

# Constrained RESTful Environments WG (core)

## Chairs:

Jaime Jiménez <jaime.jimenez@ericsson.com>

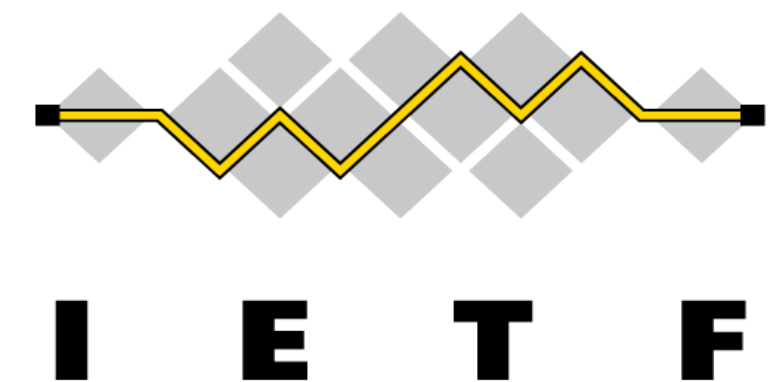
Marco Tiloca <marco.tiloca@ri.se> **New!**

## 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)

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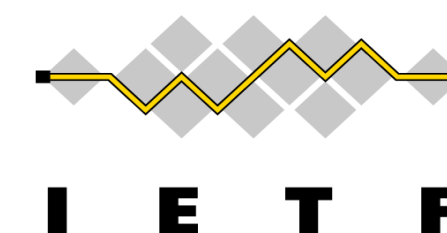
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## Wednesday (120 min, times are in UTC)

Time	Who	Subject	Docs
13:00	Chairs	Intro, WG status, news and document status.	
13:18	Ivaylo Petrov	CoRECONF - YANG CBOR	<a href="#">yang-cbor</a>
13:25	Ivaylo Petrov	CoRECONF - YANG Library	<a href="#">yang-library</a>
13:31	Ivaylo Petrov	CoRECONF - COMI	<a href="#">core-comi</a>
13:38	Ivaylo Petrov	CoRECONF - SID	<a href="#">core-sid</a>
13:44	Esko Dijk	GroupComm Bis	<a href="#">groupcomm-bis</a>
13:55	Marco Tiloca	Group OSCORE	<a href="#">oscore-groupcomm</a>
14:16	Christian Amsüss	Discovery of OSCORE groups with the Resource Directory	<a href="#">oscore-discovery</a>
14:26	Christian Amsüss	Observe notifications as multicast responses	<a href="#">multicast-notifications</a>
14:44	Esko Dijk	Proxy for CoAP group communication	<a href="#">groupcomm-proxy</a>
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	<a href="#">rel-impl</a>
13:15	Christian Amsüss	core-responses presentation	<a href="#">core-responses</a>
13:20	Christian Amsüss	Resource Directory final remarks	<a href="#">core-rd</a>
13:25	Christian Amsüss	Resource Directory extensions	<a href="#">rd-extensions</a>
13:30	Klaus Hartke	Link attribute registry plan	
13:35	Klaus Hartke	Updates on CoRAL and href	<a href="#">coral</a> , <a href="#">href</a>
13:45	Jim Schaad	CoRE Apps Discussion	
14:05	Thomas Fossatti	Problem Details For CoAP APIs	<a href="#">detail-problem</a>
14:15	Carsten Bormann	SenML Features and Versions	<a href="#">versions</a>
14:22	Carsten Bormann	Senml Data Value CT	<a href="#">data-ct</a>
14:22		Flextime	

