# Constrained RESTful Environments WG (core)

Chairs:

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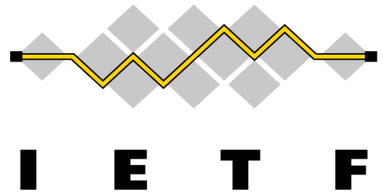

- We assume people have read the drafts
- Meetings serve to advance difficult issues by making good use of face-to-face communications
- Note Well: Be aware of the IPR principles, according to RFC 8179 and its updates

```
[ ] Blue Sheets
[ ] Jabber Scribe(s)
[ ] Note Taker(s)
```

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https://www.ietf.org/about/note-well/

All times are in UTC

# Wednesday (120 min)

- 13:00–13:10 Intro, Agenda, Status
- 13:10–13:25 CoRECONF
- 13:25–14:25 GroupComm
- 14:25–15:00 SenML

All times are in UTC

# Thursday (90 min)

- 13:00–13:05 Intro, Agenda
- 13:05–14:20 CoRE Applications
- 14:20–14:30 Flextime

# Agenda Bashing

# Intro

# Practicalities

- CoRE Interim meetings to occur every other week from the 29th of April. Time will be 14:00 UTC.
- We cleaned up the Github landing page at: core-wg.github.io
- Use of queuing at core@jabber.ietf.org
  - **`q+`** to add yourself to queue.
  - Otherwise use **`q+`** on Webex.
  - Use **`help q`** to request the list of commands.

multipart-ct-04 → RFC 8710 !! ✓

published 2020-02

hop-limit-07 → RFC 8768 !! ✓

published 2020-03

# RFC-Editor Queue

- draft-ietf-core-senml-etch-07
- draft-ietf-core-senml-more-units-06

# IESG Processing

- draft-ietf-core-resource-directory-24
  In Last Call
- draft-ietf-core-stateless-05
  In Last Call

# In Post-WGLC processing

- draft-ietf-core-echo-request-tag-09
  - WGLC to be formally closed

# WGLC to be issued

- draft-ietf-core-dev-urn-04
  - WGLC to be formally started

# CoRECONF


# CORECONF

Andy Bierman
Michel Veillette
Peter van der Stok
Alexander Pelov
Ivaylo Petrov

# Status sid-12

WGLC resulted in a good amount of editorial changes and some extra issues:

- Laurent Toutain and Andy Bierman believe it is ready
- Comments from *Peter van der Stork*, *Esko Dijk*, *Juergen Schoenwaelder*, *Michael Richardson*, *Tom Petch*
  - Prepare SID system for eventual change of YANG semantics
  - Concerns about Early Allocation
  - IANA Considerations group name
  - Other editorial or minor issues
- Some remarks are still not processed

# Status yang-cbor-12

WGLC resulted in a good amount of editorial changes and some extra issues:

- Laurent Toutain and Andy Bierman believe it is ready
- Comments from *Esko Dijk, Juergen Schoenwaelder*
  - Is there ever going to be another SID specification [JS]
  - Other editorial or minor issues
- All remarks are incorporated in master

# Status comi-09

WGLC resulted in a good amount of editorial changes and some extra issues:

- Laurent Toutain and Andy Bierman believe it is ready
- Comments from *Michael Richardson*
  - Naming of the draft cluster vs the protocol itself (also from other reviewers)
  - Security considerations

# Status yang-library-01


WGLC resulted in a good amount of editorial changes and some extra issues:

- Andy Bierman believe it is ready
- Comments *Tom Petch, Michael Richardson*
  - Security considerations
  - Other editorial changes and questions

# Timeline

To be discussed!

Likely:

- More discussion as needed and authors process comments
- Second WGLC
- Ship to IESG around end of April

# GroupComm

# Group Communication for the Constrained Application Protocol (CoAP)

draft-ietf-core-groupcomm-bis-00

**Esko Dijk, IoTconsultancy.nl**
Chonggang Wang, InterDigital
Marco Tiloca, RISE

IETF CoRE WG virtual interim, April 8th, 2020

# Goal

- Intended normative successor of experimental RFC 7390 (if approved)
  - As a Standards Track document
  - Obsoletes RFC 7390, Updates RFC 7252 / 7641
- Be standard reference for implementations that are now based on RFC 7390, e.g.:
  - “Eclipse Californium 2.0.x” (Eclipse Foundation)
  - “Implementation of CoAP Server & Client in Go” (OCF)
- What’s in scope?
  - CoAP group communication over UDP/IP, including latest developments (Observe/Blockwise/Security …)
  - Unsecured CoAP or group-OSCORE-secured communication
  - Principles for secure group configuration
  - Use cases (appendix)

# Groupcomm-bis-03/00: process view

- Updated with reviewers' comments (Jim [1], Thomas [2])
- Adopted as CoRE WG document
  - draft-dijk-core-groupcomm-bis-03 (March 9) is now draft-ietf-core-groupcomm-bis-00

[1] https://mailarchive.ietf.org/arch/msg/core/fme0kaeiiroi6ETKxD3yoD_MiyE/

[2] https://mailarchive.ietf.org/arch/msg/core/TgmEmwhDB2EokFkMCh8UWgOxO8E/

# Groupcomm-bis-00: content view

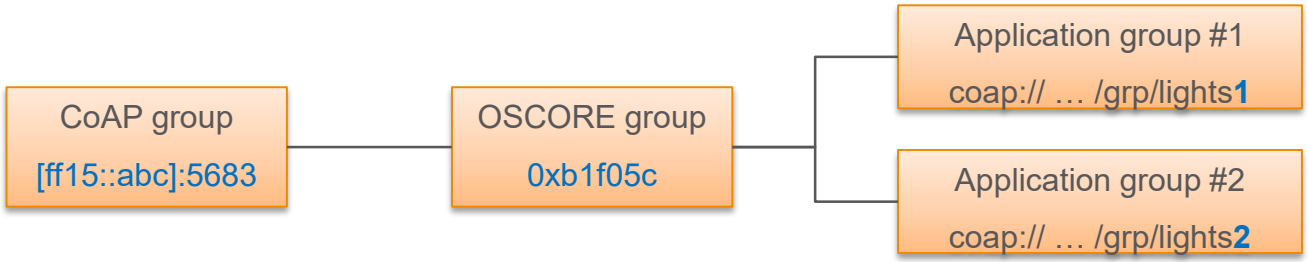
- Improved definition (2.1) of application/CoAP/security groups
  - including two new figures
- Added group discovery (2.2.3) with reference to RD.
- Security section on countering attacks (5.2.3) rewritten with more details
- Fixes & clarifications
  - improved description of RFCs that are obsoleted/updated
  - many others!

# Groupcomm-bis-00 “Group” concepts

› **Distinguish *types* of groups**
  – CoAP group: network level
  – OSCORE group (‘security group’)
  – Application group: application level

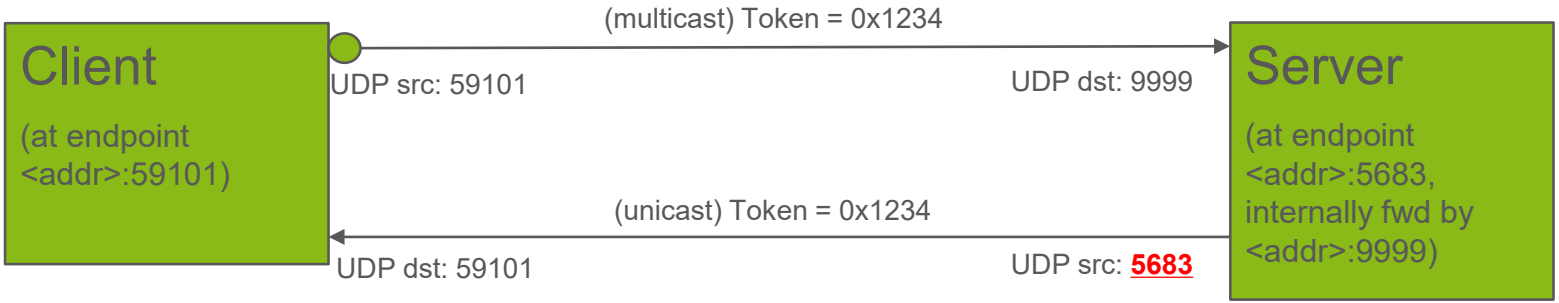
(identifiers for group type:)
→ multicast-address + port
→ Group name (invariant string)
→ <any application-specific ID>

› Example of group relations:



# Open Issues in Github / Gitlab

- See groupcomm-bis issues page and previous page
- #1 Clarify multicast endpoint concept and messaging model - UDP port may change
  - based on email thread [core] RFC 7252 - 8.2 - Multicast - Request / Response Layer, page 67, top



# Open Issues in Github / Gitlab

- See groupcomm-bis GitHub issues page and previous GitLab page

- #26 Section 2.1.2 - URI-Host for naming application groups

- #35 Consider if consistency requirement for "response suppression" should operate on Response Code class or not

# Next steps

- Work on issues in -00
- Process the latest review comments by Jim
- Test selected functions in CoAP implementations
  - E.g. “Observe + multicast” extension of RFC 7641 (first tests done successfully with Californium)

Thank you!

