# Constrained RESTful Environments WG (core)

Chairs:

Jaime Jiménez <jaime.jimenez@ericsson.com>
Marco Tiloca <marco.tiloca@ri.se> New!

Mailing list:

core@ietf.org

Jabber:

core@jabber.ietf.org

- 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)
```

# Note Well

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- The IAB or any member thereof on behalf of the IAB
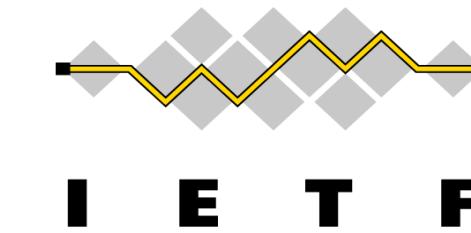- The RFC Editor or the Internet-Drafts function

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

I E T F

# Wednesday (120 min, times are in UTC)

| Time | Who | Subject | Docs |
|------|-----|---------|------|
| 13:00 | Chairs | Intro, WG status, news and document status. | |
| 13:18 | Ivaylo Petrov | CoRECONF - YANG CBOR | yang-cbor |
| 13:25 | Ivaylo Petrov | CoRECONF - YANG Library | yang-library |
| 13:31 | Ivaylo Petrov | CoRECONF - COMI | core-comi |
| 13:38 | Ivaylo Petrov | CoRECONF - SID | core-sid |
| 13:44 | Esko Dijk | GroupComm Bis | groupcomm-bis |
| 13:55 | Marco Tiloca | Group OSCORE | oscore-groupcomm |
| 14:16 | Christian Amsüss | Discovery of OSCORE groups with the Resource Directory | oscore-discovery |
| 14:26 | Christian Amsüss | Observe notifications as multicast responses | multicast-notifications |
| 14:44 | Esko Dijk | Proxy for CoAP group communication | groupcomm-proxy |
| 15:00 | Chairs | End of the meeting | |

# Thursday (90 min, times are in UTC)

| Time | Who | Subject | Docs |
|------|-----|---------|------|
| 13:00 | Chairs | Intro, Agenda bashing | |
| 13:05 | Carsten Bormann | impl-info presentation | rel-impl |
| 13:15 | Christian Amsüss | core-responses presentation | core-responses |
| 13:20 | Christian Amsüss | Resource Directory final remarks | core-rd |
| 13:25 | Christian Amsüss | Resource Directory extensions | rd-extensions |
| 13:30 | Klaus Hartke | Link attribute registry plan | |
| 13:35 | Klaus Hartke | Updates on CoRAL and href | coral, href |
| 13:45 | Jim Schaad | CoRE Apps Discussion | |
| 14:05 | Thomas Fossatti | Problem Details For CoAP APIs | detail-problem |
| 14:15 | Carsten Bormann | SenML Features and Versions | versions |
| 14:22 | Carsten Bormann | Senml Data Value CT | data-ct |
| 14:22 | | Flextime | |

# Agenda Bashing

# Intro

# CoRE:WG Chairs
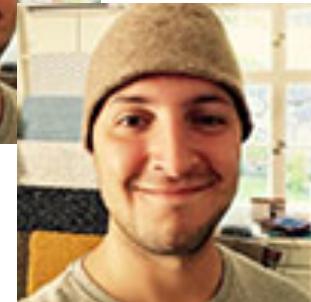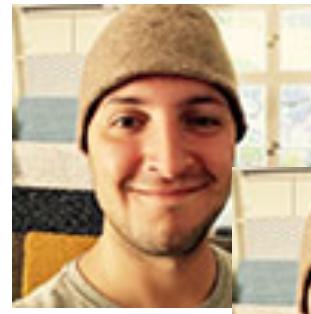
2010–2012

2012–2016

2016–2020
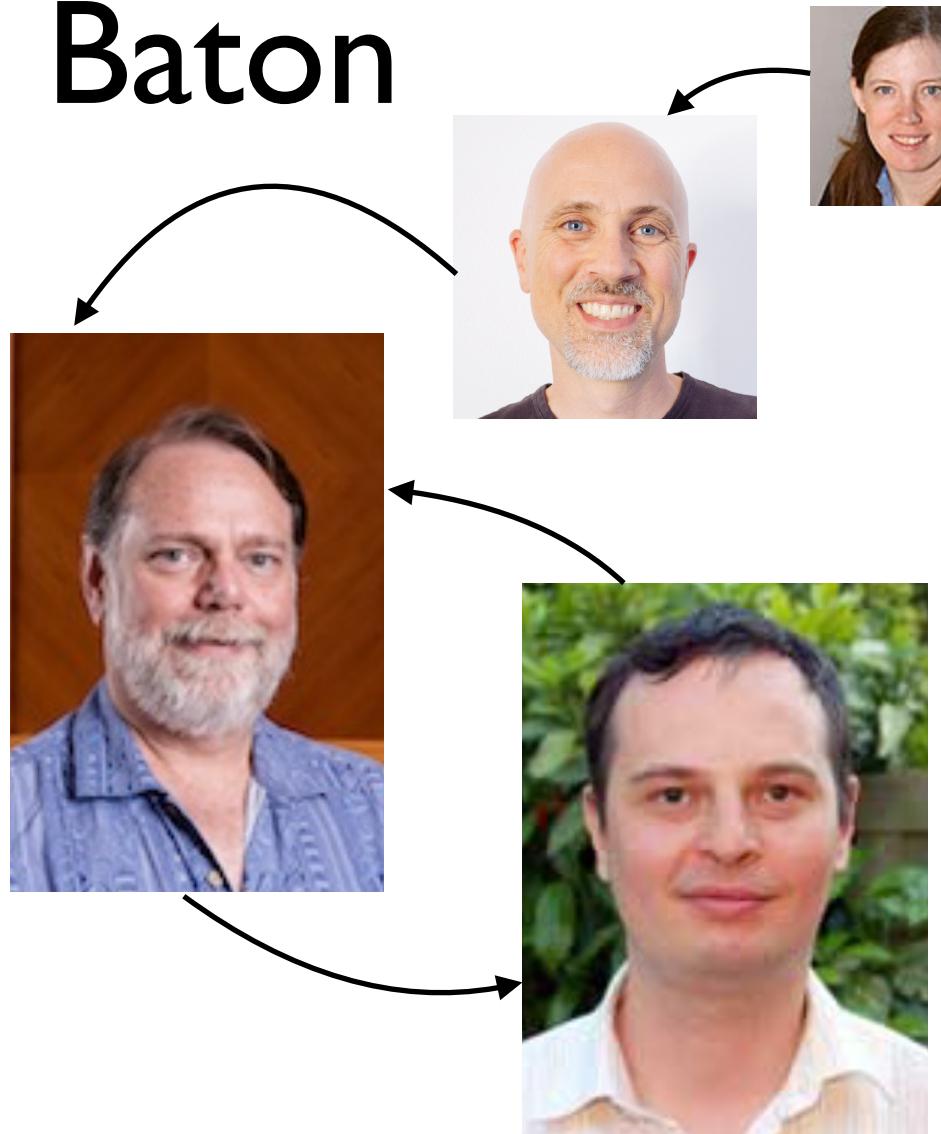
2020–

Welcome
Marco Tiloca

# Area Director: Handoff of the Baton

- **Lisa Dusseault**
(chartered us)

- **Peter Saint-Andre**