# Agenda Bashing

**Intro**

# CoRE:WG Chairs

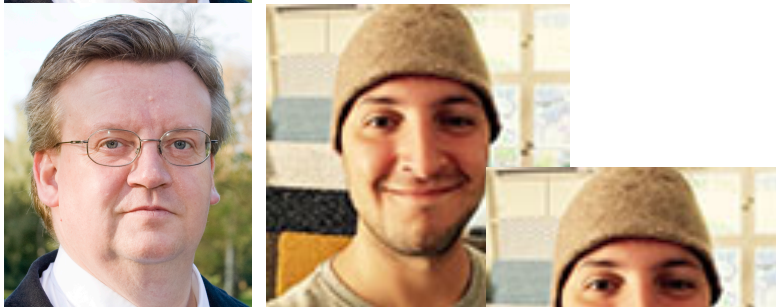
2010–2012



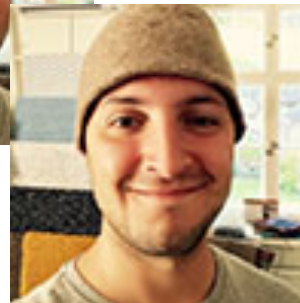
2012–2016



2016–2020



2020–



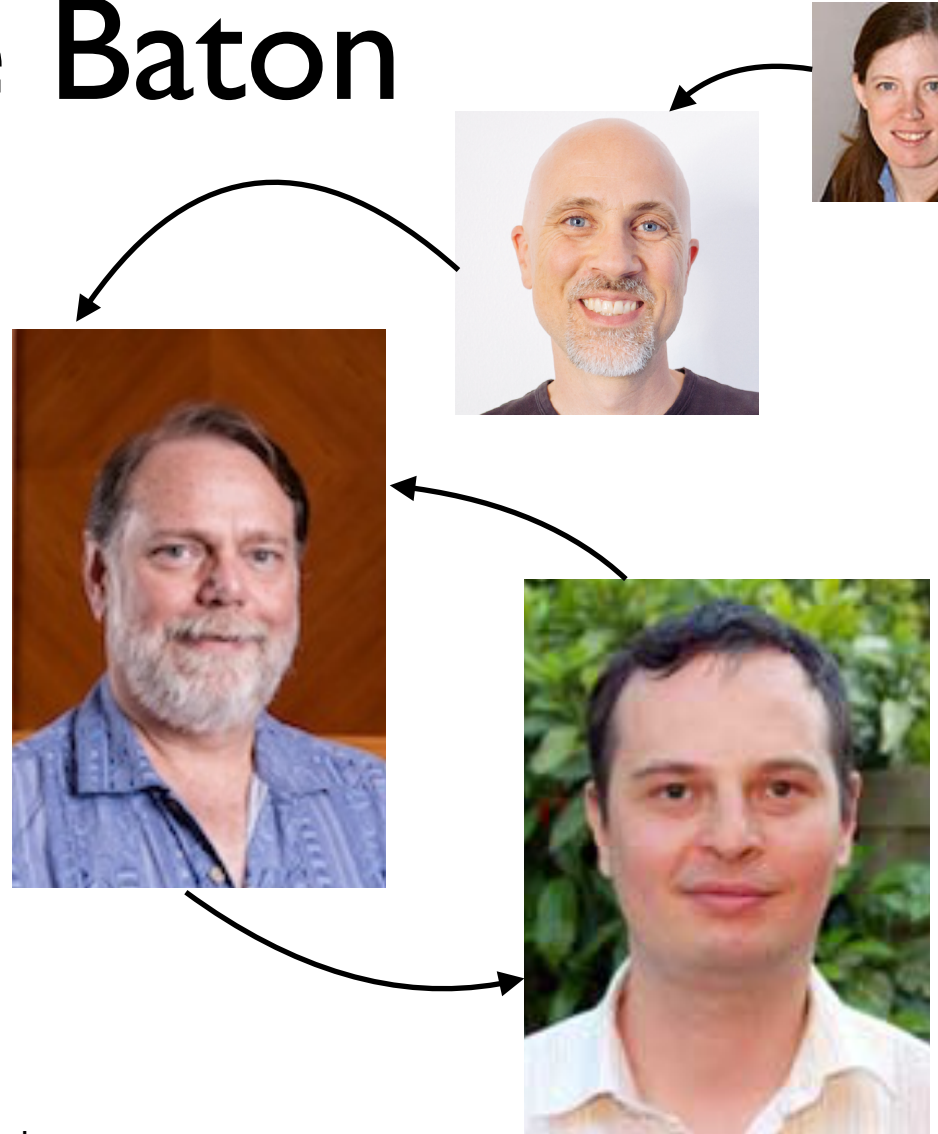
Welcome  
Marco Tiloca





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

WGGLC 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 8<sup>th</sup>, 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/fme0kaeiroi6ETKxD3yoD\\_MiyE/](https://mailarchive.ietf.org/arch/msg/core/fme0kaeiroi6ETKxD3yoD_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

