Constrained RESTful Environments WG (core)

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

✓Blue sheets
✓Scribe(s):
http://tools.ietf.org/wg/core/minutes

Note Well

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- The IETF plenary session
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- Any IETF working group or portion thereof
- Any Birds of a Feather (BOF) session
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Wednesday

All times are in time-warped EDT

- **15:20–15:23 Intro I**
- **15:23–15:43 CoAP Congestion Control (CG)**
- **15:43–15:50 Intro II**
- **15:50–16:00 Block post WGLC (CB)**
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- **16:35–16:45 No-Response (AB)**
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CoAP Simple Congestion Control/Advanced (CoCoA)

draft-bormann-core-cocoa-02

Carsten Bormann – Universität Bremen TZI
cabo@tzi.org
August Betzler, Carles Gomez, Ilker Demirkol
Universitat Politècnica de Catalunya (UPC)/Fundació i2cat
carlesgo@entel.upc.edu

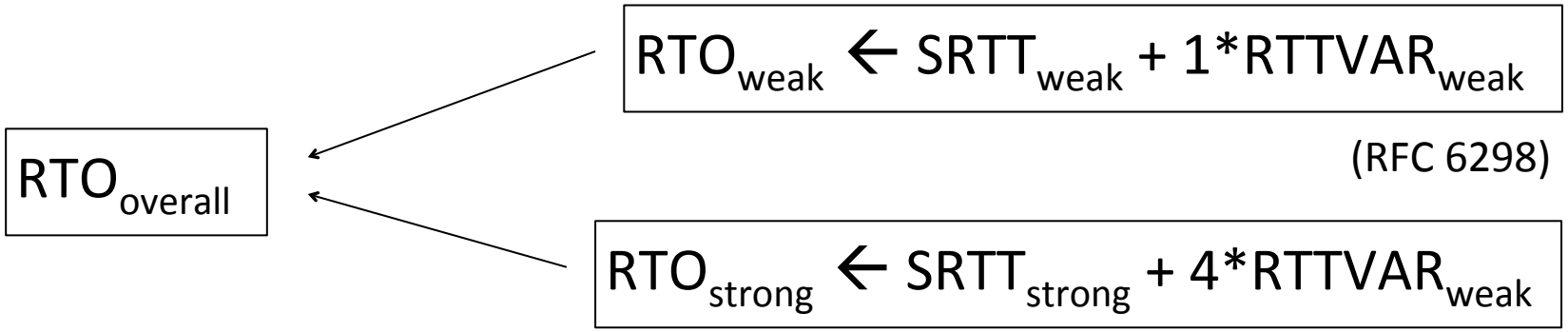
UPC members have been partly supported by the Spanish Government through project TEC2012-32531, and FEDER

Context (I)

- Default CoAP congestion control for CONs (RFC 7252)
  - RTO chosen from a fixed interval
  - Binary Exponential Backoff (BEB)
- CoCoA
  - Simple mechanism for advanced congestion control
    - Using RTT measurements for CONs
    - Rules for NONs

Context (II)

- RTO estimator
  - Input from *weak* and *strong* estimators
  - $RTO_{overall}$ is evolved from the estimator that made the most recent contribution



Updates in -02 (1/3)

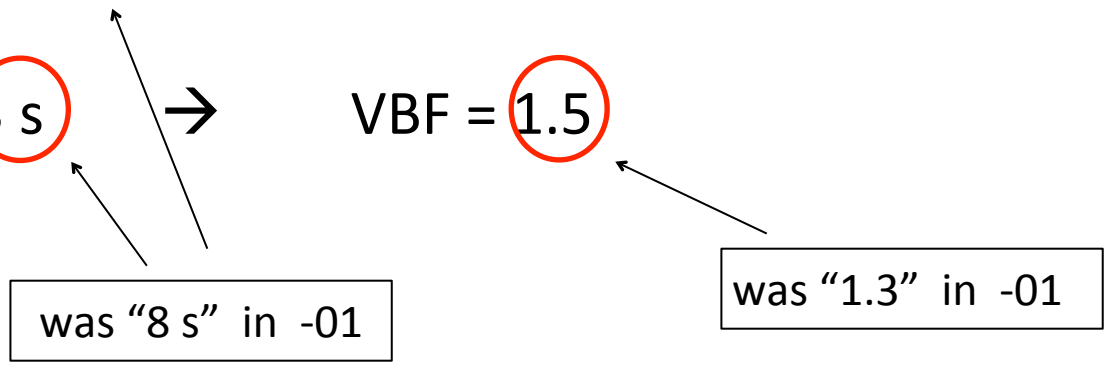
- Reduced RTO_{weak} contribution:
  - $RTO_{overall} := 0.25*RTO_{weak} + 0.75*RTO_{overall}$
  - $RTO_{overall} := 0.5*RTO_{strong} + 0.5*RTO_{overall}$
  - Only responses obtained before the 3rd retransmission update RTO_{weak}
- Aging mechanism for high RTO values
  - If RTO > 3 s, and not updated for 4*RTO , then
  - RTO = 1 + 0.5*RTO s
    - Converge towards default RTO values

Updates in -02 (2/3)

- Blind RTO estimate
  - If only the initial RTO estimate is available
    - In -01: RTO = $2^{\text{Nparallel exchanges}}$ s
    - In -02: RTO = $N_{\text{parallel exchanges}} * 2$ s
  - Changed from exponential to linear approach
  - Benefit
    - Avoids too large RTO estimates