(from 2010)

- **Barry Leiba**
(from 2012)

- **Alexey Melnikov**
(from 2016)

- **Barry Leiba**
(from 2020)

# 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](core-wg.github.io)
- Use of queuing at [core@jabber.ietf.org](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

CORECONF - CORE - 08.04.2020 - M. Veillette, A. Bierman, P. van der Stok, A. Pelov, **I. Petrov**

4

# 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
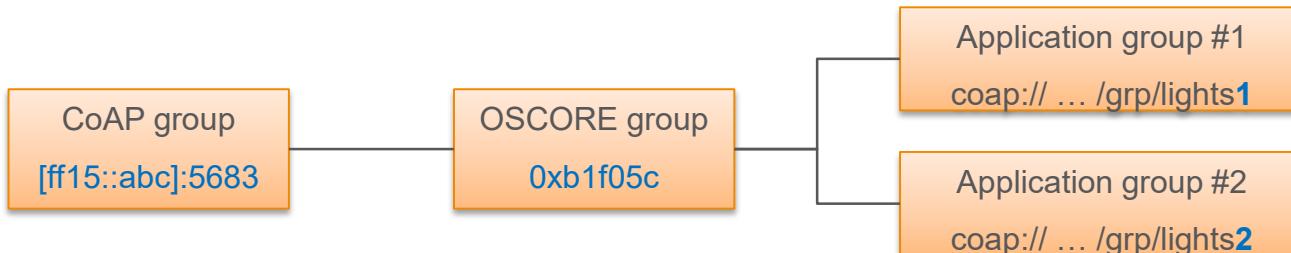
› Improved definition (2.1) of application/CoAP/security groups

- – 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**  (identifiers for group type:)
  – CoAP group: network level  → multicast-address + port
  – OSCORE group  ('security group')  → Group name (invariant string)
  – Application group: application level  → <any application-specific ID>

› Example of group relations:

# Open Issues in Github / Gitlab

› See groupcomm-bis <u>issues page</u> and <u>previous page</u>

› #1 Clarify multicast endpoint concept and messaging model - UDP port may change

– based on <u>email thread [core] RFC 7252 - 8.2 - Multicast - Request / Response Layer, page 67, top</u>

# 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 <u>issues</u> in -00

› Process the <u>latest review comments</u> 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/-F9oo5lIo6TuZHv-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 <u>external</u> 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 <u>resource</u> 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
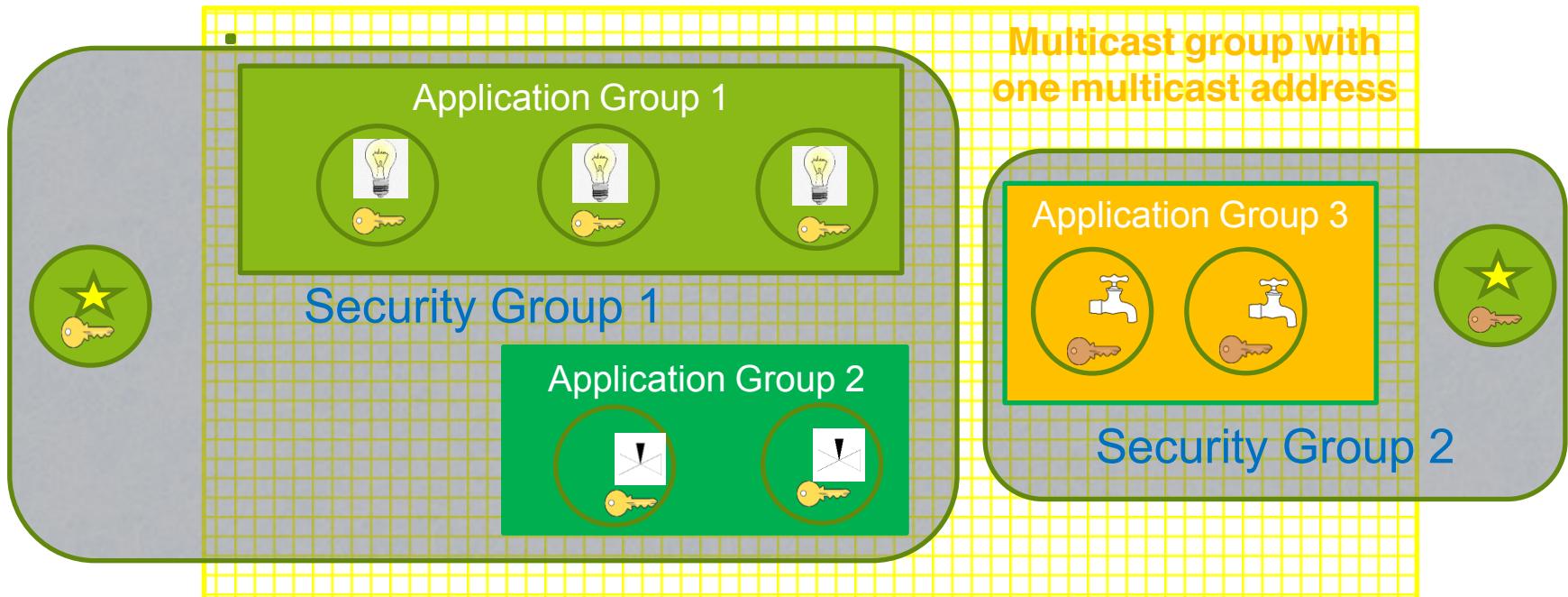
# Backup

# 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



Multicast group with one multicast address

Application Group 1

Application Group 2

Application Group 3

Security Group 1

Security Group 2

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 <u>resource</u> 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 <u>endpoint</u> 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
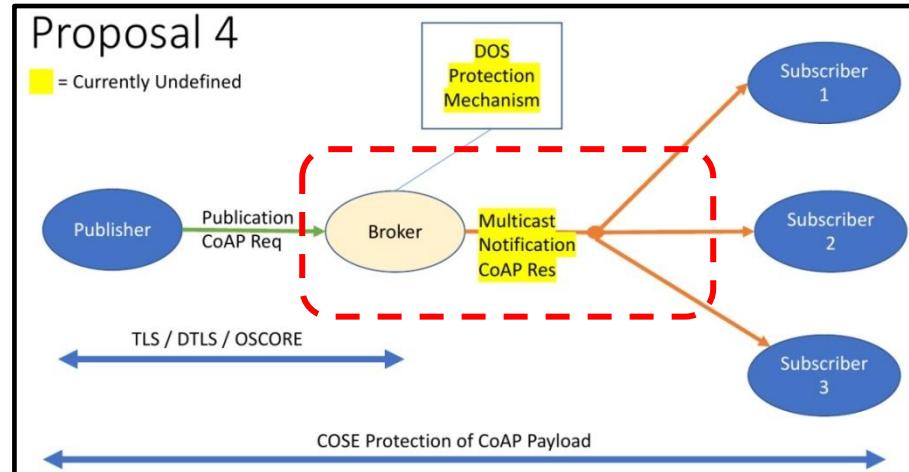
IETF CoRE WG, Virtual Interim, April 8th, 2020

# Recap

› Observe notifications as <u>multicast responses</u>
- 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 <u>belongs</u> to the group
  – The group <u>entrusts</u> 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 <u>server</u> 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, <u>from the multicast IP address</u> 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

**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
    }
```