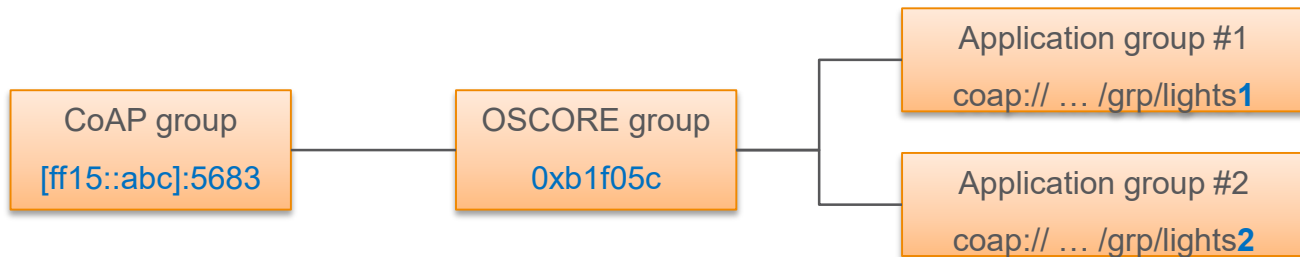
## › Distinguish *types* of groups

- CoAP group: network level
- OSCORE group (‘security group’)
- Application group: application level

(identifiers for group type:)

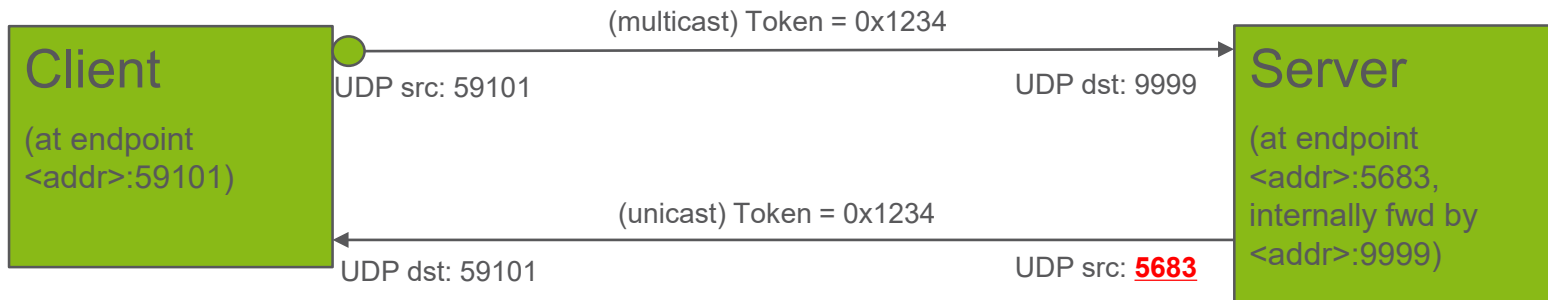
- multicast-address + port
- Group name (invariant string)
- <any application-specific ID>

## › 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 8<sup>th</sup>, 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/](https://mailarchive.ietf.org/arch/msg/core/GdqlGpoLBi-2Q61N_iQeqXC5UL4/)

[3] <https://mailarchive.ietf.org/arch/msg/core/-F9oo5llo6TuZHv-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 8<sup>th</sup>, 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/](https://mailarchive.ietf.org/arch/msg/core/78LHFFyq9c1_t0-kAmuDKcTzc3c/)

Thank you!

Comments/questions?