Updates in -02 (3/3)

- Variable Backoff Factor
  - Parameter updates
    - RTO < 1 s → VBF = 3
    - 1 ≤ RTO ≤ 3 s → VBF = 2
    - RTO > 3 s → VBF = 1.5



- Minor editorial updates and clarifications

Running code

- cocoa-02 has been implemented for Californium
  - Except for a parameter of the aging mechanism
    - Applied when large RTO is not updated after 1 minute
  - Optional congestion control “layer”
  - Unconstrained platform
    - Remote endpoints identified at the highest granularity: IP address and port number
- Note: Californium is publicly available
  - The cocoa-02 implementation for Californium will also be available soon (August/September)

Experiments and results (1/4)

- PC
  - Running multiple instances of Californium client
    - cocoa-02

- ETH Zürich Flocklab multihop testbed
  - 30 Tmote Sky motes
  - Full Contiki OS 6LoWPAN stack
    - Erbium CoAP implementation
      - Without CoCoA
    - Two different link layer mechanisms
      - ContikiMAC
      - Null RDC

Experiments and results (2/4)

- Throughput (req/s)
  - 1-to-1 scenario:

	No RDC	ContikiMAC
Default CoAP	0.67	0.56
CoCoA	1.18	0.89

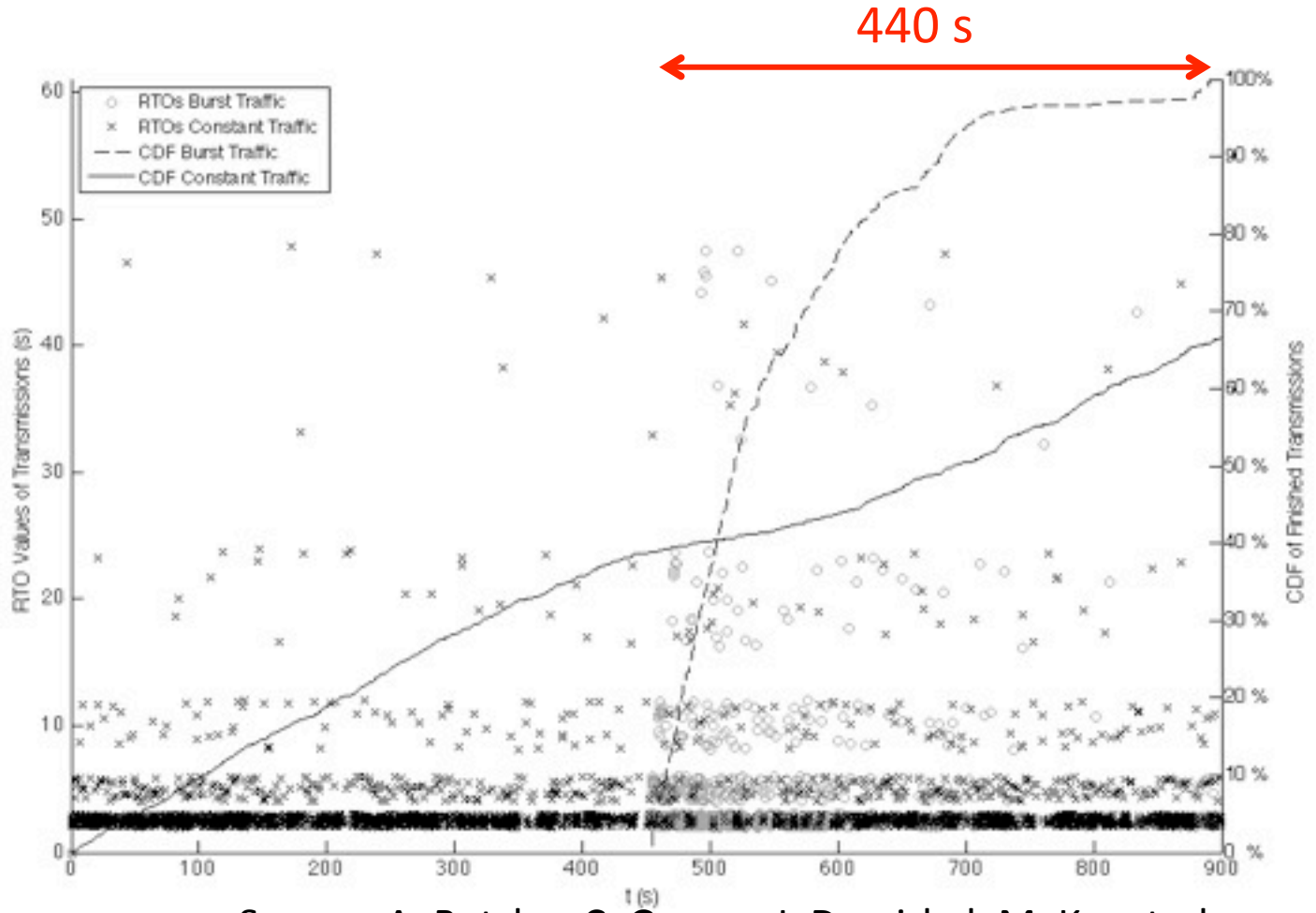
  - many-to-many scenario:
    - Note: many ϵ [25, 30]

	No RDC	ContikiMAC
Default CoAP	4.23	1.60
CoCoA	5.34	1.79

Source: A. Betzler, C. Gomez, I. Demirkol, M. Kovatsch, "Congestion Control for CoAP cloud services", SOCNE 2014.