› 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

# Updates from -04

› Appendix A - Alternative ways to retrieve a phantom request

› 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 </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"
    }
```

```
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 $n \leftarrow (r * q)$
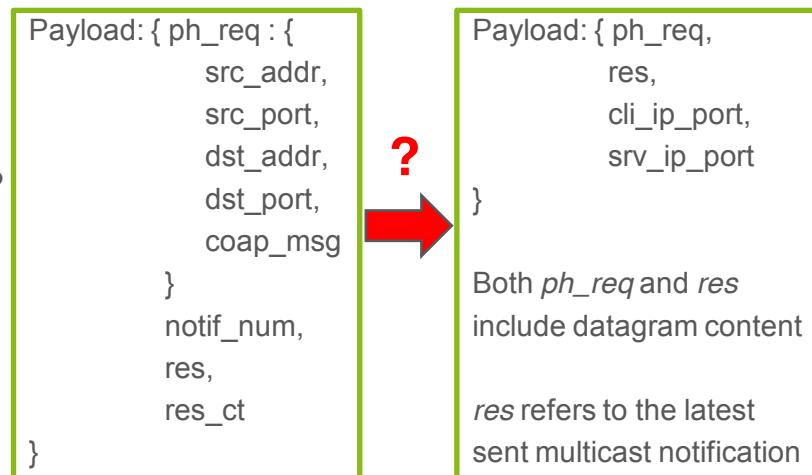
```
+-----+---+---+---+---+--------------------+--------+-------+---------+
| No. | C | U | N | R | Name               | Format | Len.  | Default |
+-----+---+---+---+---+--------------------+--------+-------+---------+
| TBD |   | x |   |   | Multicast-Response-| uint   | 0-8 B | (none)  |
|     |   |   |   |   | Feedback-Divider   |        |       |         |
+-----+---+---+---+---+--------------------+--------+-------+---------+
     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

```
Payload: { ph_req : {
                src_addr,
                src_port,
                dst_addr,
                dst_port,
                coap_msg
            }
            notif_num,
            res,
            res_ct
}
```

**?** →