Comments/questions?

# Motivation (backup slide)

- RFC 7390 was published in 2014
  - CoAP functionalities available by then were covered
  - No group security solution was available to indicate
  - It is an Experimental document (started as Informational)
- What has changed?
  - More CoAP functionalities have been developed (Block-Wise, Observe)
  - RESTful interface for membership configuration is not really used
  - Group OSCORE provides group end-to-end security for CoAP
- Practical considerations
  - Group OSCORE clearly builds on RFC 7390 normatively
  - However, it can refer RFC 7390 only informationally

# Group OSCORE - Secure Group Communication for CoAP

draft-ietf-core-oscore-groupcomm-08

**Marco Tiloca**, RISE
Göran Selander, Ericsson
Francesca Palombini, Ericsson
Jiye Park, Universität Duisburg-Essen

IETF CoRE WG, Virtual Interim, April 8th, 2020

# Selected updates from -06

- Comments and reviews from Jim and Christian – Thanks!
  - Addressed specific comments from IETF 106
  - Addressed Jim's review of -06 [1]
  - Addressed Jim's review of -07 [2] (some open points left)
  - Addressed Christian's review of -07 [3] (some open points left)

[1] https://mailarchive.ietf.org/arch/msg/core/UEXWZLXP6VnpykN-C7A-Z0qYWxY/
[2] https://mailarchive.ietf.org/arch/msg/core/GdqlGpoLBi-2Q61N_iQeqXC5UL4/
[3] https://mailarchive.ietf.org/arch/msg/core/-F9oo5Ilo6TuZHv-6-vVCpFTd5k/

# Selected updates from -06

- Message processing across group rekeying
  - Responses always protected with the latest keying material
  - A response may be processed with a different context than the request
  - Include server's 'Partial IV' and new 'kid_context'

- Support for Observe
  - Dedicated sections for requests and response processing
  - The client 'kid' from the original Observe request is stored for reference

- Using group keying material for unicast requests: NOT RECOMMENDED
  - An external adversary can redirect the request to the group or a different server
  - Bad especially for non-safe methods; impact on Echo option and Block-wise

# Three modes of operations

- Three different protecting modes
  - **Signature mode** – Main and usual mode
    - Encryption with group keying material; signature included
  - **Optimized/Hybrid mode** – Section 9
    - Request: encryption with group keying material; stripped MAC; signature included
    - Response (*): encryption with derived pairwise keying material; no signature
  - **Pairwise mode (*)** – Appendix G
    - Encryption with derived pairwise keying material; no signature

(*) Not for use cases with an intermediary that verifies signatures

# Pairwise keys

- Key derivation
  - Same construction from 3.2.1 of RFC 8613
  - **Pairwise key = HKDF(Sender/Recipient key, DH shared secret, info, L)**
    - Sender Key of the sender node, i.e. Recipient Key of the recipient side
    - Static-static DH shared secret, from one's private key and the other's public key
  - Compatible with ECDSA and EdDSA (with mapping to Montgomery coordinates)

- New Pairwise Flag bit in the OSCORE option
  - Set to 1 if the message is protected with pairwise keying material
    - Optimized/Hybrid mode – Responses only
    - Pairwise mode – Requests and responses

# Open points

- Sender Sequence Number (SSN). Reset after rekeying?
  - Reset (as in OSCORE)
    - Pro: maximum lifetime of SSN, at each key epoch
    - Con: observations have to terminate after rekeying.
  - Don't reset --- Default behavior, app policies may override
    - Pro: observations can continue throughout a rekeying
    - Con: non-maximum lifetime of SSN, at each key epoch

- Optimized/hybrid mode
  - Concerns from Jim and Christian
  - Move to an appendix, and only about the optimized request
  - Instead, move the pairwise mode up in the document body

# Open points

- Normative statements on the modes. Proposal:
  - Signature mode MUST be supported
  - Pairwise mode MAY be supported
    - MUST be supported if Echo and/or Block-wise is supported
  - Applications can protect a request in one mode, and responses in another mode

- (a) OSCORE; (b) Group OSCORE in pairwise mode. Difference for a node?
  - a) Multiple full context establishments, on the wire
  - b) 1 full context establishment on the wire, through the Group Manager
    - Derivations of Recipient Contexts happen locally and when needed
  - The difference is about key management.
  - Add considerations about this in the section on pairwise mode?

# Open points

- Use of the pairwise mode in the group
  - Signaled as a group policy?

- Does the pairwise flag bit have a more general applicability? (Christian)
  - Thought about it with Group OSCORE in mind. No further obvious meanings.

- Should we flip the value of the pairwise flag bit? (Christian)
  - 0: Group OSCORE pairwise mode; same for OSCORE
  - 1: Signature mode
  - Need to (easily) update implementations

# Open points

- Error handling on not supporting the pairwise mode
  - Not so much to do on the client
  - The server can respond with an error, possibly with diagnostic information
  - Issues with that?

- Group ID in all notifications following a rekeying (Jim)
  - The client has two observations with the server
    - One observations with CTX1, one observation with CTX2
  - The server uses the same ‘kid’ in both CTX1 and CTX2
  - Is this really an issue?
    - The two observations started with two different requests, with different tokens
    - Tokens are associated to security contexts

# Open points

- Appendix E.2 – “Baseline” synchronization of Client’s Sequence Number
  - First request to be accepted or not by the server? (Christian, Jim)
- For the pairwise mode, the client has to know
  - Address, ‘kid’, and public key of the server
  - Generic discovery mechanisms in Appendix G.1. Good enough?
- Silent servers supporting the pairwise mode
  - Need to have a public key and a ‘kid’ as its identifier
  - These silent-server-only provide a public key, and get a Sender ID. Issues with that?
- Remove IANA registries on signature params and key params
  - Point at the recently extended registries in *cose-rfc8152bis-algs-07*
- Considerations on what should be done after reboot. New Appendix?

# Next steps

- Close open points
  - From Jim's and Christian's review of -07
  - Other pending issues raised today
  - From Jim's review of -08 [1] – Thanks!

- Test message protection in pairwise mode

- Once done, move to WGLC ?

[1] https://mailarchive.ietf.org/arch/msg/core/kmh1KjqEsR156m7EZ4yawaJnaG8/

# Thank you!

# Comments/questions?

https://github.com/core-wg/oscore-groupcomm

# Discovery of OSCORE Groups with the CoRE Resource Directory

draft-tiloca-core-oscore-discovery-05

Marco Tiloca, RISE
**Christian Amsüss**
Peter van der Stok

IETF CoRE WG, Virtual Interim, April 8th, 2020

# Recap

- A newly deployed device:
  - May not know the OSCORE groups and their Group Manager (GM)
  - May have to wait GMs to be deployed or OSCORE groups to be created

- Use the CoRE Resource Directory (RD):
  - Discover an OSCORE group and retrieve information to join it
  - Practically, discover the links to join the OSCORE group at its GM
  - CoAP Observe supports early discovery and changes in group information

- Use resource lookup, to retrieve:
  - The name of the OSCORE group
  - A link to the resource at the GM for joining the group

# Updates from -04

- Addressed review from Jim – Thanks!
  - https://mailarchive.ietf.org/arch/msg/core/FoNCVZtIRzYhv4Imx6e87ZoFk0w/
  - Still one open point (later slide)

- Improved content organization
  - Registration of Group Manager endpoints
  - List and description of target attributes

- Registration of links to ACE Authorization Servers

- Added examples in CoRAL
  - Also asked by Jim

# Link to Authorization Server

- When registering an OSCORE group to the RD
  - Possible to register related link to an Authorization Server (AS)
  - The AS is associated to the GM of the OSCORE group
- The joining node is able to retrieve the link to the AS
  - Avoid a first unauthorized access to the GM at joining time

```
Request: GM -> RD

Req: POST coap://rd.example.com/rd?ep=gm1
Content-Format: 40
Payload:
</group-oscore/feedca570000>;ct=41;rt="core.osc.mbr";
                              sec-gp="feedca570000";app-gp="group1";
                              cs_alg="-8";cs_alg_crv="6";
                              cs_key_kty="1";cs_key_crv=6";
                              cs_kenc="1",
<coap://as.example.com/token>;
      rel="authorization-server";
      anchor="coap://[2001:db8::ab]/group-oscore/feedca570000"

Response: RD -> GM

Res: 2.01 Created
Location-Path: /rd/4521
```

# From Jim's review

- An application group can use multiple OSCORE groups
  - E.g., one for administration and one for normal communication

- Clarified meaning and usage of 'sec-gp'
  - Stable, invariant and plane name of the OSCORE group
  - This also makes *draft-ace-key-groupcomm-oscore* an informative reference