Experiments and results (3/4)

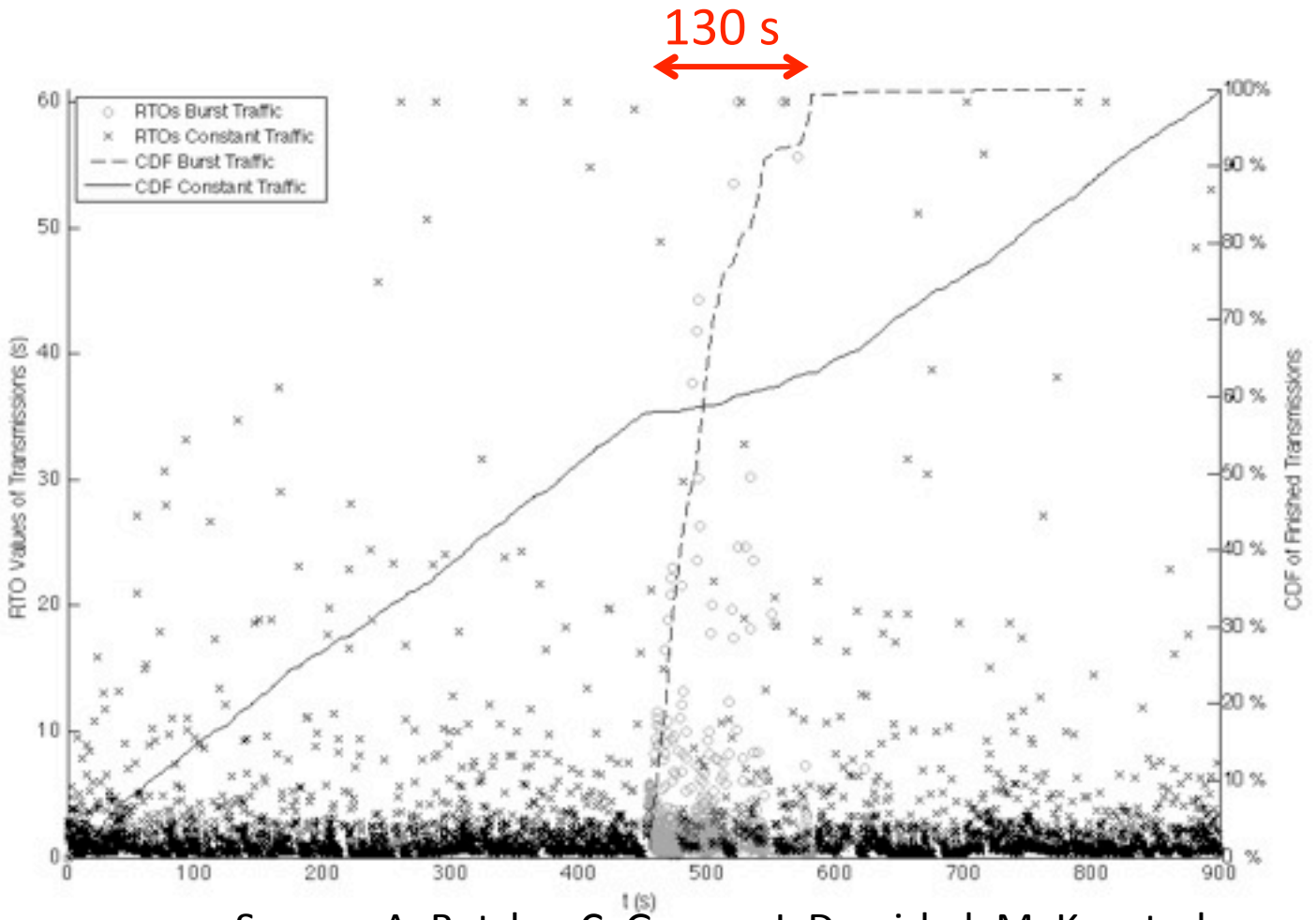
- Burst traffic scenario: default CoAP



Source: A. Betzler, C. Gomez, I. Demirkol, M. Kovatsch, "Congestion Control for CoAP cloud services", SOCNE 2014.

Experiments and results (4/4)

- Burst traffic scenario: CoCoA



Source: A. Betzler, C. Gomez, I. Demirkol, M. Kovatsch, "Congestion Control for CoAP cloud services", SOCNE 2014.

GPRS scenario: preliminary results

Conclusions

- CoCoA is becoming stable
  - Different types of evaluations
    - Simulation of 802.15.4 networks
    - Experiments in an 802.15.4 testbed
    - (Preliminary) experiments in a GPRS scenario
  - Running code
    - Implemented for Californium
    - Implemented for Zolertia Z1 (Cooja evaluations)

Call to Action

- Please experiment with Californium+cocoa-02
  - We'll announce availability on the list
- Please implement cocoa-02
- Please provide feedback before IETF91

Questions from the agenda

- Is this getting close to being useful?
- Should we continue to work on this?
- When do we want to adopt this?