```
Payload: { ph_req,
                res,
                cli_ip_port,
                srv_ip_port
}
```

Both *ph_req* and *res* include datagram content

*res* refers to the latest sent multicast notification

# 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
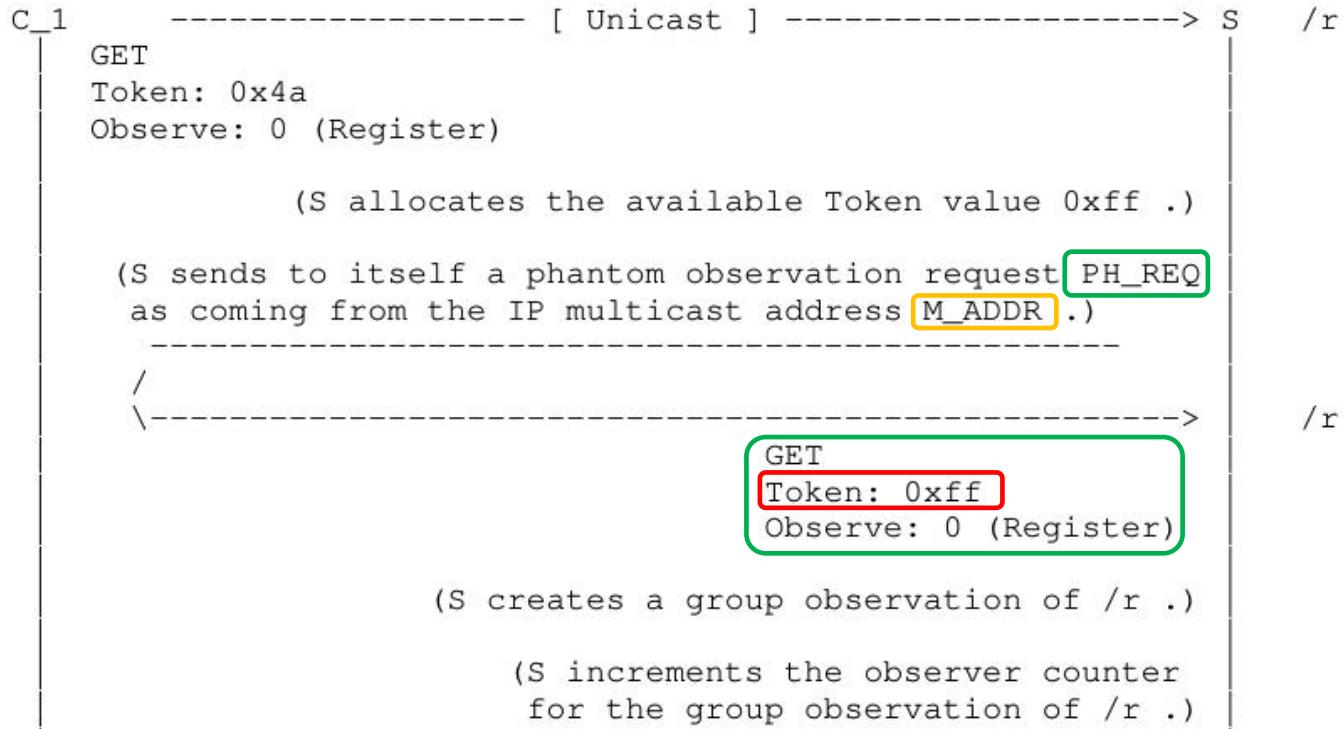
# Server side

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

```
C_1       ----------------- [ Unicast ] --------------------> S    /r
 |    GET
 |    Token: 0x4a
 |    Observe: 0 (Register)
 |
 |            (S allocates the available Token value 0xff .)
 |
 |   (S sends to itself a phantom observation request PH_REQ
 |    as coming from the IP multicast address M_ADDR .)
 |    ----------------------------------------------------
 |    /
 |    \--------------------------------------------------------->      /r
 |                                    GET
 |                                    Token: 0xff
 |                                    Observe: 0 (Register)
 |
 |                         (S creates a group observation of /r .)
 |
 |                            (S increments the observer counter
 |                             for the group observation of /r .)
```
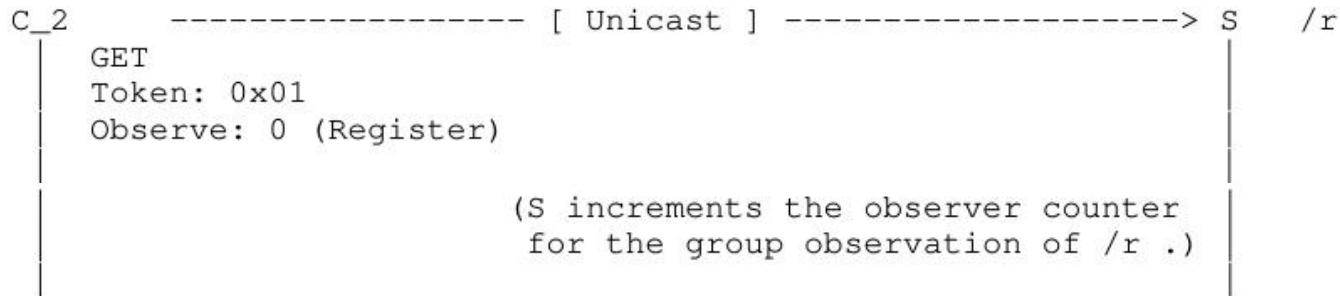
# C1 registration

```
C_1 <-------------------- [ Unicast ] ----------------        S
  |   5.03
  |   Token: 0x4a
  |   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
  |           }
  |                                                            |
```

# C2 registration

```
C_2         ----------------- [ Unicast ] -------------------> S    /r
   |    GET                                                     |
   |    Token: 0x01                                             |
   |    Observe: 0 (Register)                                   |
   |                                                            |
   |                        (S increments the observer counter  |
   |                          for the group observation of /r .) |
   |                                                            |
```

# C2 registration

