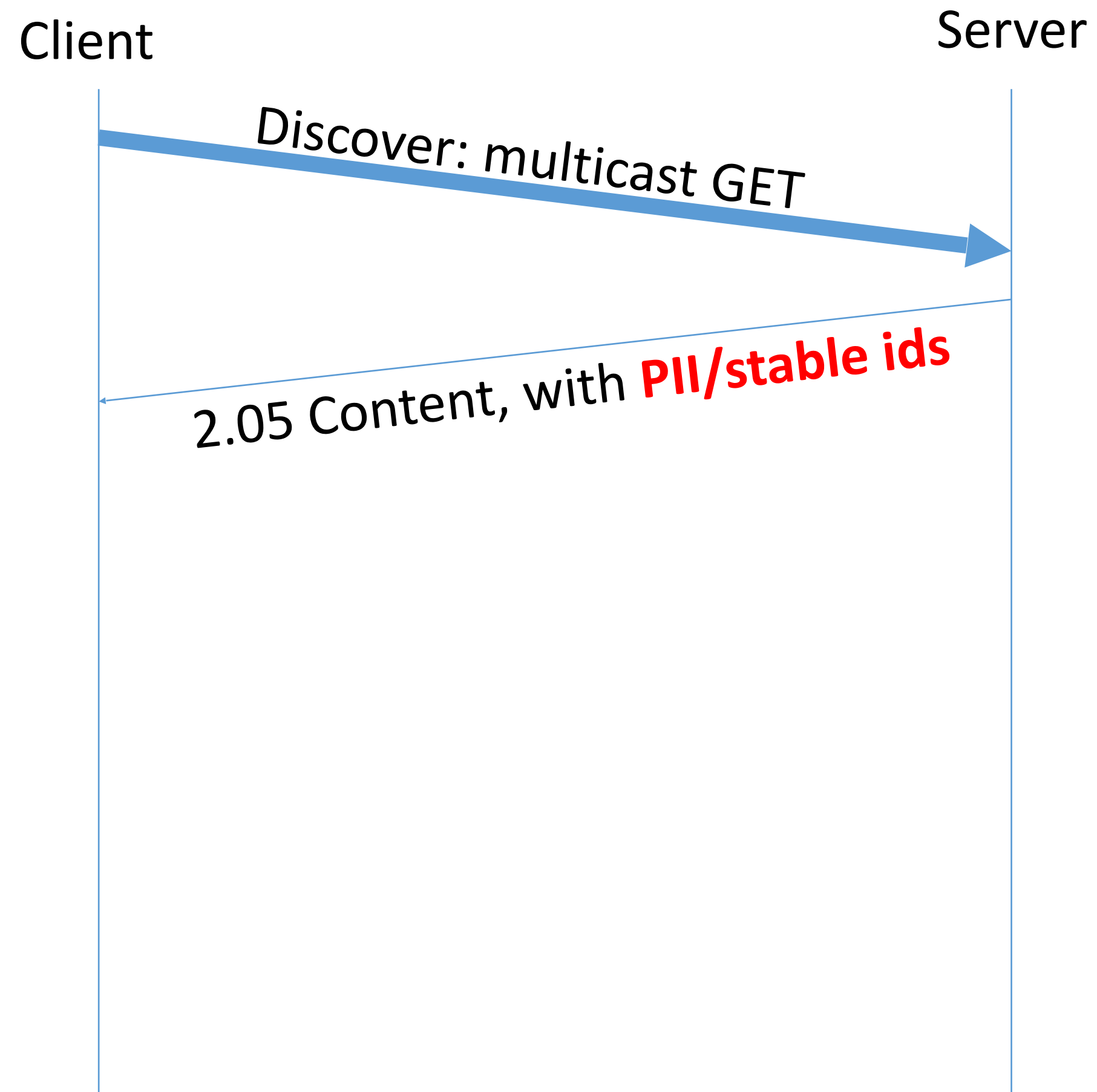
<https://tools.ietf.org/html/draft-thaler-core-redirect>