Milestones (from WG charter page)

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

Document submissions to IESG:

- **Done** CoAP protocol specification with mapping to HTTP Rest API to IESG
- **Oct 2013** Blockwise transfers in CoAP to IESG
- **Done** Observing Resources in CoAP to IESG
- **Done** Group Communication for CoAP to IESG
- **Jan 2014** BP for HTTP-CoAP Mapping Impl to IESG
- **Jan 2014** CoRE Link Collections in JSON to IESG
- **May 2014** CoRE Interfaces to IESG
- **Dec 2099** HOLD (date TBD) Constrained security bootstrapping specification to IESG

RFC 7252

~~draft-ietf-core-coap-18~~

- Was approved 2013-07-11
- Waited some more for AUTH48 until 2014-06-26
- draft-mcgrew-tls-aes-ccm-ecc
  - Defines the DTLS ciphersuites for RPK and Cert mode: TLS_ECDHE_ECDSA_WITH_AES_128_CCM_8
  - (alongside with TLS_PSK_WITH_AES_128_CCM_8 for PSK mode, RFC 6655)
  - IESG state “Approved-announcement to be sent::Point Raised – writeup needed”
- draft-ietf-tls-oob-pubkey (in queue since 2014-02-06)
  - Defines RPK for DTLS
  - IESG state “Waiting for Writeup” (post IETF last call)

Submitted to IESG

- **draft-ietf-core-observe-14 (2014-07-20) for Standards-Track (Proposed Standard)**
- **draft-ietf-core-groupcomm-20 (2014-07-21) for Informational**

WG documents

- draft-ietf-core-block — 2nd WGLC passed
  - waiting for revision
- draft-ietf-core-http-mapping

- draft-ietf-core-links-json
  - done, but waiting for more implementation experience
- draft-ietf-core-resource-directory
  - charter work needed, to resume activity!
- draft-ietf-core-interfaces
  - to resume activity!

Related Work Reports

Quiet Period for IoT Plugtests

- Next: **ETSI-M2M** Plugtest
  - Testing the HTTP binding, though
- Where?
  - SOPHIA ANTIPOLIS, FRANCE
- When?
  - 10–12 SEPTEMBER 2014
- How Much?
  - Free!
- Tests:
  - ETSI-M2M Devices, DA, GSCL, NSCL, NA…

Agenda Bashing

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Group 1: WG docs

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-block-15

- editorial update from -14
  - -14 was plugtested in London and seemed to work well
- WGLC 2014-07-04..-18
  - #368 (editorial)
- Older ticket #367 (Content-Format mismatch)
  - clearly, abort transfer on mismatch
  - similarly, could add more text for slide 25–27 of IETF88 slides
- Is this done now?

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Guidelines for HTTP-CoAP Mapping Implementations