```
C_2 <-------------------- [ Unicast ] ----------------       S
  |  5.03
  |  Token: 0x01
  |  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
  |           }
  |
  |     (The value of the resource /r changes to "5678".)
```
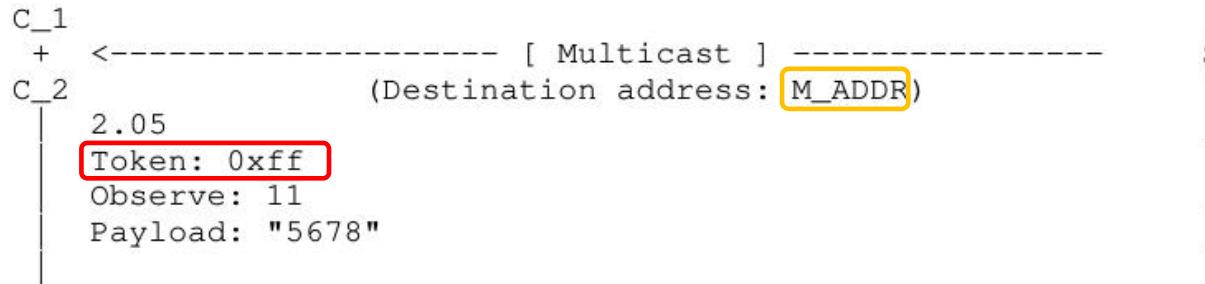
# Multicast notification

```
C_1                                                          |
 +  <------------------ [ Multicast ] ----------------       S
C_2                  (Destination address: M_ADDR)           |
 |  2.05                                                      |
 |  Token: 0xff                                               |
 |  Observe: 11                                               |
 |  Payload: "5678"                                           |
 |                                                            |
 |                                                            |
```

› 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 <u>consumes</u> the value $y$ and does <u>not</u> reuse it as SN in the group

› To secure/verify <u>all</u> 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

MUST

– '*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

MAY

– '*cs-kenc*' : countersignature key encoding

– '*alg*' : AEAD algorithm

– '*hkdf*' : HKDF algorithm

› 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

```
C_1        ------------- [ Unicast w/ OSCORE ]  ---------------> S    /r
   | GET
   | Token: 0x4a
   | Observe: 0 (Register)
   | OSCORE: {kid: 1 ; piv: 101 ; ...}
   |
   |           (S allocates the available Token value 0xff .)
   |
   |     (S sends to itself a phantom observation request  PH_REQ
   |      as coming from the IP multicast address  M_ADDR .)
   |      ----------------------------------------------------
   |     /
   |     \-------------------------------------------------------->    /r
   |                         GET
   |                         Token: 0xff
   |                         Observe: 0 (Register)
   |                         OSCORE: {kid: 5 ; piv: 501 ; ...}
   |
   |   (S steps SN_5 in the Group OSCORE Sec. Ctx : SN_5 <== 502)
   |
   |                         (S creates a group observation of /r .)
   |
   |                         (S increments the observer counter
   |                          for the group observation of /r .)
```

# C1 registration w/ security

```
C_1 <-------------- [ Unicast w/ OSCORE ] --------------     S
   |   5.03                                                   |
   |   Token: 0x4a                                            |
   |   OSCORE: {piv: 301; ...}                                |
   |   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,                                 |
   |              join_uri : "coap://myGM/group-oscore/myGroup", |
   |              sec_gp : "myGroup"                          |
   |          }                                               |
   |                                                          |
```

5: Sender ID ('kid') of S in the OSCORE group
501: Sequence Number of S in the OSCORE group
when S created the group observation

# C2 registration w/ security