# Background

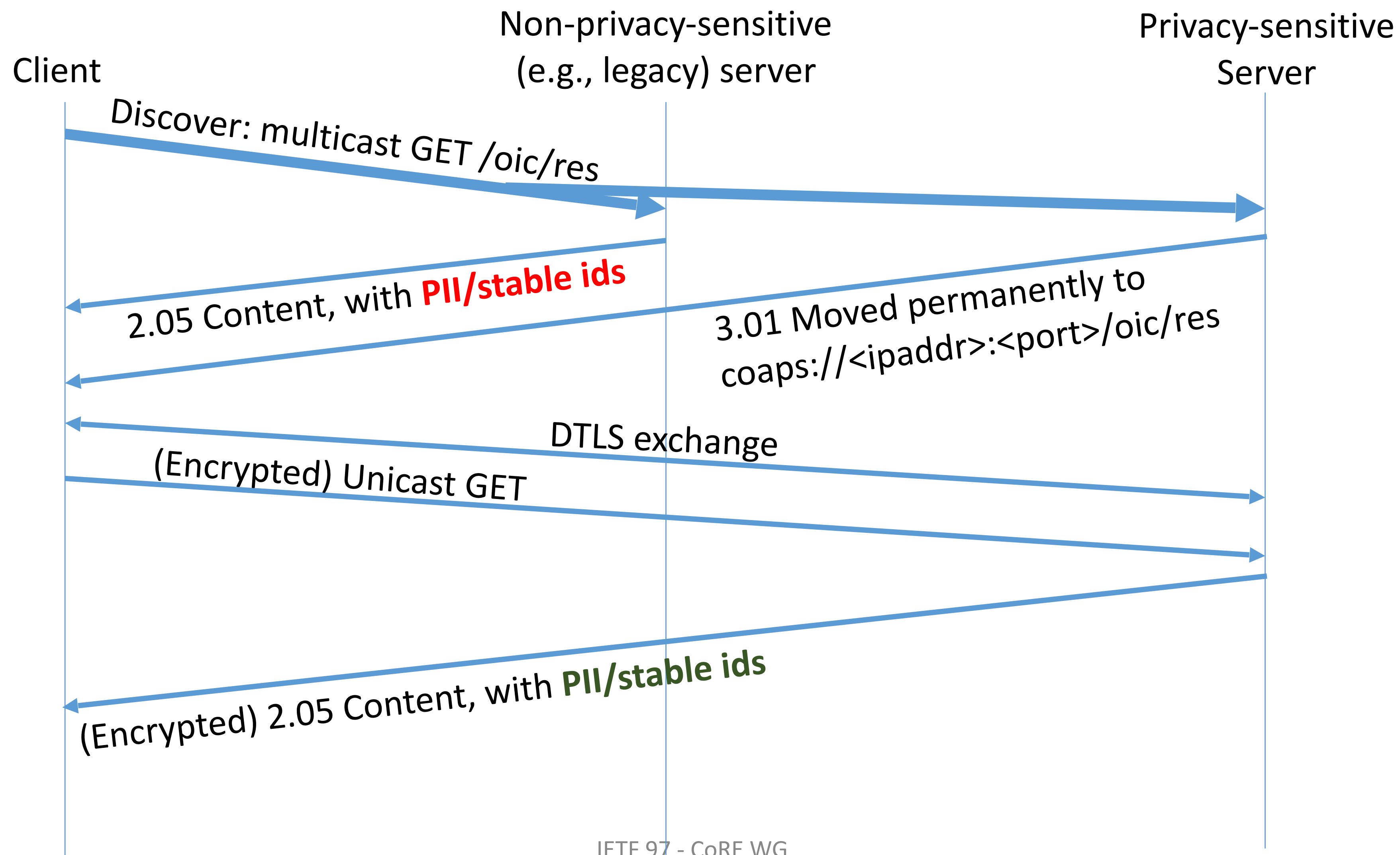
Open Connectivity Foundation (OCF) does IoT schemas, certification, etc.