- Algorithm/key related parameters
  - Improved name and definitions

# Examples in CoRAL

- Covered all the main examples
  - Registration, Update with re-registration, Lookup #1, Lookup #2
- Many things become easier
- Easier to specify the link to the AS
  - Easy to add information to such link
  - That link is not to be “navigated”. Ok?
- Currently as Appendix
  - Plan to move to the document body

```
Request: Joining node -> RD

Req: GET coap://rd.example.com/rd-lookup/res
  ?rt=core.osc.mbr&app-gp=group1
Accept: TBD123456 (application/coral+cbor)

Response: RD -> Joining node

Res: 2.05 Content
Content-Format: TBD123456 (application/coral+cbor)

Payload:
#using <http://coreapps.org/reef#>
#using <http://coreapps.org/core.rd#>

#base <coap://[2001:db8::ab]/>
rd-item </group-oscore/feedca570000> {
   rt "core.osc.mbr"
   sec-gp "feedca570000"
   app-gp "group1"
   cs_alg -8
   cs_alg_crv 6
   cs_key_kty 1
   cs_key_crv 6
   cs_kenc 1
   as-uri <coap://as.example.com/token>
}
```

# Open point – BACnet example

- Explicit registration of node's membership to application groups
  - Nodes don't need to know their application groups in advance
- Issues
  - This results in multiple endpoint registrations
  - This is not a native functionality of the RD
- This document itself does not need this feature
  - But, it seems common practice in some deployments
- Possible way forward
  - Remove the membership registration from the BACnet example
  - Define the membership registration in a separate short document

# Summary and next steps

- Addressed Jim's review; link to AS; examples in CoRAL
- Outcome from previous meetings
  - "Time to start reading it in order to decide for WGA" [1]
  - People volunteered to review: Jim (done); Carsten; Klaus; Bill [1]
  - "Reviewer volunteers are asked to provide reviews now" [2]
- Way forward
  - Close the open point on registration of node's membership (BACnet example)
  - CoRAL: move examples to the document body; translate the BACnet example
  - Process reviews as they come

[1] https://etherpad.ietf.org/p/notes-ietf-104-core?useMonospaceFont=true
[2] https://mailarchive.ietf.org/arch/msg/core/78LHFFyq9c1_t0-kAmuDKcTzc3c/

# Thank you!

# Comments/questions?

https://gitlab.com/crimson84/draft-tiloca-core-oscore-discovery

# Backup

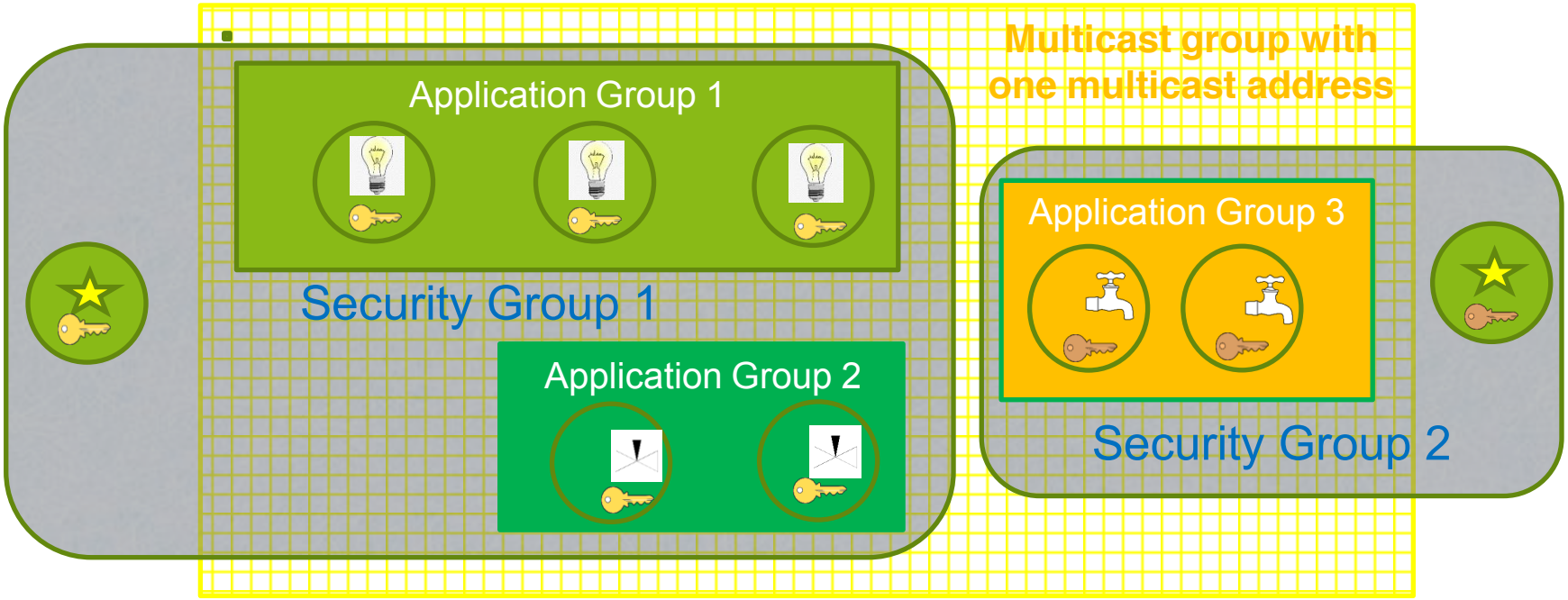
# Application/CoAP/Security Groups

- Application group
  - Defined in {RD} and reused as is
  - Set of CoAP endpoints sharing a pool of resources
  - Registered and looked up just as per Appendix A of {RD}

- CoAP/Multicast Group
  - Defined in draft-dijk-core-groupcomm-bis
  - Set of CoAP endpoints listening to the same IP multicast address
  - The IP multicast address is the ‘base’ address of the link to the application group

- OSCORE Security Group
  - Set of CoAP endpoints sharing a common Group OSCORE Security Context
  - A GM registers the group-membership resources for accessing its groups

# Application vs. Security Groups




Client of application group

Different key sets

Resources for given function

# Alg/key related parameters

- New optional parameters for a registered join resource
  - (*)(**) *cs_alg* : countersignature algorithm, e.g. “EdDSA”
  - (*) *cs_alg_crv* : countersignature curve (if applicable), e.g. “Ed25519”
  - (*) *cs_key_kty* : countersignature key type, e.g. “OKP”
  - (*) *cs_key_crv* : countersignature curve (if applicable), e.g. “Ed25519”
  - (*) *cs_kenc* : encoding of public keys, e.g. “COSE_Key”
  - (**) *alg* : AEAD algorithm
  - (**) *hkdf* : HKDF algorithm

- Benefits for a joining node, when discovering the OSCORE group
  - (*) No need to ask the GM or to have a trial-and-error when joining the group
  - (**) Decide whether to join the group or not, based on supported the algorithms

# Registration

- The GM registers itself with the RD
  - MUST include all its join resources, with their link attributes
  - New ‘rt’ value “core.osc.mbr” in the CoRE Parameters registry

```
Request: GM -> RD

Req: POST coap://rd.example.com/rd?ep=gm1
Content-Format: 40
Payload:
</group-oscore/feedca570000>;ct=41;rt="core.osc.mbr";
                             sec-gp="feedca570000";app-gp="group1";
                             cs_alg="-8";cs_alg_crv="6";
                             cs_key_kty="1";cs_key_crv=6";
                             cs_kenc="1",
<coap://as.example.com/token>;
      rel="authorization-server";
      anchor="coap://[2001:db8::ab]/group-oscore/feedca570000"

Response: RD -> GM

Res: 2.01 Created
Location-Path: /rd/4521
```

# Discovery (1/2)

› The device performs a resource lookup at the RD
  – Known information: name of the Application Group, i.e. “group1”
  – Need to know: OSCORE Group Identifier; Join resource @ GM; Multicast IP address
  – ‘*app-gp*’ → Name of the Application Group, acting as tie parameter in the RD

```
Request: Joining node -> RD

Req: GET coap://rd.example.com/rd-lookup/res
  ?rt=core.osc.mbr&app-gp=group1

Response: RD -> Joining node


Res: 2.05 Content
Payload:
<coap://[2001:db8::ab]/group-oscore/feedca570000>;rt="core.osc.mbr";
    sec-gp="feedca570000";app-gp="group1";
    cs_alg="-8";cs_alg_crv="6";cs_key_kty="1";
    cs_key_crv=6";cs_kenc="1";anchor="coap://[2001:db8::ab]"
```

# Discovery (2/2)

- The device performs an endpoint lookup at the RD
  - Still need to know the Multicast IP address
  - 'ep'  // Name of the Application Group, value from '*app-gp*'
  - 'base'  // Multicast IP address used in the Application Group

```
Request: Joining node -> RD

Req: GET coap://rd.example.com/rd-lookup/ep
  ?et=core.rd-group&ep=group1

Response: RD -> Joining node

Res: 2.05 Content
Payload:
</rd/501>;ep="group1";et="core.rd-group";
          base="coap://[ff35:30:2001:db8::23]"
```