Angelo Castellani, Salvatore Loreto, Akbar Rahman, Thomas Fossati, Esko Dijk

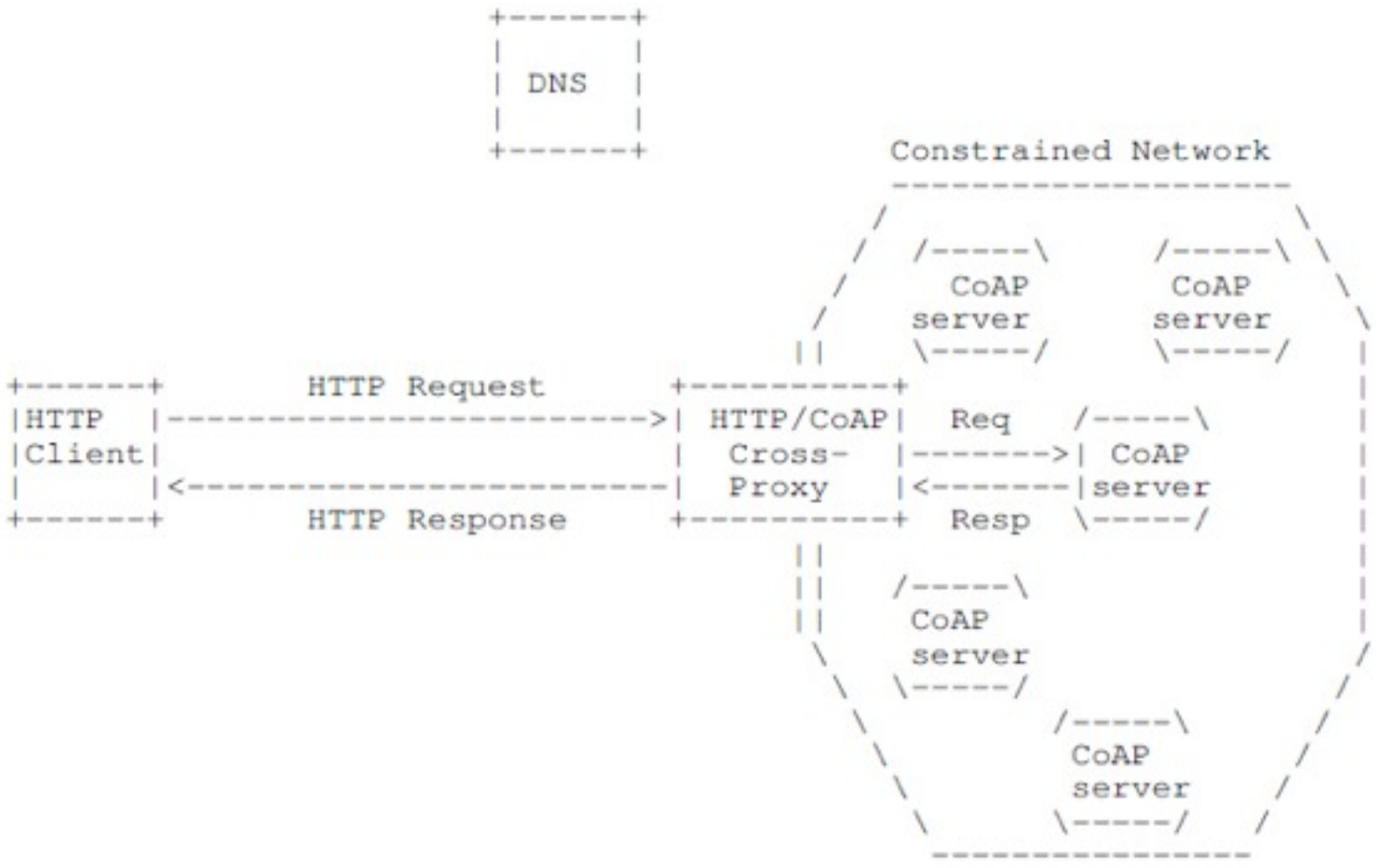
IETF-90, July 2014

http://tools.ietf.org/html/draft-ietf-core-http-mapping-04

Main Changes (from IETF-89 London)

- Changes from ietf-03 to ietf-04:
  - Expanded use case descriptions in Section 4
  - Fixed/enhanced discovery examples in Section 5.4.1
  - Addressed Ticket #365 (Media-type conversion by HTTP- CoAP proxy) in new:
    - Section 6.3.1 (Generalized media-type mapping)
    - Section 6.3.2 (Content translation)
  - Updated HTTPBis WG draft references to recently published RFC numbers
  - Various editorial improvements

Reverse Cross-Protocol Proxy Deployment Scenario



Reminder: Focus of I-D is reverse HTTP-CoAP (HC) Cross Proxy

Closed Ticket #365 (1/4)

- Ticket #365 (Media-type conversion by HTTP-CoAP proxy)
  - Need to specify that media-type conversion is needed in HC proxy
  - Conversion between the CoAP Content Format and HTTP media type is needed, in both directions

Closed Ticket #365 (2/4)

- Overview (Section 6.3)
  - A HC Proxy translates HTTP media types [RFC7231] and content encodings [RFC7231] into CoAP content formats (Section 12.3 of [RFC7252])
  - Media type translation can happen in:
    - GET, PUT or POST requests going from HTTP to CoAP,
    - and in 2.xx (i.e. successful) responses going from CoAP to HTTP
  - Specifically:
    - PUT and POST need to map the Content- Type and Content-Encoding HTTP headers into a CoAP Content-Format option,
    - whereas GET needs to map Accept and Accept-Encoding HTTP headers into a CoAP Accept option.
    - On the way back, the CoAP Content-Format option is renormalised into a suitable HTTP Content- Type and Content-Encoding combination

Closed Ticket #365 (3/4)

- Generalized media-type mapping (Section 6.3.1)
  - Is needed whenever one of the **many** HTTP media-types do not exist in the **short** CoAP Content-Format table
  - Prefer loosing some information about the content instead of returning a failure (i.e. "*415 Unsupported media-type" for POST/PUT response*)
  - Table 2 defines the default lookup table for the "loose" media-type mapping.
  - Given an input media-type, the table returns its best generalised media-type using longest prefix match
  - OPTIONAL feature - Implementations supporting this mapping SHOULD provide a flexible way to define the set of media-type generalisations allowed

Internet media-type	Generalised media-type
application/*+xml	application/xml
application/*+json	application/json
text/xml	application/xml
text/*	text/plain
/	application/octet-stream

Table 2: Media type generalisation

Closed Ticket #365 (4/4)

- Media-type mapping algorithm (Section 6.3.2)
  - This section defines the algorithm used to map an Internet media type to its correspondent CoAP Content-Format.

```
INPUT:  C-T and C-E
OUTPUT: C-F or Fail

1.  if no C-T: return Fail
2.  C-F = MAP[C-T, C-E]
3.  if C-F is not None: return C-F
4.  if C-E is not "identity":
5.    if C-E is supported (e.g. gzip):
6.      decode the representation accordingly
7.      set C-E to "identity"
8.    else:
9.      return Fail
10. repeat steps 2. and 3.
11. if C-T allows a non-lossy transformation into \
12.    one of the supported C-F:
13.      transcode the representation accordingly
14.      return C-F
15. if GMAP is defined:
16.   C-F = GMAP[C-T]
17.   if C-F is not None: return C-F
18. return Fail
```

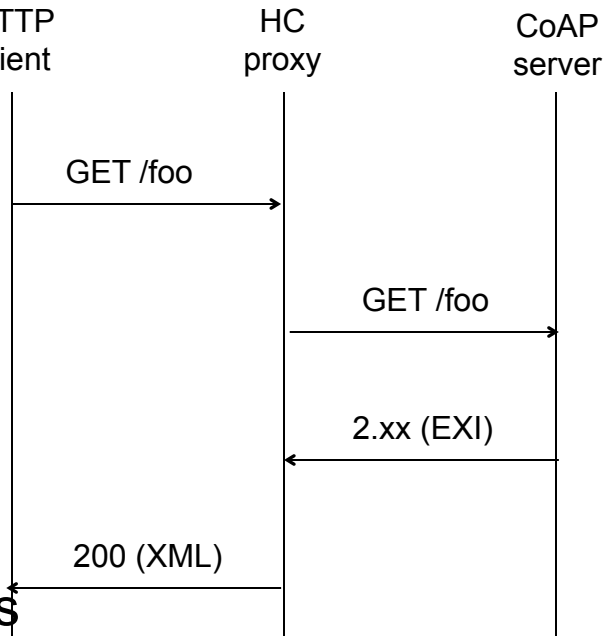
Figure 2

Where:

- C-T, C-E, and C-F stand for the values of the Content-Type (or Accept), Content-Encoding (or Accept-Encoding) HTTP headers, and Content-Format CoAP option respectively.
- If C-E is not given it is assumed to be "identity".
- MAP is the mandatory lookup table, GMAP is the optional generalised table.

Content translation (Section 6.3.3)

- Some content formats specifically target constrained environments
  - Various web formats have their binary counterpart
  - e.g.: XML / EXI, JSON / CBOR
- Binary formats (EXI/CBOR) right now have still a low adoption rate on the “unconstrained “ web
  - Human-readable protocols/formats are preferred HTTP/XML/JSON
- Cross-proxy MAY translate these formats to its well-known, well-supported counterpart (preferably through external modules).
  - Access control and black-listing/white-listing rules SHOULD be provided together with this feature



<u>This is an OPTIONAL feature, HC proxy MUST be specifically configured to this kind of translations</u>

Last Open Ticket #366 (Mapping of Link Format payloads to be valid in HTTP domain)

- If a HTTP client retrieves a CoRE Link Format document via an HC proxy, the relative URI references may not be valid anymore.
- Example HTTP request to HC proxy:
  - GET http://hcproxy.example.com/hc/coap://mysensor.example.com/.well-known/core
- Example Link Format resource /.well-known/core retrieved by the HC proxy:
  - </sensors/temp>;rt="temperature-c";if="sensor"
- Which indicates a relative path on the CoAP server. While, to be fully correct, it should perhaps read:
  - <coap://mysensor.example.com/sensors/temp>;rt="temperature-c";if="sensor"
- That means the HC Proxy would need to modify the payload before returning it to the HTTP client. See for background: http://tools.ietf.org/html/rfc6690#section-2.2
- Is this desirable? Or should the HC proxy not change any payloads retrieved.
  Are there other content formats that need to be adapted in a similar way?

Flextime

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- 17:33–17:53 CoAP-MQ
- 17:53–18:15 other new work
- 18:15–18:30 Flextime

Thursday

- 17:30–17:33 Intro
- 17:33–17:53 Wednesday * 2 / 3
- 17:53–18:13 CoAP-MQ
- 18:13–18:28 other new work
- 18:28–18:30 Flextime

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draft-ietf-core-links-json-00.txt

- RFC 6690 (link-format) documents are somewhat foreign to many web app developers
  - would prefer to have them in JSON format
- There is no standard way to represent link-format documents in applications
  - but everyone knows how to handle JSON

➔ Define a standard JSON translation for link-format

```
</sensors>;ct=40;title="Sensor Index",
</sensors/temp>;rt="temperature-c";if="sensor",
</sensors/light>;rt="light-lux";if="sensor",
<http://www.example.com/sensors/t123>
  ;anchor="/sensors/temp";rel="describedby",
</t>;anchor="/sensors/temp";rel="alternate"
```

➔

```
[{"href":"/sensors","ct":"40","title":"Sensor Index"},
  {"href":"/sensors/temp","rt":"temperature-c","if":"sensor"},
  {"href":"/sensors/light","rt":"light-lux","if":"sensor"},
  {"href":"http://www.example.com/sensors/t123",
   "anchor":"/sensors/temp","rel":"describedby"},
  {"href":"/t","anchor":"/sensors/temp","rel":"alternate"}]
```

Potential Issue: How to update

- Structure: Array of links
- RD update might
  - add links: trivial
  - change links: replace on href as key?
  - remove links (how to indicate this?)
- draft-ietf-appsawg-json-merge-patch was defined to solve problems like this
  - but does not fit: only can update object (map), not array
- restructure links-json as an object (map)?
  - are hrefs really unique in real-life link sets???

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CoRE Resource Directory

draft-ietf-core-resource-directory-02 (in progress)

Z. Shelby, C. Bormann

CoRE WG, IETF-90 Toronto

Open issues in progress

- #369 – Semantic catalogue use case addition
- #370 – Integrate the DNS-SD mapping
  - Together with Kerry Lynn
- #371 – DDoS security consideration
- #372 – Example section with use cases
  - Help from the WG welcome
- #373 – Fix the registration update interface

Registration update interface

When are we done?

1. Close the current set of tickets in -02
2. Do one more editing round for -03
3. Get 1-2 expert reviews, at least one from OMA
4. Oh yes, add this to our charter ☺

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comi: draft-vanderstok-core-comi-04

- The draft seems to be maturing
- This would be great functionality to have
- Needs more coordination with coman/opsawg
  - BTW, please help review coman drafts!
- Where do we go from here?