- OCF uses COAP
- OCF does not want to fork COAP
- OCF found privacy issues
- OCF needs some solution regardless of whether IETF or not
- OCF strongly prefers a generic (non-OCF-specific) solution
- OCF prefers it be done by IETF

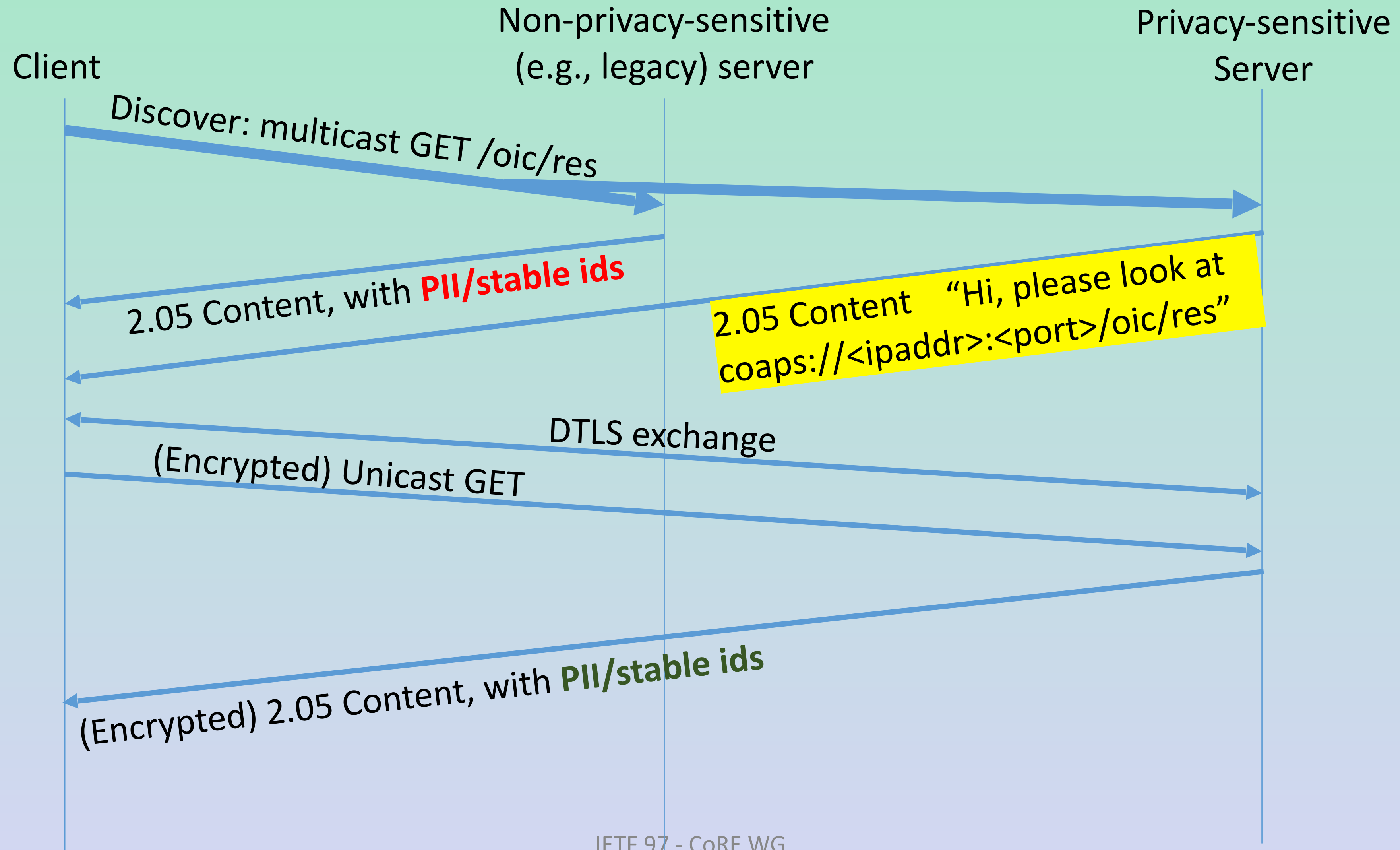
# Today's problem with PII and stable id's



# With redirect



# Sketch for an approach without redirect



# Alternatives considered

- Use a Resource Directory
  - Same issue can arise with discovering RD to start with
  - Don't want to have to depend on deploying an RD in all cases
- Use a success response with different content
  - More complex & error-prone since requires each relevant entity handler (e.g., app) to be aware rather than base coap layer in one place
  - Different from other protocols (http, etc.)
- Alternative-Address option in coap-tcp-tls
  - Requires same URI scheme, so cannot redirect from coap to coaps
- Use a multicast security mechanism
  - Good if it can exist longer term, but don't see it happening soon