# Observe Notifications as CoAP Multicast Responses

draft-tiloca-core-observe-multicast-notifications-02

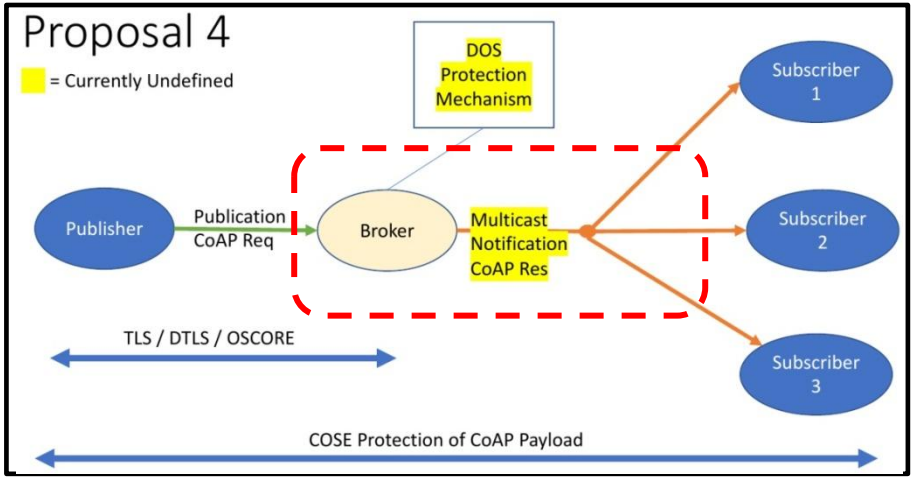
Marco Tiloca, RISE
Rikard Höglund, RISE
**Christian Amsüss**
Francesca Palombini, Ericsson

IETF CoRE WG, Virtual Interim, April 8th, 2020

# Recap

- Observe notifications as multicast responses
  - Many clients observe the same resource on a server S
  - Improved performance due to multicast delivery
  - Multicast responses are not defined yet. Token binding? Security?

- Practical use case
  - Pub-Sub scenario
  - Many clients subscribe to a same topic on the Broker
  - Better performance
  - Subscribers are clients only




From the Hallway Discussion @ IETF 104

# Contribution

- Define Observe notifications as multicast responses

- Management and enforcement of a common Token space
  - The Token space belongs to the group
  - The group entrusts the management to the server
  - All clients in a group observation use the same Token value

- Use of Group OSCORE to protect multicast notifications
  - The server aligns all clients of an observation on a same *external_aad*
  - All notifications for a resource are protected with that *external_aad*

# Rationale

- The server can start a group observation for a resource, e.g. :
  1. With no observers yet, a traditional registration request comes from a first client
  2. With many traditional observations, all clients are shifted to a group observation

- Phantom observation request
  - Generated inside the server, it does not hit the wire
  - Like if sent by the group, from the multicast IP address of the group
  - Multicast notifications are responses to this phantom request

- The server sends to new/shifted clients an ***error response*** with:
  - Serialization of the phantom request
  - IP multicast address where notifications are sent to
  - current representation of the target resource

# Updates from -04

- New section on congestion control
  - Requested by Carsten at IETF 106
  - Building on *core-groupcomm-bis* and RFC 7641
- Encoding of the informative error response
  - New content format *informative-response+cbor*
  - New registry for parameter of informative response
  - Separate registry for parameters of phantom request
- Parameter meaning
  - *src_addr*, *src_port*, *dst_addr*, *dst_port* : addressing information
  - *coap_msg* : serialization of the phantom request (i.e. UDP payload)
  - *notif_num* : latest used observe number, as baseline for the client
  - *res* , *res_ct*: current resource representation and its content-format

**Informative error response**

```
Payload: { ph_req : {
             src_addr : bstr(M_ADDR),
             src_port : 65500,
             dst_addr : bstr(SERVER_ADDR),
             dst_port : 7252,
             coap_msg : bstr(PH_REQ.CoAP)
           },
           notif_num : 10,
           res : bstr("1234"),
           res_ct : 0
         }
```

# Updates from -04

- Appendix A - Alternative ways to retrieve a phantom request

```
Request:

    GET </ps/topics?rt=oic.r.temperature>
    Accept: CoRAL

Response:

    2.05 Content
    Content-Format: CoRAL

    rdf:type <http://example.org/pubsub/topic-list>
    topic    </ps/topics/1234> {
        dst_addr h"ff35003020010db8..1234"
        src_port 5683
        dst_addr h"20010db80100..0001"
        dst_port 5683
        coap_msg h"120100006464b431323334"
    }
```

- Pub-Sub
  - The phantom request is part of the topic metadata
  - A subscriber gets it already upon topic discovery
  - Early listening for multicast observations

- Sender introspection
  - Useful for debugging upon intercepting notifications
  - Query the server on a dedicated interface

```
Request:

    GET </.well-known/core/mc-sender?token=6464>

Response:

    2.05 Content
    Content-Format: application/informative-response+cbor

    {'ph_req': {
        'dst_addr': h"ff35003020010db8..1234"
        'src_port': 5683
        'dst_addr': h"20010db80100..0001"
        'dst_port': 5683
        'coap_msg': h"120100006464b431323334"
    }}
```

# Updates from -04

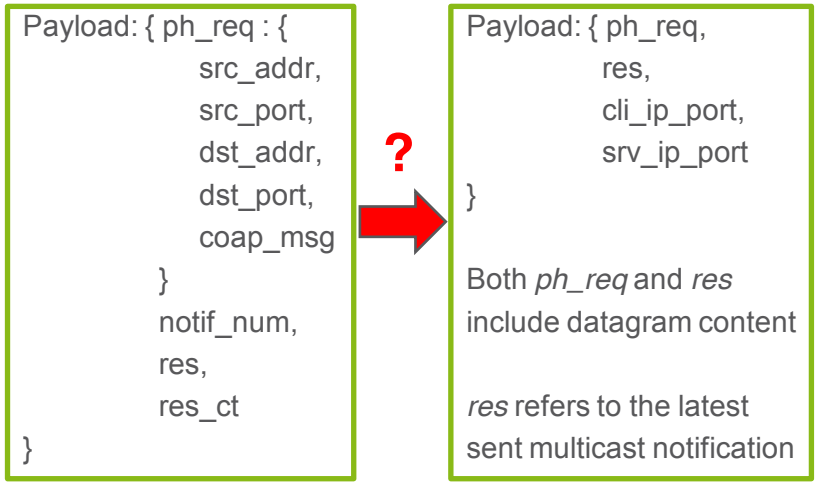
- Cancellation of group observation
  - The server sends to itself a phantom cancellation request
  - A multicast 5.03 response follows, with no payload
- When? Not enough clients are still active
  - Proposal: rough counting of alive clients, with a poll for interest
  - New CoAP options for successful multicast notifications
- Server current rough estimate: *n*
  - Expected confirmations *m* < *n*
  - Option value: *q* = ceil (*n* / *m*)
  - Each client picks a random *c* : [ 0, *q* )
  - If *c* == 0, the client sends a registration request (Non; with No-Response)
  - The server receives *r* of such requests, than *n* ← (*r* * *q*)

| No. | C | U | N | R | Name | Format | Len. | Default |
|---|---|---|---|---|---|---|---|---|
| TBD | | x | | | Multicast-Response-Feedback-Divider | uint | 0-8 B | (none) |

C = Critical, U = Unsafe, N = NoCacheKey, R = Repeatable,

# Open points

- Informative error response in CoRAL
  - Early version already in Appendix A
- Considerations on the rough counting of alive clients
  - When stop waiting for confirmations? Leisure time + some transmit time …
  - Good practices and checks to be sure avoiding Smurf attacks
- Alternative encoding of the informative request
  - Now the info on the current resource is split
  - Serialize it as the phantom request in coap_msg?
  - Pro: use the native Observe numbers



# Summary

- Multicast notifications to all clients observing a resource
- Latest additions
  - Media type and encoding for the error response
  - Cancellation of group observation, based on rough counting of clients
  - Alternative ways to retrieve a phantom request
- Open points to address
  - Considerations and parameter tuning for the client rough counting
  - Encoding within the error response (full notification vs. resource representation)
  - Error response in CoRAL (already sketched in the Appendix)
  - Error response using the format from *core-coap-problem* ?
- Need for document reviews

# Thank you!

# Comments/questions?

https://gitlab.com/crimson84/draft-tiloca-core-observe-responses-multicast

# Backup

# Assumptions

- Clients have previously discovered the resource to access
- The server knows the IP multicast address where to send notifications
- If Group OSCORE is used to secure multicast notifications
  - The server has previously joined the right OSCORE group
- The server provides the clients with other required information

# Server side

1. Build a GET phantom request; Observe option set to 0

2. Choose a value T, from the Token space for messages …
   - … coming from the multicast IP address and addressed to target resource

3. Process the phantom request
   - As coming from the group and its IP multicast address
   - As addressed to the target resource