- Hallway-Meeting Fri 0900–1200, Room TBA

alt-trans

- Increasing implementer pull for CoAP-over-TCP and CoAP-over-websockets
  - draft-bormann-core-coap-tcp-01
  - draft-savolainen-core-coap-websockets-02
- CoAP-over-SMS is in LWM2M, but somewhat underspecified
  - expired: draft-becker-core-coap-sms-gprs-04
- URI issues seem to settle
  - draft-silverajan-core-coap-alternative-transports-06
- Tackle this package now?

Wednesday

All times are in time-warped EDT

- **15:20–15:23 Intro I**
- **15:23–15:43 CoAP Congestion Control (CG)**
- **15:43–15:50 Intro II**
- **15:50–16:00 Block post WGLC (CB)**
- **16:00–16:15 HTTP mapping (SL)**
- **16:15–16:20 Links-JSON (chairs)**
- **16:20–16:25 Core-Interfaces (chairs)**
- **16:25–16:30 Resource Directory (chairs)**
- **16:30–16:35 comi, alt trans (chairs)**
- **16:35–16:45 No-Response (AB)**
- **16:45–16:50 Flextime**

TATA CONSULTANCY SERVICES
Experience certainty.

The No-Response option for CoAP

draft-tcs-coap-no-response-option-06

CoRE WG meeting @ IETF 90

Abhijan Bhattacharyya, Soma Bandyopadhyay, Arpan Pal
TCS Innovation Labs

From meeting #89, London

- Gained good interest
- Received traction from multicast
- One technically important comment received
  - How to handle token reuse

Major updates in draft in a nutshell

- Added a new section on token reuse (section 5.2 in the new draft)
  - Discussed in detail later
- Modified the section 3 (exemplary application scenario) to make it more compact
  - Incorporated an example of sending actuation commands through multicast with No-response
- Applicability to request methods is modified (Ref. Table 2)
  - GET request for cancellation of observe (‘observe’ with value ‘1’ – ‘deregister’)
    - Client may express disinterest in getting response from the server against a cancellation request
      - Only possible application along with GET identified so far
      - No-response with normal GET or GET with observe (start an observe session) request should have no effect of No-response, if present

Option properties for quick reference

Number	C	U	N	R	Name	Format	Length	Default
TBD		X	-		No-Response	uint	1	0

Option Properties

Value	Binary Representation	Description
0	00000000	Suppress all responses (same as empty value).
2	00000010	Allow 2.xx success responses.
8	00001000	Allow 4.xx client errors.
16	00010000	Allow 5.xx server errors.

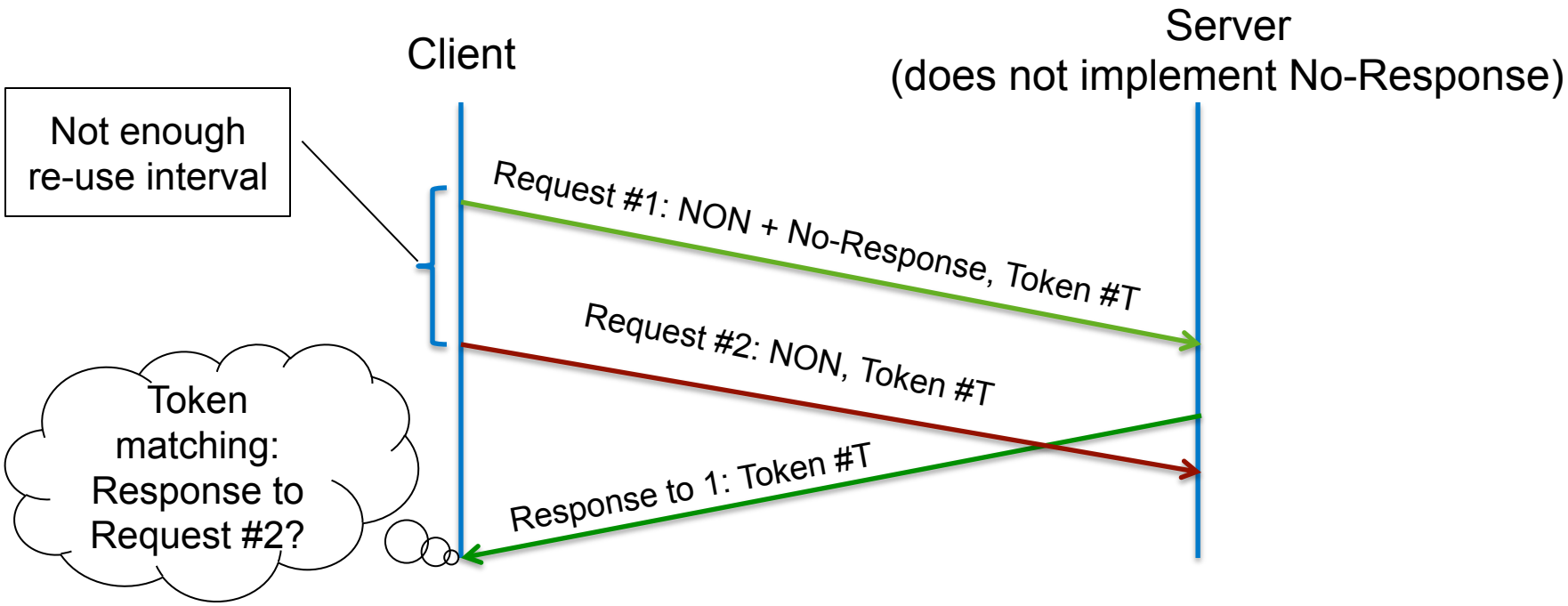
Option values

Token re-use : The problem

- Tokens provide a matching criteria between request and response
- Life of a token starts when it is assigned to a request and ends when the final matching response is received
  - Can be reused again
- NON request with No-Response has no response path – no token matching
  - Client has to decide a suitable time for retiring the token and reuse
- Problem is, the option is elective – server may not implement and actually send a response
  - Uncertainty about the server side response
    - True for granular suppression of response as well

Token re-use : The problem (contd.)