# Details

- RFC 7252 today:
  - Location-Path and Location-Query already exist
  - Other values reserved for future Location-\* options
- Add Option numbers for Location-Scheme and Location-Authority
- Add Response Code “3.01 Moved Permanently” for parity with HTTP

# Redirect alone is not sufficient

There is a separate CFRG problem:

- one must also use an authentication scheme that does not reveal a stable identifier to clients before authentication is complete
- mutual auth schemes exist (e.g., “secret handshake” paper in SOSP 2003) that only reveal the identity of both endpoints if authentication succeeds, but not yet available in current standards and popular code bases

# Discussion

- WG adoption?

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# CoRE Working Group

Mapping LWM2M model to CoMI YANG  
draft-vanderstok-core-yang-LWM2M-00

165

Peter van der Stok, Jaime Jiménez

# Purpose

**Motivation:** Difficult to understand differences and commonality between CoMI/YANG and OMA LWM2M (advantages, disadvantages)

**This Draft:** specifies an automatic mapping from a LWM2M xml-based device specification to a YANG MODULE for CoMI consumption.

**Purpose:** better understanding of relations between YANG Module and OMA LWM2M specification

**Info:** CoMI at IETF (draft-vanderstok-core-comi-10) describes a network management interface based on CoAP and YANG.

# Method

- Standard organizations use hierarchical models that can be specified in XML and describe classes with attributes and operations that can be instantiated on servers.
- OMA LWM2M and IPSO standardize numbered object types and resources.
- YANG module specifies data models with named objects and leafs. <sup>167</sup>
- Goal: Specify a mapping from a LWM2M xml-based device specification to a YANG MODULE for CoMI consumption.

# Example: Humidity Object

## Object definition

Name	Object ID	Instances	Mandatory	Object URN
Humidity	3304	Multiple	Mandatory	urn:oma:lwm2m:ipso:3304

## Resource definitions

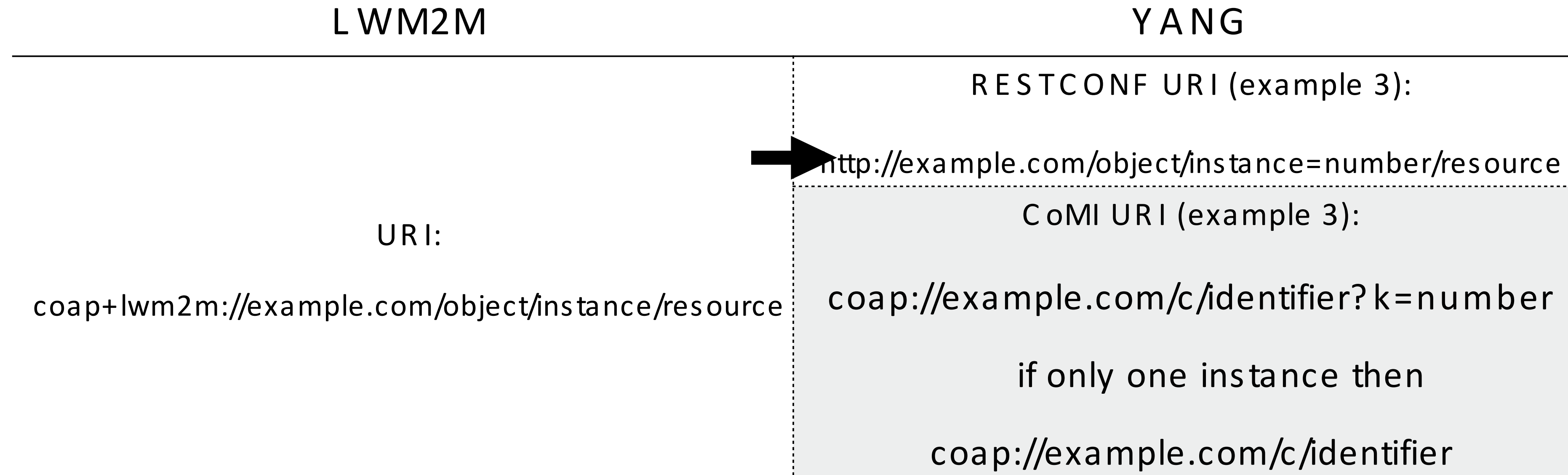
ID	Name	Operations	Instances	Mandatory	Type	Units	Description
5700	Sensor Value	R	Single	Mandatory	Float	...	...
5601	Min Measured Value	R	Single	Optional	Float	...	...
5602	Max Measured Value	R	Single	Optional	Float	...	...
5603	Min Range Value	R	Single	Optional	Float	...	...
5604	Max Range Value	R	Single	Optional	Float	...	...
5701	Sensor Units	R	Single	Optional	String	...	...
5605	Reset Min and Max	E	Single	Optional	Opaque	...	...