4. Hereafter, use T as token value for the group observation

5. Store the phantom request, with no reply right away

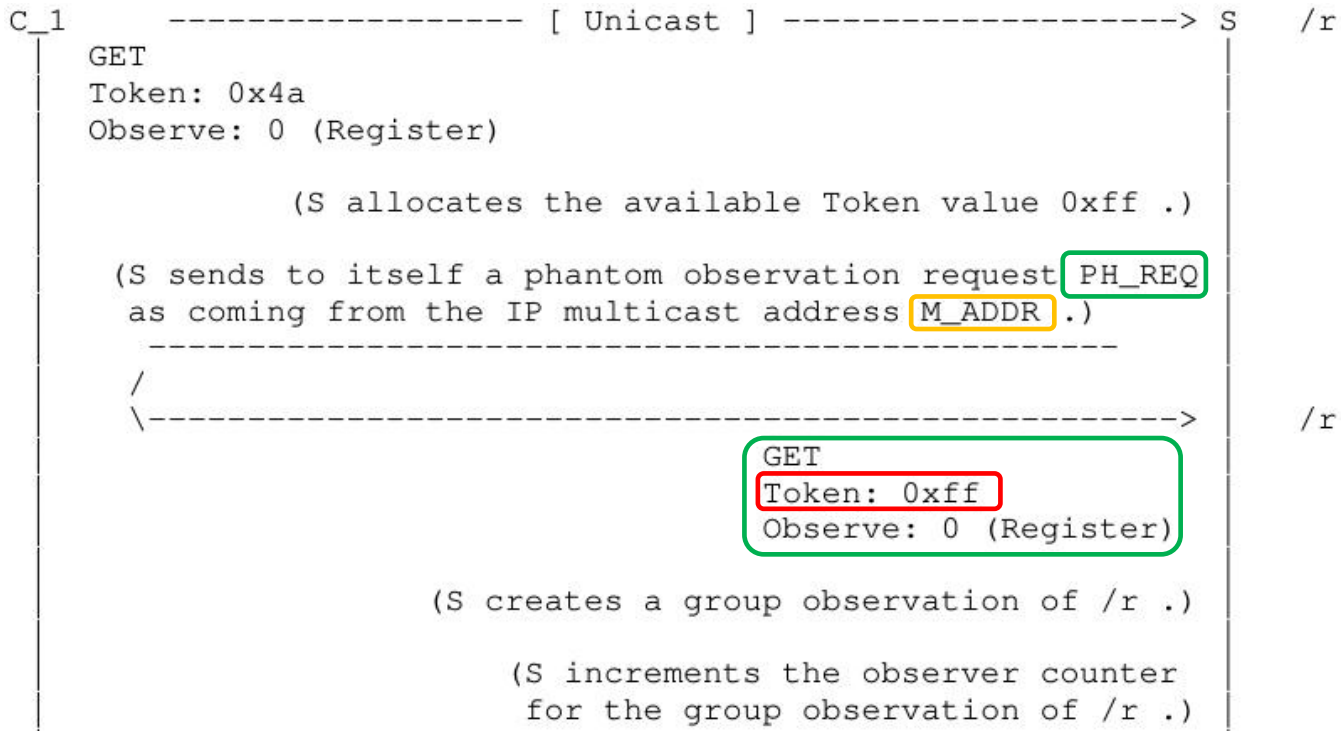
# Interaction with clients

- The server sends to new/shifted clients an ***error response*** with
  - '*ph_req*': byte serialization of the phantom request + Multicast IP addres + …
  - ' *res*': current representation of the target resource
  - '*notif_num*' and '*res_ct*': observe counter and content-format for the resource

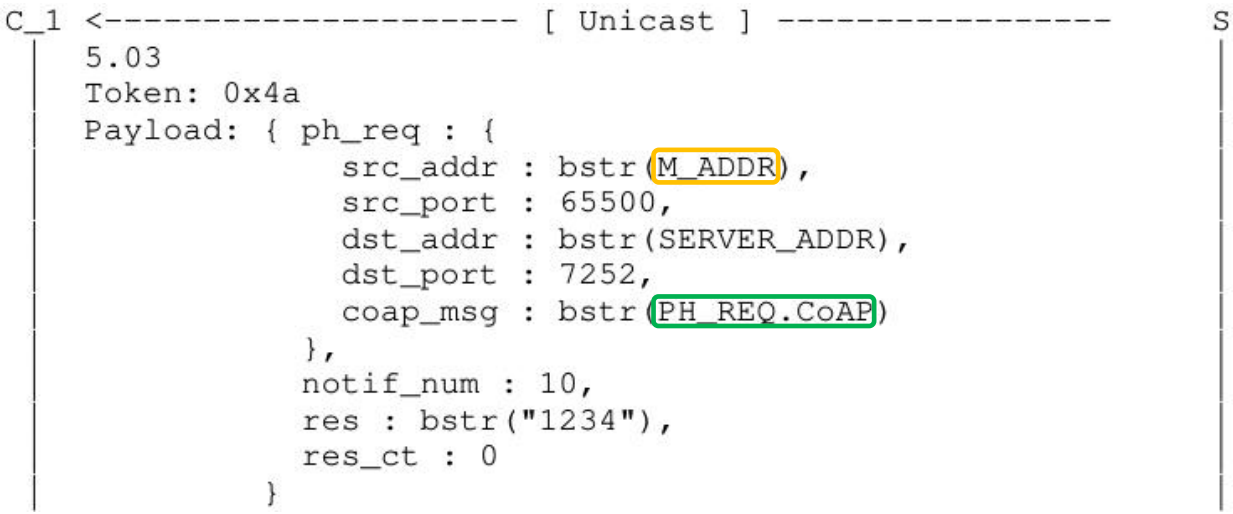
- When the value of the target resource changes
  - The server sends an Observe notification to the IP multicast address
  - The notification has the Token value T of the phantom request

- When getting the error response, a client
  - Configures an observation from an endpoint associated to the multicast IP address
  - Accepts observe notifications with Token value T, sent to that multicast IP address