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

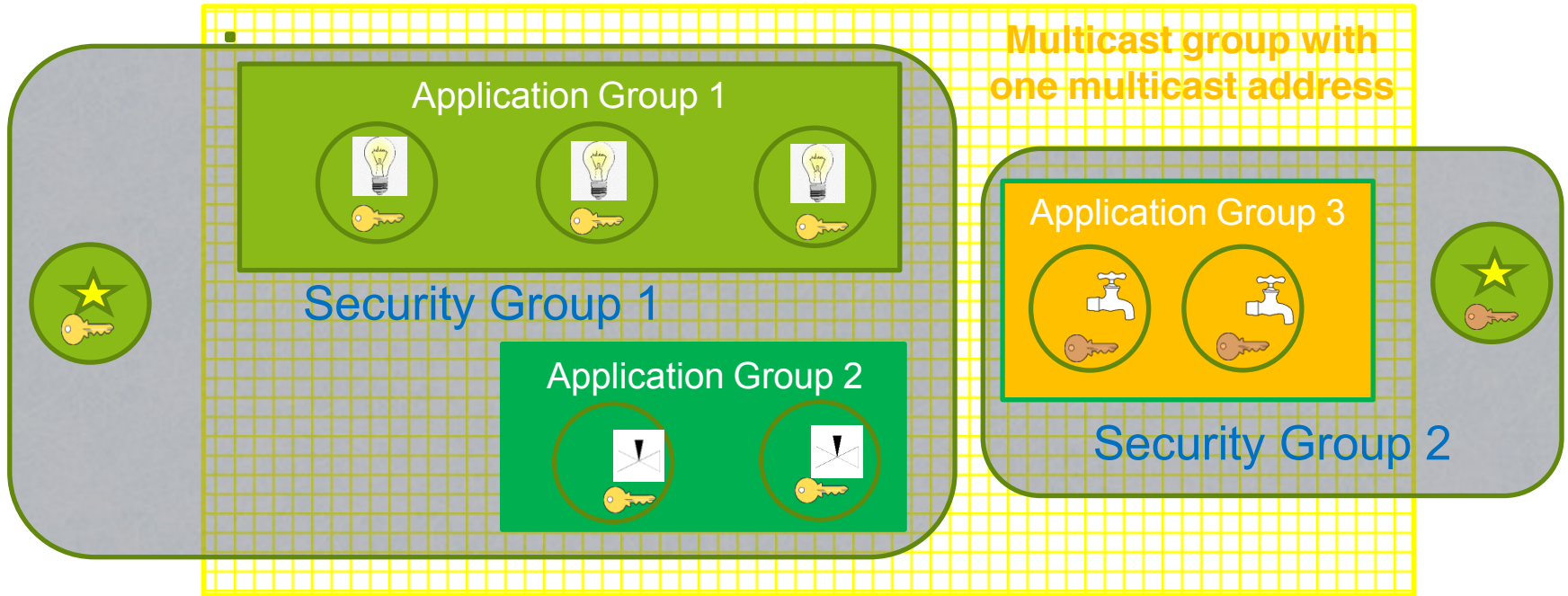
Backup

# 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=gml

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**

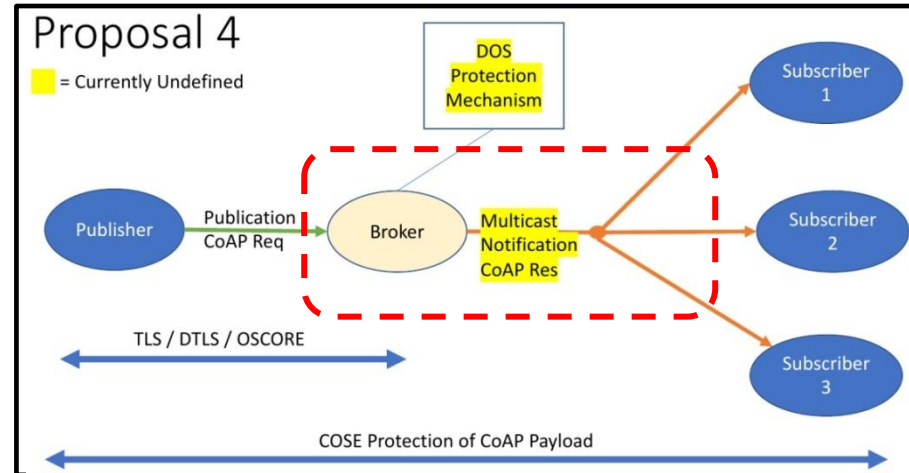
Francesca Palombini, Ericsson

IETF CoRE WG, Virtual Interim, April 8<sup>th</sup>, 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



# 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

### › 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:  $q = \text{ceil}(n / m)$
- 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, then  $n \leftarrow (r * q)$