# Conversion Rules

L WM2M	YANG (RFC 6020)
optional /mandatory attribute	Mandatory false/true statement
R, W attributes	Config statement (False=R, True=W)
E attribute	YANG RPC/ACTION
range attribute	range statement
units	units statement
<sup>169</sup> device	YANG list
resources	leafs of device YANG list
object Instance	YANG List instance identified with key

# URI Conversion



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- ?k=number, as query parameter for instance number.
- /c signifies comi server data (discovery returned)
- /identifier equals object\*1000 + resource

# Generated YANG module

```
module: ietf-yang-humidityNM
  +--ro IPSO-humidity* [instance_number]
    +--ro instance_number          uint16
    +--ro Sensor_Value             decimal64
    +--ro Units?                   string
    +--ro Min_Measured_Value?      decimal64
    +--ro Max_Measured_Value?      decimal64
    +--ro Min_Range_Value?         decimal64
    +--ro Max_Range_Value?         decimal64
    +---x Reset_Min_and_Max_measured_values
```

[ ] list<sup>171</sup>keys  
rw configuration data (read and write)  
ro state data (read only)  
\* list and leaf list  
x action

# Takeaways

- Example 1 (module: ietf-yang-humidityID) is a bit forced and lacks the Resource Name.
- Example 2 ( module: ietf-yang-humidityNM) seems to be the best fit.
- Example 3 (ietf-yang-humidityLF) seems too complex.
- Both .XML (3482 characters) and .YANG (4570 characters) have a lot of “noise” in them.
- YANG is much more expressive than LWM2M,
- There are many design choices for the mapping algorithm.
- Key leafs are just one possible way to represent instances.
- Access Control mapping might be done better.
- YANG has no Float, we use 64 bit precision (float is 32).
- Need to script automatic conversion.
- Where would a converter run? GWs, devices, server?

# Links

- <https://tools.ietf.org/html/rfc6020>
- <http://technical.openmobilealliance.org/Technical/technical-information/release-program/current-releases/oma-lightweightm2m-v1-0>
- <http://ipso-alliance.github.io/pub/>
- (Preliminary work) <http://jaimejim.github.io/drafts/draft-vanderstok-core-yang-lwm2m-00.txt>
- [jaimejim.github.io/drafts/3304.xml](http://jaimejim.github.io/drafts/3304.xml)
- [jaimejim.github.io/drafts/3304.yang](http://jaimejim.github.io/drafts/3304.yang)

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# Addition of organisation prefix to [RFC6690](#) IANA CoRE parameters registration

draft-groves-core-rfc6690up-00

IETF #97 Seoul

Christian Groves

# Problem

- RFC6690 defines IANA registration procedures for resource type (rt) and interface description (if) link attributes.
- Each link attribute must have a separate IANA registration.
- Potentially there will be 100s (1000s?) of resource types. Interfaces likely to be less.



# Result

- More work all around (organisations, IANA, expert etc.)
- Delay in registration
- Or not at all (too hard)

# Proposal – Update to RFC6690

- Allow for a organizational prefix to be registered.
- Allowing organizations to manage their namespace.
- To do so they must provide a specification indicating the rules for the namespace.
- **MUST** comply with RFC6690 conventions
- **SHOULD** provide a reference to where registrations can be found.

# OCF

- Have had feedback from several OCF members that they support the approach.
- Proposal for a prefix “x.” that allows a reverse domain name to be used without registration.  
e.g. “x.org.openconnectivity.r.widget”  
Organizational prefix used for compactness:  
e.g. “oic.r.widget”

# Next Steps

- Is there any support to the prefix mechanism?
- Is there any support to add an “x.” prefix for reverse domain names?

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