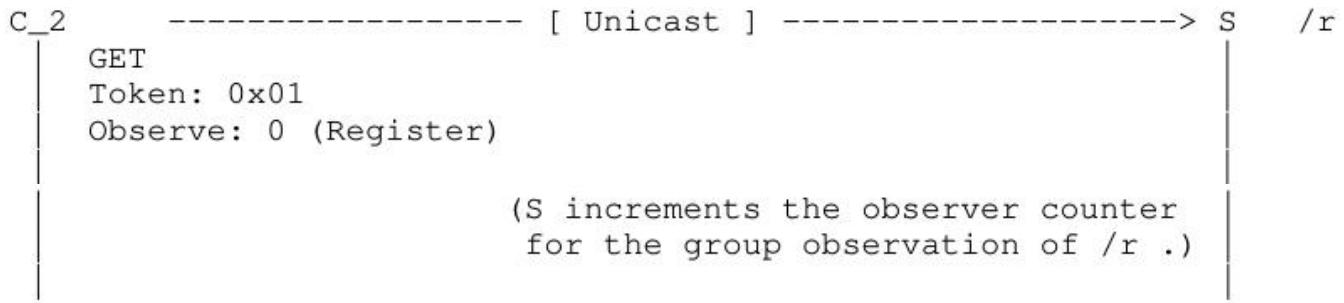
# C1 registration



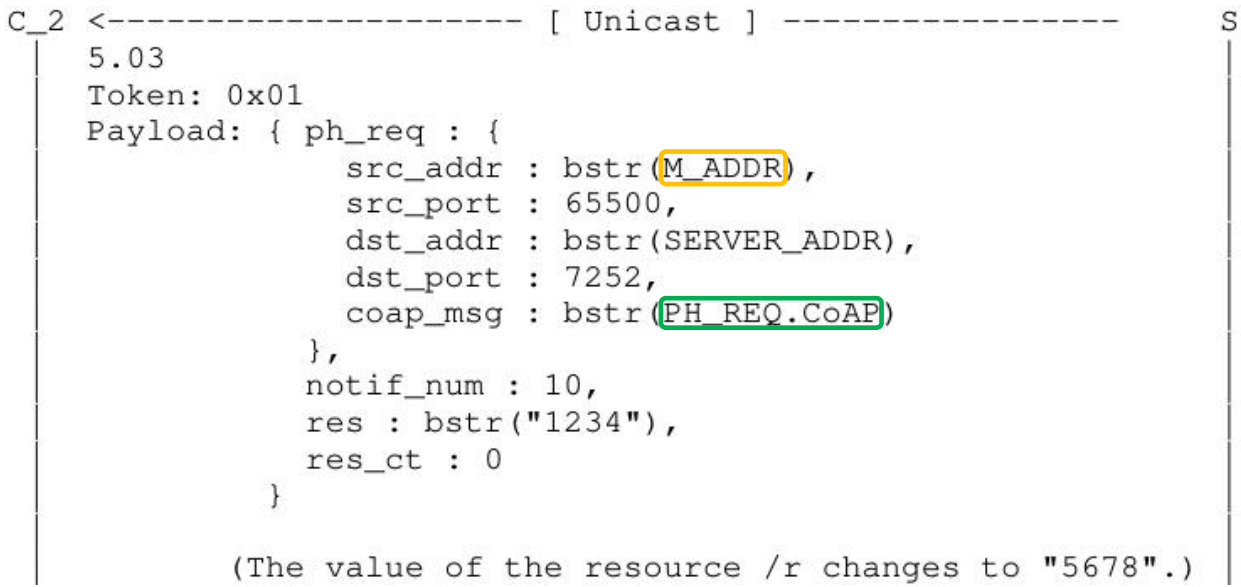
# C1 registration



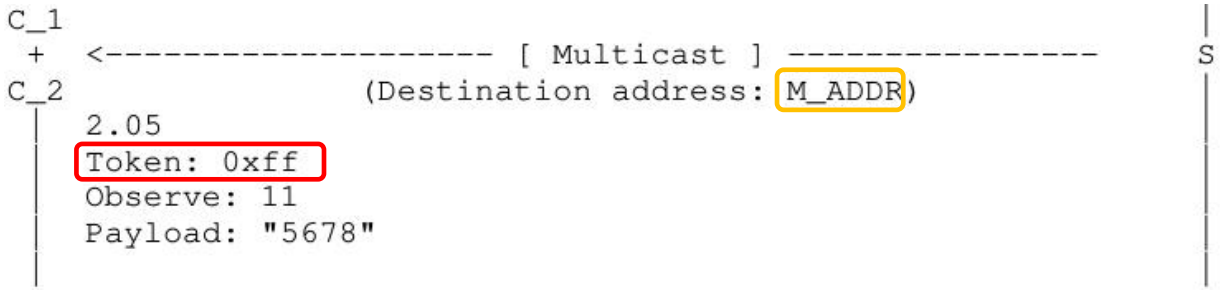
# C2 registration



# C2 registration



# Multicast notification




- Same Token value of the Phantom Request
- Enforce binding between
  - Every multicast notification for the target resource
  - The (group) observation that each client takes part in

# Security with Group OSCORE

- The phantom request is protected with Group OSCORE
  - ***x*** : the Sender ID ('kid') of the Server in the OSCORE group
  - ***y*** : the current SN value ('piv') used by the Server in the OSCORE group
  - Note: the Server consumes the value ***y*** and does not reuse it as SN in the group

- To secure/verify all multicast notifications, the OSCORE *external_aad* is built with:
  - 'req_kid' = ***x***
  - 'req_piv' = ***y***

- The phantom request is still included in the informative response
  - Each client retrieves ***x*** and ***y*** from the OSCORE option

# Security with Group OSCORE

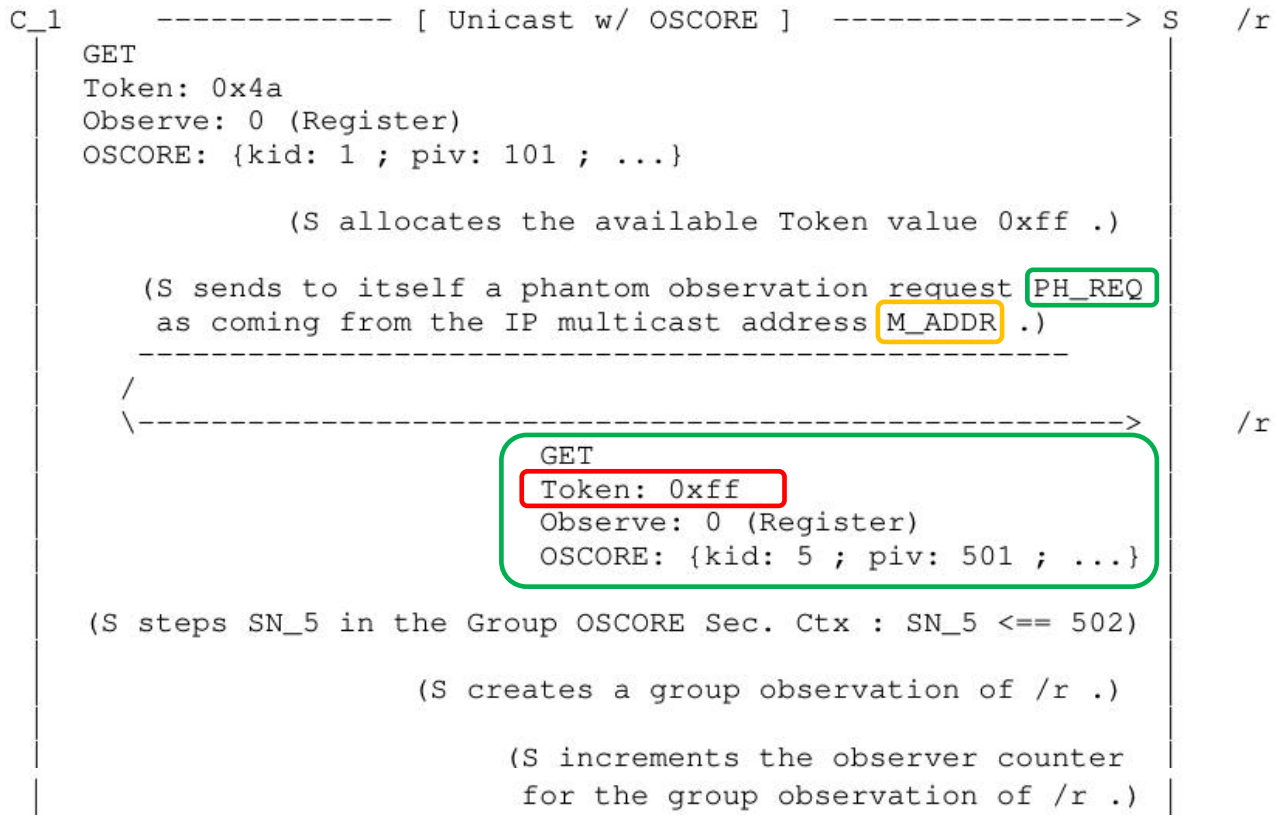
- In the error response, the server can ***optionally*** specify also:
  - '*join-uri*' : link to the Group Manager to join the OSCORE group
  - '*sec-gp*' : name of the OSCORE group
  - '*as-uri*' : link to the ACE Authorization Server associated to the Group Manager
  - '*cs-alg*' : countersignature algorithm
  - '*cs-crv*' : countersignature curve
  - '*cs-kty*' : countersignature key type
  - '*cs-kenc*' : countersignature key encoding
  - '*alg*' : AEAD algorithm
  - '*hkdf*' : HKDF algorithm

MUST

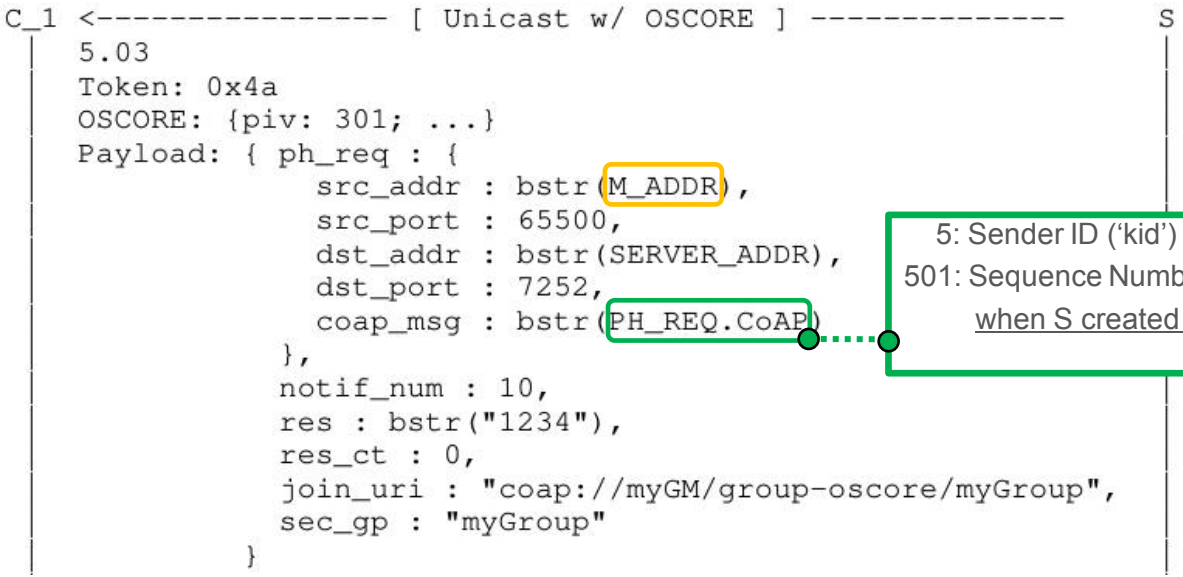
MAY

- Clients can still discover the OSCORE group through other means
  - E.g., using the CoRE Resource Directory, as in *draft-tiloca-core-oscore-discovery*