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

```
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 address + ...
  - ‘*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

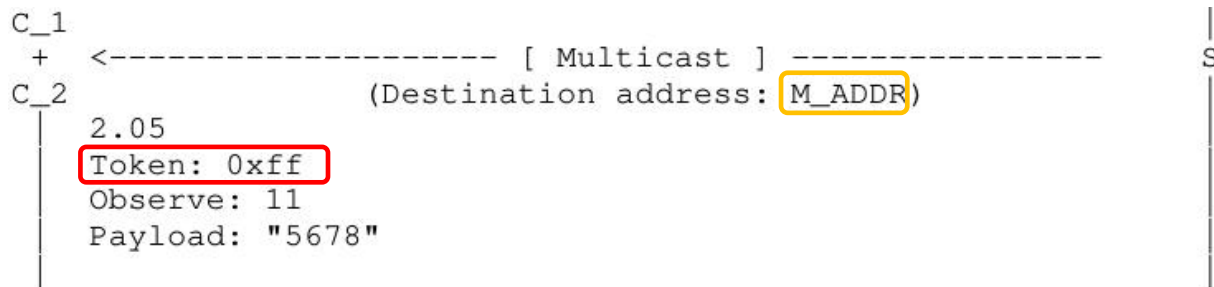
```
C_2 ----- [ Unicast ] -----> S /r
| GET
| Token: 0x01
| Observe: 0 (Register)
|
|                                     (S increments the observer counter
|                                     for the group observation of /r .)
|
```

# 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



- › 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-ky*’ : countersignature key type
- ‘*cs-kenc*’ : countersignature key encoding
- ‘*alg*’ : AEAD algorithm
- ‘*hkdf*’ : HKDF algorithm

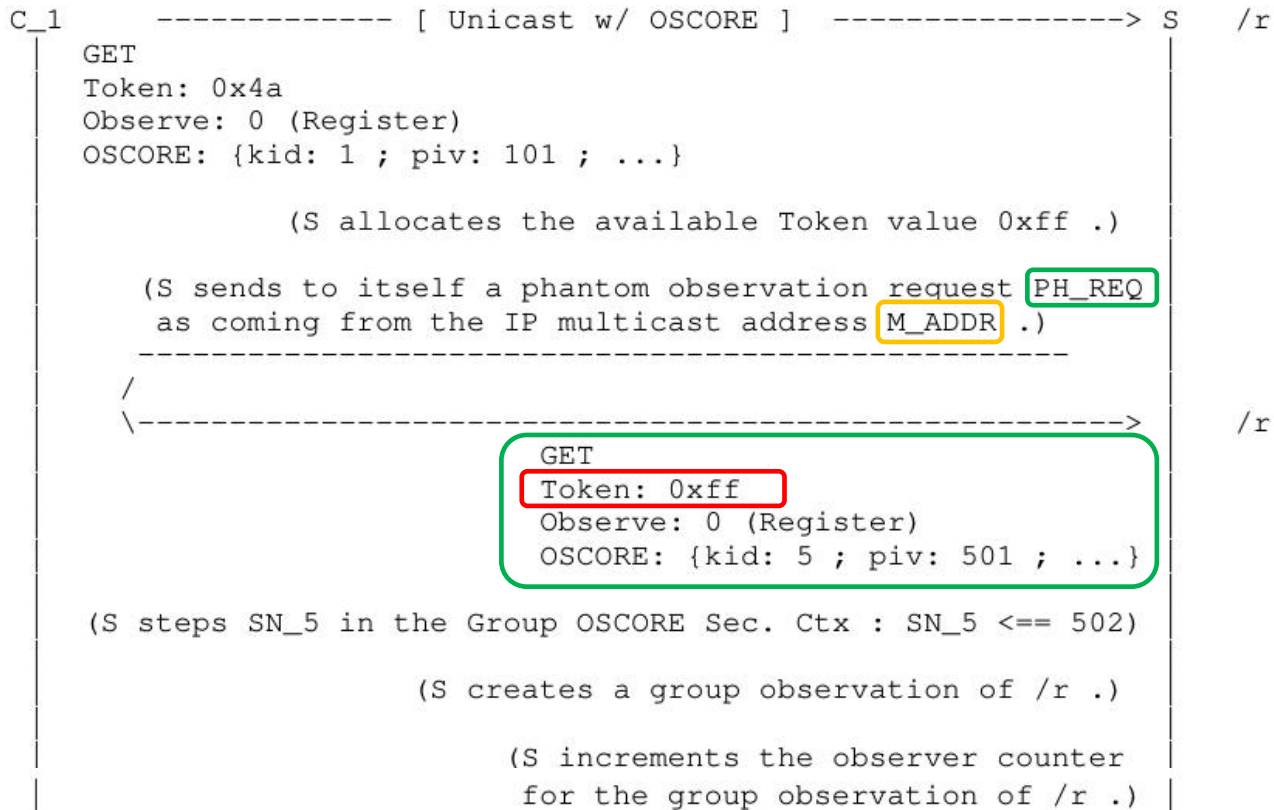
MUST

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