```
C_2        ------------- [ Unicast w/ OSCORE ]  ---------------> S    /r
  |    GET                                                       |
  |    Token: 0x01                                               |
  |    Observe: 0 (Register)                                     |
  |    OSCORE: {kid: 2 ; piv: 201 ; ...}                         |
  |                                                              |
  |                                (S increments the observer counter |
  |                                 for the group observation of /r .) |
  |                                                              |
```
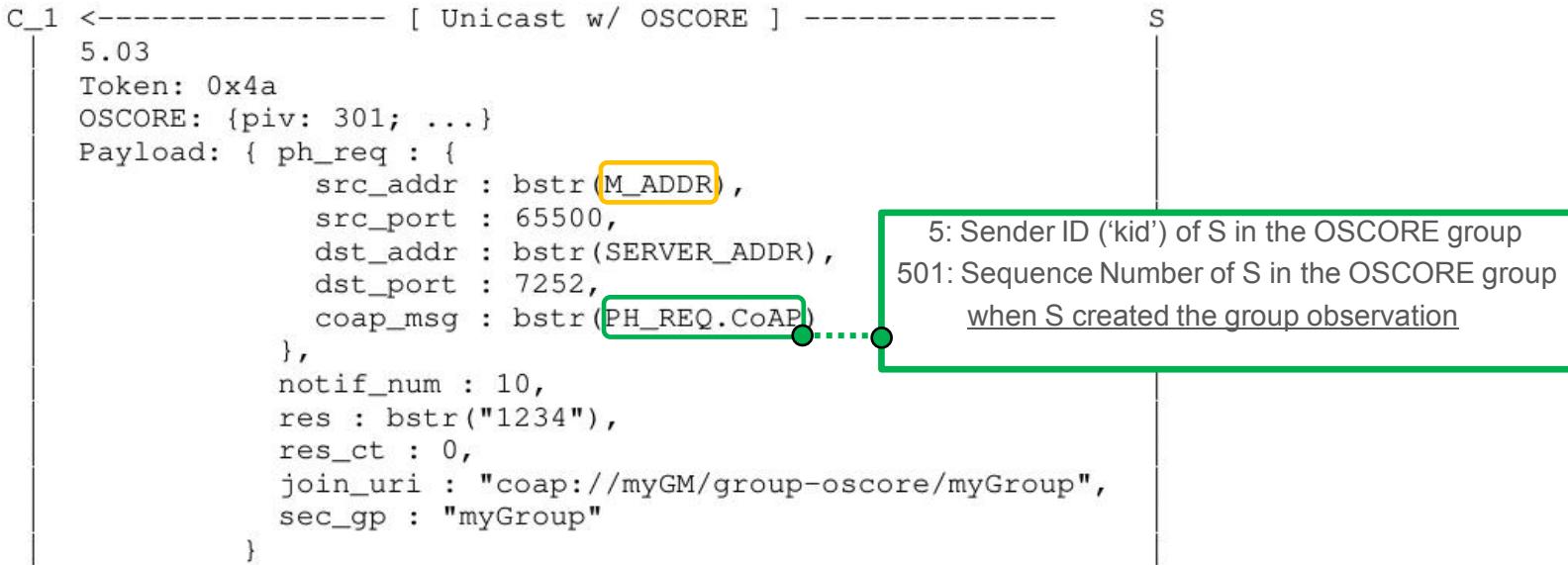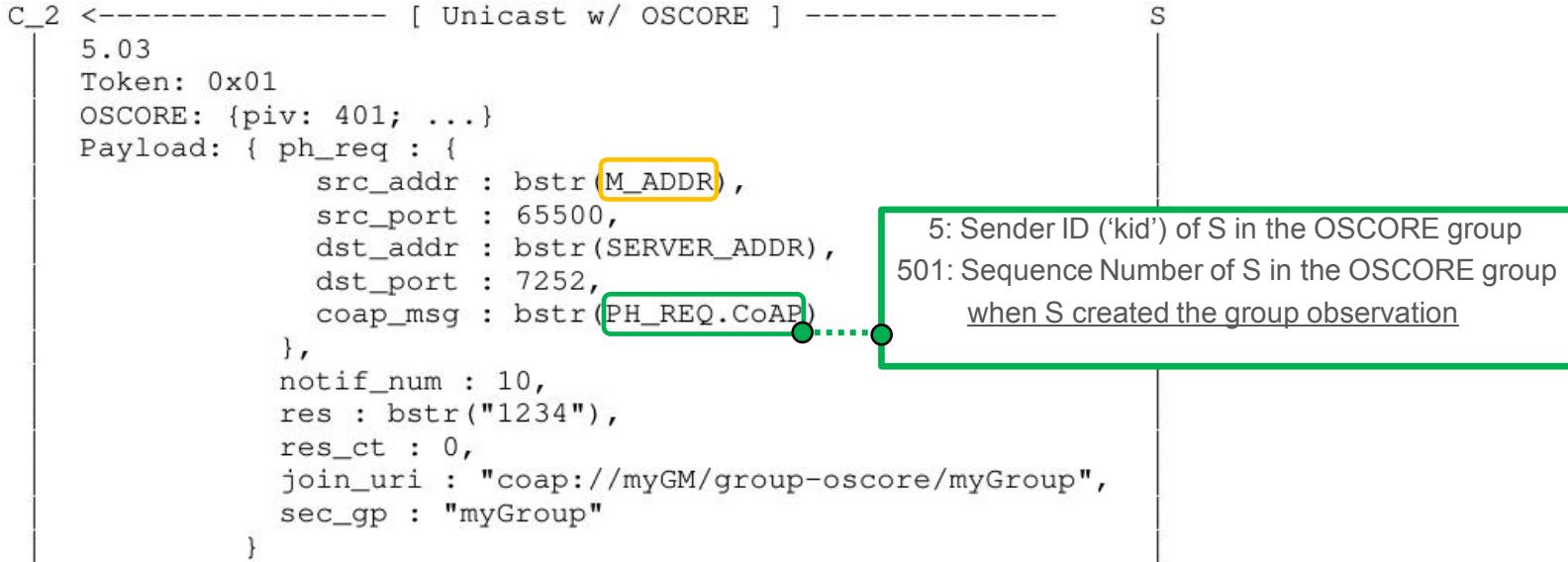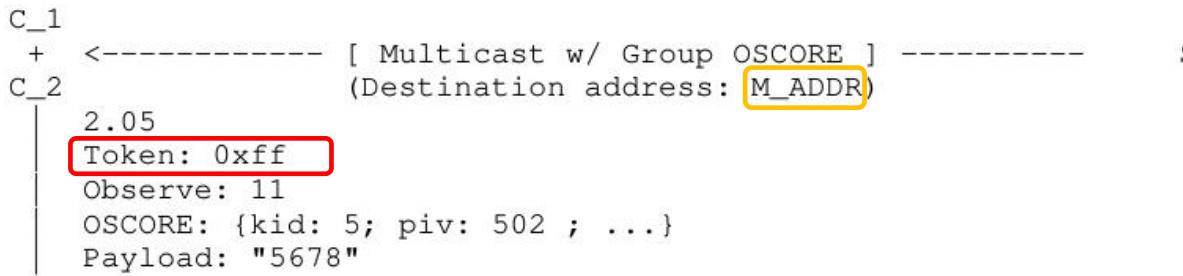
# C2 registration w/ security

```
C_2 <--------------- [ Unicast w/ OSCORE ] --------------         S
    |  5.03                                                        |
    |  Token: 0x01                                                 |
    |  OSCORE: {piv: 401; ...}                                     |
    |  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,                                      |
    |             join_uri : "coap://myGM/group-oscore/myGroup",   |
    |             sec_gp : "myGroup"                               |
    |            }                                                 |
    |                                                              |
```

5: Sender ID ('kid') of S in the OSCORE group

501: Sequence Number of S in the OSCORE group

when S created the group observation

# Multicast notification w/ security