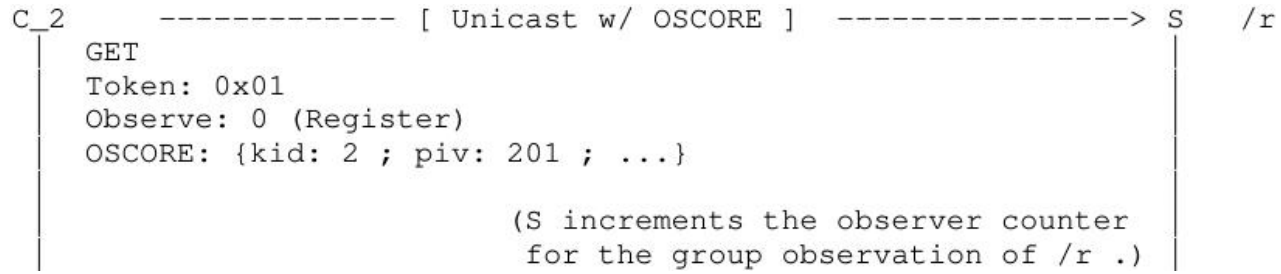
# C1 registration w/ security



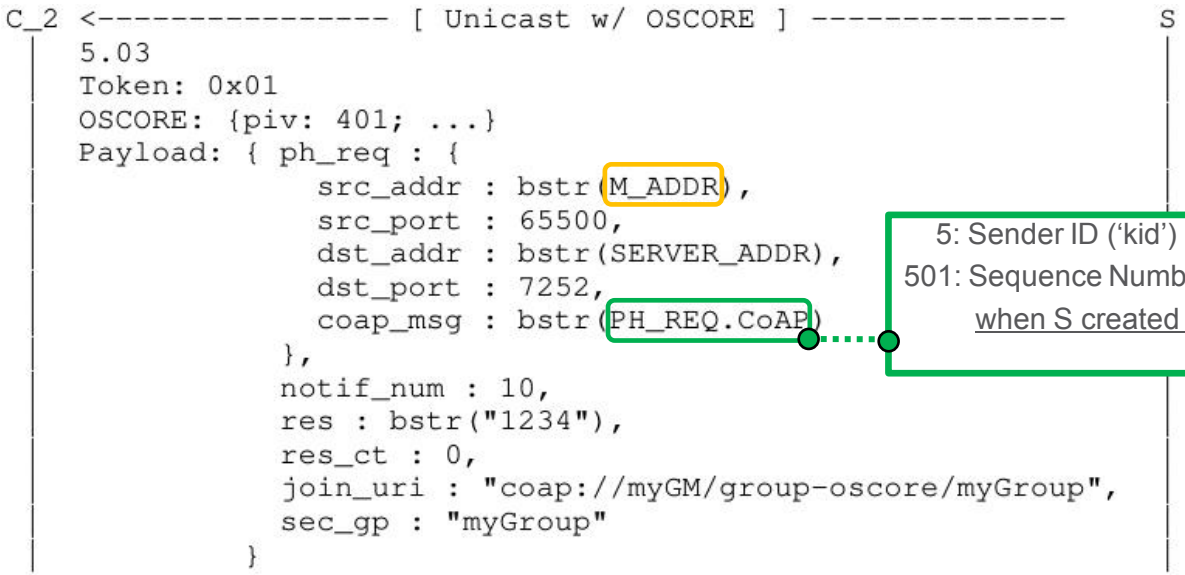
# C1 registration w/ security



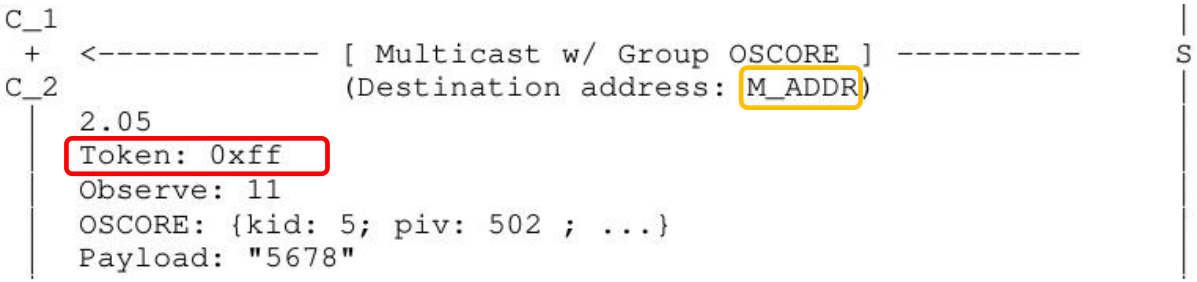
# C2 registration w/ security



# C2 registration w/ security



# Multicast notification w/ security




- When encrypting and signing the multicast notification:
  - The OSCORE *external_aad* has 'req_kid' = 5 and 'req_iv' = 501
  - Same for all following notifications for the same resource
- Enforce secure binding between
  - Every multicast notification for the target resource
  - The (group) observation that each client takes part in

# Proxy Operations for CoAP Group Communication

draft-tiloca-core-groupcomm-proxy-00

Marco Tiloca, RISE
**Esko Dijk, IoTconsultancy.nl**

IETF CoRE WG virtual interim, April 8th, 2020

# Motivation

- CoAP supports group communication over IP multicast
  - *draft-ietf-core-groupcomm-bis*

- The use of proxies introduces a number of issues
  - Clients to be whitelisted and authenticated on the proxy
  - The client may receive multiple responses to a single *unicast* request
  - The client may not be able to distinguish responses and origin servers
  - The proxy does not know when to stop handling responses

- Possible approaches for proxy to handle the responses
  - Individually forwarded back to the client
  - Forwarded back to the client as a single aggregated response

# Contribution

- Description of proxy operations for CoAP group communication
  - Addressed all issues in *draft-ietf-core-groupcomm-bis*

- Considered approach to handle responses:
  - Individually forwarded back to the client

- Assumptions
  - The proxy is explicitly configured to support group communication
  - Clients are whitelisted on the proxy, and identified by the proxy
  - Group OSCORE is used for secure group communication (end-to-end, client to server).

# Rationale

- Signaling protocol with two new CoAP options
  - Along the lines of Thomas' comments for *draft-dijk-core-groupcomm-bis*

- In the request addressed to the proxy, the client indicates:
  - To be interested in and capable of handling multiple responses
  - For how long the proxy should collect and forward back responses

- In a response to a group request, the server indicates its IP address
  - The client can distinguish the responses and the different servers
  - The client becomes able to (directly, or via proxy) contact the server individually via unicast

# Multicast-Signaling option

| No. | C | U | N | R | Name | Format | Length | Default |
|---|---|---|---|---|---|---|---|---|
| TBD1 | X | x | - | | Multicast-Signaling | uint | 1-5 B | (none) |

C=Critical, U=Unsafe, N=NoCacheKey, R=Repeatable

- Used only in requests
  - Presence: explicit claim of support and interest from the client
  - Value: indication to the proxy on how long to handle unicast responses
- Class I for OSCORE
  - Allows the proxy to see it but not to remove it

# Response-Forwarding option

| No. | C | U | N | R | Name | Format | Length | Default |
|---|---|---|---|---|---|---|---|---|
| TBD2 | X | x | - | | Response-Forwarding | (*) | 8-20 B | (none) |

C=Critical, U=Unsafe, N=NoCacheKey, R=Repeatable

- Used only in responses
  - Presence: allows the client to distinguish responses and originator servers
  - Value: IP address of the server, as a tagged CBOR byte string
- Class E for OSCORE

# Workflow: C -> P

- C prepares a request addressed to P
  - The group URI is included in the Proxi-Uri option or the URI-* options
- C chooses T seconds, as token retention time
  - T < Tr , with Tr = token reuse time
  - T considers processing at the proxy and involved RTTs
- C includes the Multicast-Signaling option, with value T′ < T
- C sends the request to P via unicast
  - C retains the token beyond the reception of a first matching response

# Workflow: P -> S

- P identifies C and verifies it is whitelisted
- P verifies the presence of the Multicast-Signaling option
  - P extracts the timeout value T′
- P forwards the request to the group of servers, over IP multicast
- P will handle responses for the following T′ seconds
  - Observe notifications are an exception – they are handled until the Observe client state is cleared.

# Workflow: S -> P

- S knows there's a client behind the proxy, by detecting the Multicast-Signaling Option.

- S includes the Response-Forwarding option in the response
  - The option value is the IP address of the server, as a tagged CBOR byte string

# Workflow: P -> C

- P forwards responses back to C, individually as they come
- P frees-up its token towards the group of servers after T′ seconds
  - Late responses > T' will not match and not be forwarded to C
  - Observe notifications are the exception
- C retrieves the Response-Forwarding option
  - C distinguishes different responses from different origin servers
  - C is able to later contact a server individually, either directly or indirectly
- C frees-up its token towards the proxy after T seconds
  - Again, Observe notifications are the exception

# Open points

- Mostly from Christian's comments – Thanks!
- Alternative design proposed – to consider
  - Proxy removes the Multicast-Signaling Option from request;
  - Proxy adds the Response-Forwarding Options and its IP address info to responses
  - No end-to-end security for the information in both Options
- If the proxy authenticates the client with a <C,P> OSCORE context …
  - We have a use case for "nested OSCORE"
  - Should we define it? Would this same document be appropriate?
- This document is general enough, as about "proxy operations"
  - Should it define also response aggregation as alternative approach?