```
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

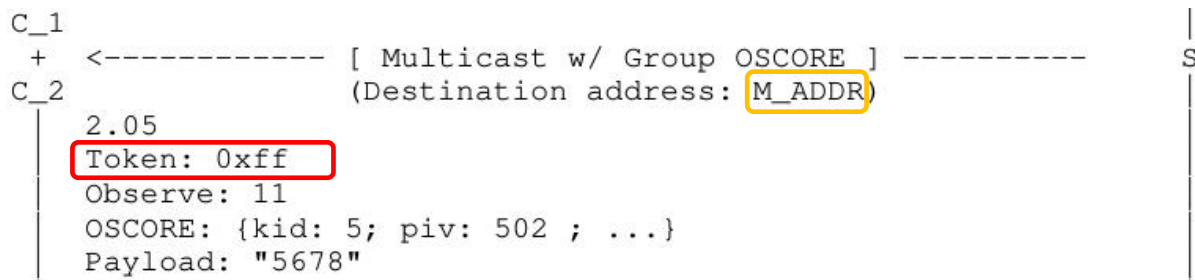
```
C_2 ----- [ Unicast w/ OSCORE ] -----> S /r
| GET
| Token: 0x01
| Observe: 0 (Register)
| OSCORE: {kid: 2 ; piv: 201 ; ...}
|
|                                     (S increments the observer counter
|                                     for the group observation of /r .)
|
```

# 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



- › 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 Tilocca, RISE  
**Esko Dijk, IoTconsultancy.nl**

IETF CoRE WG virtual interim, April 8<sup>th</sup>, 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
  - $T < T_r$ , with  $T_r$  = 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  $\langle C,P \rangle$  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 → 1
- ▶ Explicit statement on anchor as lookup attribute
- ▶ IANA, references, examples, layout

Secdir: ready

Genart: not read

→ 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



# 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

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- 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

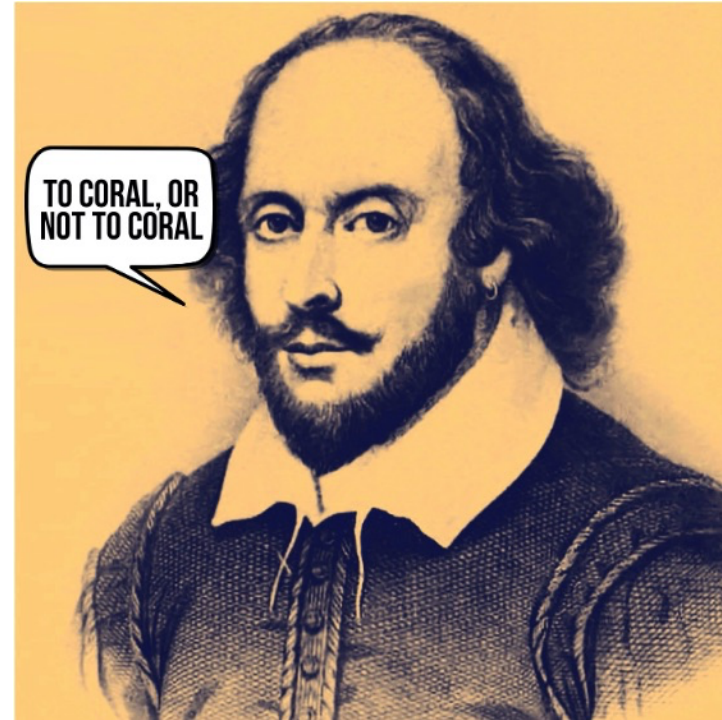
- Jim suggests subsuming the diagnostic payload under the problem structure:
  - Add another optional `diagnostic` key in the “Global” map
  - Christian: *“APIs that need something similar could add their own extension”*
- I think the question is: is this going to be common enough that is worth factoring 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+, 2020-04-08, 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}  
]
```

# Examples

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  "ct": "text/csv@gzip" }
```

# 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<sub>2</sub>”
  - 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?**