```
C_1                                                              |
  +    <------------ [ Multicast w/ Group OSCORE ] ----------    S
C_2                   (Destination address: M_ADDR)              |
   |   2.05                                                      |
   |   Token: 0xff                                               |
   |   Observe: 11                                               |
   |   OSCORE: {kid: 5; piv: 502 ; ...}                          |
   |   Payload: "5678"                                           |
```

› When encrypting and signing the multicast notification:
  – The OSCORE *external_aad* has 'req_kid' = 5 and 'req_iv' = 501
  – Same for <u>all</u> 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-  |  (*)   | 8-20 B | (none)  |
|        |   |   |   |   | Forwarding |        |        |         |
|        |   |   |   |   |            |        |        |         |
+--------+---+---+---+---+------------+--------+--------+---------+
      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

# Discovery Topics

# A link relation type for disclosing implementation information

draft-bormann-t2trg-rel-impl-01

Carsten Bormann

IETF 107+, 2020-04-16, 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.

# Unsolicited responses

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

Res: 2.05 Content
Payload: </firmware>,</food-preference>

Res: 2.05 Content
Response-For: GET /food-preference
Payload: vegan
```

Use cases
- ▶ draft-bormann-core-responses-00: configured setups, triangles
- ▶ Block2 transfer with window size (reference lost)
- ▶ DOTS: Observation for more than first block
- ▶ Cache prepopulation
- ▶ Multicast notifications

Usable tokens
- ▶ Prior request
- ▶ Out-of-(message-layer)-band agreement
- ▶ Option that changes the rules

Take up again?

# Resource Directory

`draft-ietf-core-resource-directory`

Zach Shelby, Michael Koster, Carsten Bormann, Peter van der Stok,
*Christian Amsüss*

2020-04-16

# Status

-24 processed IETF016 comments

- ▶ discovery via DNS-SD included explicitly for CoAP[S] over UDP and TCP
- ▶ lifetime minimum 60 $\rightarrow$ 1
- ▶ Explicit statement on anchor as lookup attribute
- ▶ IANA, references, examples, layout

Secdir: ready
Genart: not read
$\rightarrow$ Revised I-D Needed

# Easy points

- Example errors
- Language consistency
- Dots and dashes

Text ready in PRs or will be soon

# Needs a bit of thought

- ▶ DDOS mitigation. Non-normatively mention recommendation-to-come for Echo in ERT?
- ▶ Simple registration from fake sender as firewall bypass. Require client aliveness? When?
- ▶ Random endpoint names picked by client. Guidance on size might suffice, but is it thought through?

# Input would help – who knows X.509?

- the certificate is uniquely identified by the CN field and the serial number
- What in a certificate *can* be used?
- And how is it properly referenced?

# Resource Directory Extensions

`draft-amsuess-core-resource-directory-extensions`
(and others)

Christian Amsüss

2020-04-16

# What is this

Things that RDs can do

# What is this

Things that RDs can do

without delaying RD publication or making it bloated

# What is this

Things that RDs can do

without delaying RD publication or making it bloated

Also: "How to extend the RD"

# In the mixed bag

Reverse Proxy "Please give me a public address"

Infinite Lifetime for stateful connections or courageous CTs

~~Relation following~~ use CoRAL FETCH

Lifetime Age for RD replication

~~Provenance~~ for RD replication / use CoRAL reef

Zone identifier introspection to peek beyond the split horizon

Multicast aggregation A make-believe RD for multicast discovery

Opportunistic RD (I'm sure we've done something like this before)

# Outside the bag

- RD-DNS-SD
- CoRAL reef
- RD replication
- Group membership?
- (protocol negotiation)

Take a grab?

# CoRE Applications

# draft-hartke-core-parameters

Klaus Hartke

CoRE Meeting

2020-04-16

# draft-ietf-core-href

Klaus Hartke

CoRE Meeting
2020-04-16

# Changes since IETF 106

Changes from draft-ietf-core-href-01 to -02:

- Changed the syntax of schemes to exclude upper case characters (#13)
- Minor editorial improvements (#34 #37)

Changes from draft-ietf-core-href-02 to -03:

- Expanded the set of supported schemes (#3)
- Specified creation, normalization and comparison (#9)
- Clarified the default value of the "path.type" option (#33)
- Removed the "append-relation" path type (#41)
- Renumbered the remaining path types
- Renumbered the option numbers
- Restructured the document
- Minor editorial improvements

# Overhead

*URI*

| major type | 3 | 49 | coap | : | / | / | example.com | / | foo | / | abc…xyz |
|---|---|---|---|---|---|---|---|---|---|---|---|
| additional information | 24 | | 4 | 1 | 2 | | 11 | 1 | 3 | 1 | 26 |

2          1      2                    1        1          = 44
                                                          = 7

*draft-ietf-core-href-03*

| major type | 4 | 0 3 | coap | 0 3 | example.com | 0 3 | foo | 0 3 | abc…xyz |
|---|---|---|---|---|---|---|---|---|---|
| additional information | 8 | 0 4 | 4 | 1 11 | 11 | 5 3 | 3 | 5 24 26 | 26 |

1          2                    2                    2                3          = 44
                                                                                = 10

↑ option number    ↑ option value length

*Idea*

| major type | 2 | 0 | coap | 1 | example.com | 5 | foo | 5 | abc…xyz |
|---|---|---|---|---|---|---|---|---|---|
| additional information | 24 48 | 4 | 4 | 11 | 11 | 3 | 3 | 26 | 26 |

option number
option value length

2          1      1                    1                1          = 44
                                                                    = 6