# Summary

- Defined proxy operations for CoAP group communication
  - Embedded signaling protocol, using two new CoAP options
  - The proxy separately forwards back individual responses to the client for a defined time period T'
  - The client can distinguish the origin servers and corresponding responses
- Main next step: address Christian's comments and open points
- Need for comments and feedback

# Thank you!

# Comments/questions?

https://gitlab.com/crimson84/draft-tiloca-core-groupcomm-proxy

# SenML

# SenML Data Value Content-Format Indication

draft-ietf-core-senml-data-ct-01

Ari Keränen, Carsten Bormann

IETF 107+, 2020-04-08, in the cloud

# Examples

```
{"n":"nfc-reader", "vd":"gmNmb28YKg", "ct":"60"}
```

```
{"n":"nfc-reader-42",
 "vd":"H4sIAA+dmFwAAzMx0jEZMAQALnH8Yn0AAAA",
 "ct":"text/csv@gzip"}
```

# Feature objective: extensibility

- `ct` is generally ignorable (like any new SenML field)
- But we would like to also have a “must understand” version, `ct_`

- Issue: Interaction between the two (`bct`, `bct_`) and resolved records
- Would prefer to have specific information (in record) override base
- But now, that happens only separately, within the thread for each field name!

# RFC 8428: “Must understand” and “_”?

- »Extensions that are **mandatory** to understand to correctly process the Pack MUST have a label name that ends with the "_" character.«
- »Applications MUST ignore any JSON **key-value pairs** that they do not understand unless the key ends with the "_" character, in which case an error MUST be generated.«
  (12.3.1 for senml+json, equivalent text for other representations)
- So a receiver is free to ignore a **key-value combination** if it doesn’t understand the key **or** if it doesn’t understand the combination
- Note that `foo` and `foo_` are different fields from a SenML perspective, except possibly by their semantic definition
  - convention: don’t define a `foo` and a `foo_` that are unrelated

# RFC 8428: ct, ct_, bct, bct_

- Resolving algorithm can be performed without understanding field semantics: no inter-field interaction
  - Fields do define how base value and given value for that field mix
  - »A future specification that defines new base fields needs to specify how the field is resolved.«
- Resolving is not influenced by unrelated fields (ct vs. ct_):
  It happens **separately** for ct and for ct_
- The rules applying to a record are applied **after** resolving

- But we need to look at examples having some of these four
  and see whether what we built makes sense

# Solution option #1

- Do not apply base value (bct or bct_) if a current value (ct or ct_) exists in the record
- Not supported by RFC 8428
  - Would require using new version/feature for SenML

# Solution option #2

- Future specification need to specify semantics of the "safe-to-ignore" and "must understand" versions of the same field in the same record
  - ct_ is the first registration of "must understand" fields
  - Can be handled as DE guidance and clarified in SenML-bis?
- Easy to avoid problem: don't mix the two variants in the Packs
  - but also need to enable combining packs easily
- For ct draft: if both exist in the same Record: ct_ overrides ct (i.e., ignore/remove "safe-to-ignore" version)
- Not perfect, but we don’t know better without new SenML version

# What we don’t like about solution #2

- If a pack has a bct_, you can no longer usefully use bct or ct *from that position on*
- That is a limitation, but it doesn’t detract from other useful combinations
- Workaround: Instead of using bct_, use ct_ once to check the must-understand feature; can use bct then

- To do: designated expert to write a wiki page explaining all this

# Mixing b and _ fields: what are the resolution rules?

1)

```
[
 {"bfoo_":42, "n":"t1", "v":1},
 {            "n":"t2", "v":2},
 {"foo": 1,   "n":"t3", "v":3}
]
```

2)

```
[
 {"bfoo_":42, "n":"t1", "v":1},
 {            "n":"t2", "v":2},
 {"foo_": 1,  "n":"t3", "v":3}
]
```

3)

```
[
 {"bfoo":42, "n":"t1", "v":1},
 {           "n":"t2", "v":2},
 {"foo_": 1, "n":"t3", "v":3}
]
```

4)

```
[
 {"bfoo":42, "n":"t1", "v":1},
 {           "n":"t2", "v":2},
 {"foo": 1,  "n":"t3", "v":3}
]
```

# Mixing b and _ fields: resolved

1)

```
[
 {"bfoo_":42, "n":"t1", "v":1},
 {            "n":"t2", "v":2},
 {"foo": 1,   "n":"t3", "v":3}
]
```

```
[
 {"foo_":42, "n":"t1", "v":1},
 {"foo_":42, "n":"t2", "v":2},
 {"foo": 1, "foo_":42", "n":"t3", "v":3}
]
```

# Mixing b and _ fields: resolved

2)

```
[
 {"bfoo_":42, "n":"t1", "v":1},
 {            "n":"t2", "v":2},
 {"foo_": 1,  "n":"t3", "v":3}
]
```

```
[
 {"foo_":42, "n":"t1", "v":1},
 {"foo_":42, "n":"t2", "v":2},
 {"foo_": 1, "n":"t3", "v":3}
]
```

# Mixing b and _ fields: resolved

3)

```
[
 {"bfoo":42,  "n":"t1", "v":1},
 {            "n":"t2", "v":2},
 {"foo_": 1,  "n":"t3", "v":3}
]
```

```
[
 {"foo":42,  "n":"t1", "v":1},
 {"foo":42,  "n":"t2", "v":2},
 {"foo_": 1, "foo":42, "n":"t3", "v":3}
]
```

# Mixing b and _ fields: resolved

4)

```
[
 {"bfoo":42,  "n":"t1", "v":1},
 {            "n":"t2", "v":2},
 {"foo": 1,   "n":"t3", "v":3}
]
```

```
[
 {"foo":42,  "n":"t1", "v":1},
 {"foo":42,  "n":"t2", "v":2},
 {"foo": 1,  "n":"t3", "v":3}
]
```

# SenML Features and Versions

draft-bormann-core-senml-versions-01

Carsten Bormann

IETF 107+, 2020-04-08, in the cloud

# RFC 8428, SenML: Version 10

- RFC 8428 SenML evolution path: allows for version upgrade
- Default version: 10 (accounting for previous development versions)
- Can set higher:  {"bver":11, "v":4711}
- Semantics to be defined by RFC updating RFC 8428

# Objective: extensibility

- Over time, new specifications will add features to SenML
- Version number is a unitary declaration:
  implementation of certain features is needed by the receiver to process SenML pack

- Version number N+1 includes all features of version number N (total order)
  - Except for features that are **deprecated**

# Version numbers are stupid

- Well, they work well for document revisions and software releases
- Not so great for protocols and other interface specifications
- Long discussion in T2TRG:
  Version numbers force creating a total order on a set of new features
- Better: declare individual features
  - Could do with must-understand fields: `bfeature1_: true`
  - But maybe can leverage the version number?

# Proposal: interpret version number as bits

- A number can be used as a bit array
- Version 10 = $1010_2$, i.e. features 1 and 3 ($2^1 + 2^3 = 10$)
- Add bits for additional features
- Proposed feature 4: use of Secondary Units ($2^4 = 16$)
  Version number with that additional feature would thus be 26
- Feature code can go up to 52 (53-bit integers in JSON):
  48 remaining now (after secondary unfits)

# 53: wasn’t that an evil number?

- Yes.
- But it could be all we need:
  - As the number of features that can be registered has a hard limit (48 codes left at the time of writing), the designated expert is specifically instructed to maintain a frugal regime of code point allocation, keeping code points available for SenML Features that are likely to be useful for non-trivial subsets of the SenML ecosystem.
  - Quantitatively, the expert could for instance steer the allocation to not allocate more than 10 % of the remaining set per year.

# draft-bormann-core-senml-versions-01

- Defines the feature system:
  New Registry under the SenML registry
  Reserving feature code 0..3 for “10 = $1010_2$”
  Specification required, frugality mandate to designated expert
- **Updates** the RFC 8428 version number to use that system
- Registers feature code 4: Use of secondary units

- Useful?
- Ready for working group adoption?

# A link relation type for disclosing implementation information

draft-bormann-t2trg-rel-impl-01

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IETF 107+, 2020-04-08, in the cloud

# Implementation information helps debugging

- HTTP has `Server:`, `User-Agent:`
- CoAP: Not great to send this with every request/response
- Server side: Make information **discoverable**
- **/.well-known/core**: natural place
- Don’t put the actual information there, but a link
- Need a link relation type then

# draft-bormann-t2trg-rel-impl-01

- Defines link relation type `impl-info` for linking to implementation information
- Does **not** define media types this could point to
  - We could do that later
  - HTML is a great media type, too
- Discusses security considerations of disclosing implementation information
- Briefly touches on DDoS mitigation

# I’m done here, but:

- There is a controversial proposal known as `security.txt` draft-foudil-securitytxt-09, ostensibly for vuln reporting (and hiring)
- Shouldn’t rel-impl do something similar?
- No:
  - security.txt is for websites, not for devices
  - Pet vs. cattle
  - Implementation information can be set by manufacturer; security.txt merges this with PIL (purpose in life), operator contact, policy, … Not clear this (or link to this) is best kept in device.
- Yes: ? Discuss.

# Thank you!
# Comments/questions?