# draft-ietf-core-coral

Klaus Hartke

CoRE Meeting
2020-04-16

# Changes since IETF 106

Changes from draft-ietf-core-coral-01 to -02:

- Added nested elements to form fields

- Replaced the special construct for embedded representations with links

- Changed the textual format to allow simple/qualified names wherever IRI references are allowed

- Introduced predefined names in the textual format (#39)

- Minor editorial improvements and bug fixes (#16 #28 #31 #37 #39)

Changes from draft-ietf-core-coral-02 to -03:

- Changed the binary format to express relation types, operation types and form field types using draft-ietf-core-href (#2)

- Clarified the current context and current base for nested elements and form fields (#53)

- Minor editorial improvements (#27)

# CoRE App Doc Structure

JIM SCHAAD

# Goal – Discussion!!!

- Present some information about documenting Apps
- Show how apps have common sets of operations/objects
- Get some input from the community about potential ways forward
- Look at the importance of being able to machine read definitions from documents

# Gross Approaches

- Base the document on the links
  - Approach used by html today
  - Matches the way documents presented today

- Base the document on the objects
  - Object oriented programming

- Both methods allow for doing common definitions

# By link example

Link: </a>; rel="collection"

# By object example

Collection of <item>

  * Supports GET and FETCH

Item

  * Supports GET, FETCH

Deletable Item : Item

  * Supports DELETE

# Applications we have now

- PUB SUB

- REEF – Resource Directory in CoRAL

- ACE Group Administrator

# CoAP Problem Details

draft-fossati-core-coap-problem-02

# Summary

- Standardise an error reporting format for CoAP APIs – [RFC 7807](#)-like
- -00 published Nov 2019; 2 iterations since then
- Got airtime in Singapore @ CoRE APPs side-meeting
- Got some quality (on- and off-line) discussion
- Time seems ripe to discuss next steps with the wider working group

# Quick recap

- Structure of Problem
  - Global block
    - Error identification: `ns` and `type`
    - Common fields: `title`, `details`, CoAP `response_code`, `instance` URI
  - Local block
    - Per namespace extensions: API developers can define their (ANY DEFINED BY `ns`) stuff
    - The keys defined here (TODO, in a separate map) have scoped meaning
- Name-spacing
  - `ns` codepoints can be private (<0) or public (>0)
  - When / if API goes public, renumbering happens by grabbing a public `ns`, the rest (types and per-`ns` extensions) stays the same

# Issue #19 - Localisation

- Is there anything we can do to help here?
- Should we recommend a default language?
- Should we add language tags a la CoRAL?

# Issue #14: "X dash"

- Context: RFC 6648, in particular the analysis in Appendix B
- The problem is if the producer never updates to the public format, consumers – not just CoAP clients but the whole logging pipeline – need to cope for an indefinite amount of time
- Unfortunately, consumers don't seem to have much leverage
- We define a private-to-public migration plan from the onset
  - To what extent is that effective in preventing the problem?
  - Provide discussion on strategies for minimising the risk of "eternal pollution" (e.g., use an automated software update mechanism)

# Open questions
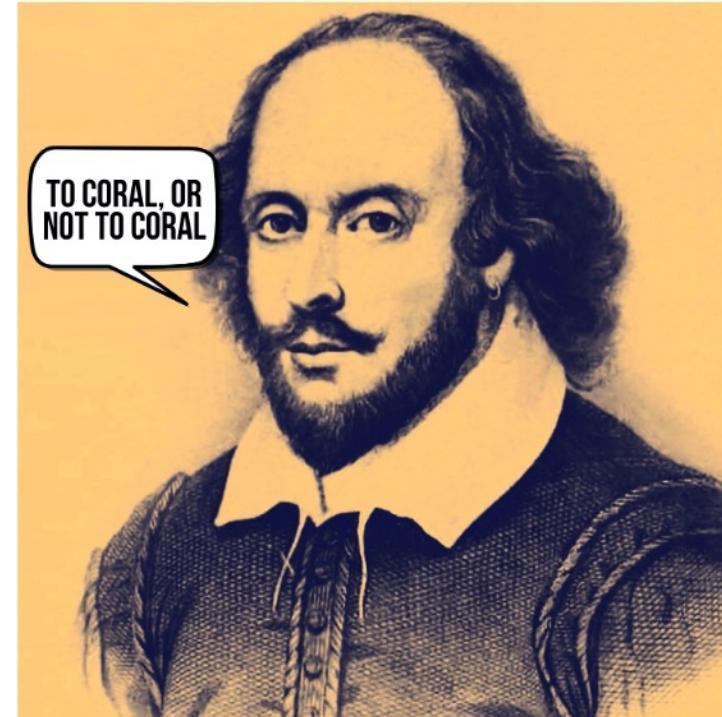
- Jim suggests subsuming the diagnostic payload under the problem structure:
  - Add another optional `diagnostic` key in the "Global" map
  - Christian: *"APIs that need something similar could add their own extension"*
- I think the question is: is this going to be common enough that is worth factoring it out proactively?
- Is there an appetite for that?

# CoRALization?

- PRO: technically superior:
  - absorbs encoding, compression, transport variability
- CON: depends on the CoRAL machinery
  - Q: how strong is the dependency?  Can it exist with a minimalist implementation that has comparable complexity with the current spec?
  - How long will it take to get it out?
    - Which is really a  question about CoRAL stability – when can we expect CoRAL's moving parts (at least those that would have an impact here) to become fully stable?

# Discussion Points

- Is standardization needed here?
- Is this ready for adoption?

# SenML

# SenML Data Value Content-Format Indication

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

Ari Keränen, Carsten Bormann

IETF 107+, 2020-04-16, 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

# Backup

# 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+, 2020-04-16, 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?

# Thank you!
# Comments/questions?