- Simple situation: Client is never going to care about any response coming back or about relating the response to the original request
  - MAY reuse the token value at liberty
- But what happens if we have something like this:



Token re-use: Solution approach

- Had quite a bit of discussion in the mailing list
- In most practical cases client should have an application specific ‘patience’ time till when it can re-use a token
  - Appendix-B.4.1 of draft-bormann-coap-misc defines ‘patience’ option which in effect puts a deadline to the server to respond back
  - However, ‘patience’ is not exposed to the protocol level at present
- A TOKEN_REUSE_TIME is defined similar to Section 2.5 of groupcomm draft

```
TOKEN_REUSE_TIME = NON_LIFETIME + MAX_SERVER_RESPONSE_DELAY + MAX_LATENCY
```

- Similar interpretation for multicast
- Unicast specific modifications:
  - MAX_SERVER_RESPONSE_DELAY : simply the expected maximum response delay from the server to which client sent the request
  - Includes ‘Leisure’ period (Section 8.2 of RFC 7252) but G = 1 for unicast.

Thank you

What next?

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Thursday

- 17:30–17:33 Intro
- 17:33–17:53 CoAP-MQ
- 17:53–18:15 other new work
- 18:15–18:30 Flextime

CoAP-MQ: Publish-Subscribe Extensions For CoAP

Extensions to enable a publish-subscribe interaction model between CoAP endpoints and CoAP services with asynchronous notifications and supporting sleeping and partially reachable endpoints

Use Cases and Design Overview

- Enable Publish-Subscribe model for interaction between CoAP endpoint and gateway or server
- Enable connection to a partially reachable endpoint, e.g. sleeping sensor or behind firewall
- Uses CoRE Resource Directory to register MQ endpoints
- Uses new core.mq server attribute and core.pubsub registration parameters
- Topics map to resource path
- CoAP-MQ Broker becomes the origin server
- Clear distinction between client and server endpoint roles

Documents Referred To In This Draft

- RFC 7252 (CoAP)
- CoRE Resource Directory
- Observing Resources in CoRE
- RFC 6690 (Core Link-Format)
- OMA LWM2M (queue mode)

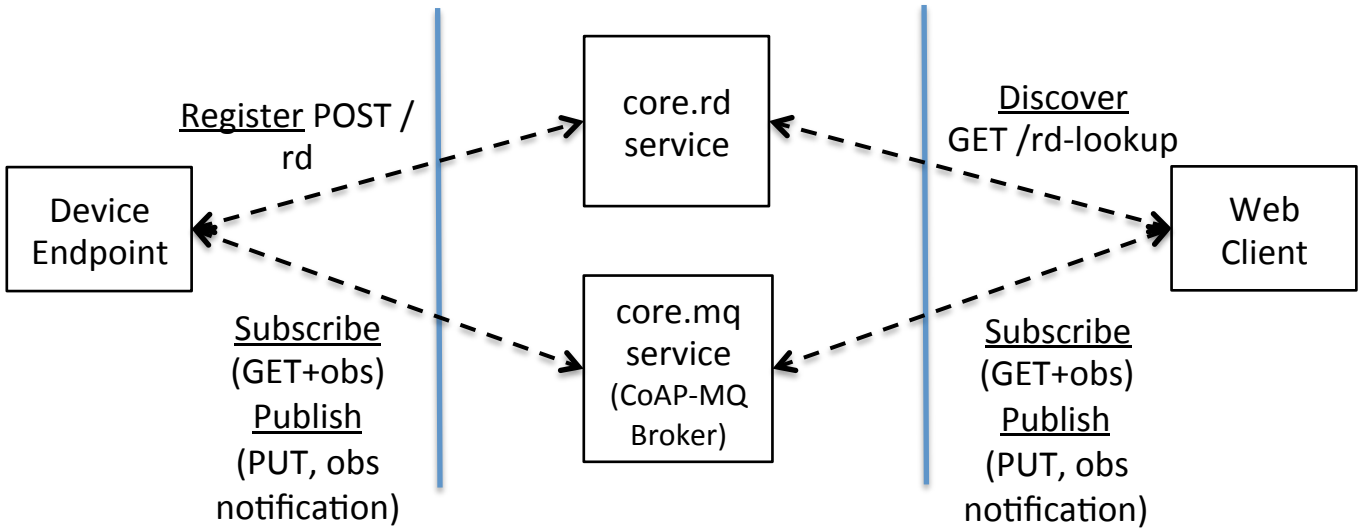
Terminology

- Topic – a string, similar to a path, that uniquely identifies an item or object being subscribed or published to
- CoAP-MQ Broker – A server node that stores information published to it, referenced by topic, and published said information to all subscribed entities
- Client role endpoint – an endpoint that is responsible for initiating all interactions, capable of sleeping
- Server role endpoint – an endpoint that listens for requests and responds to commands

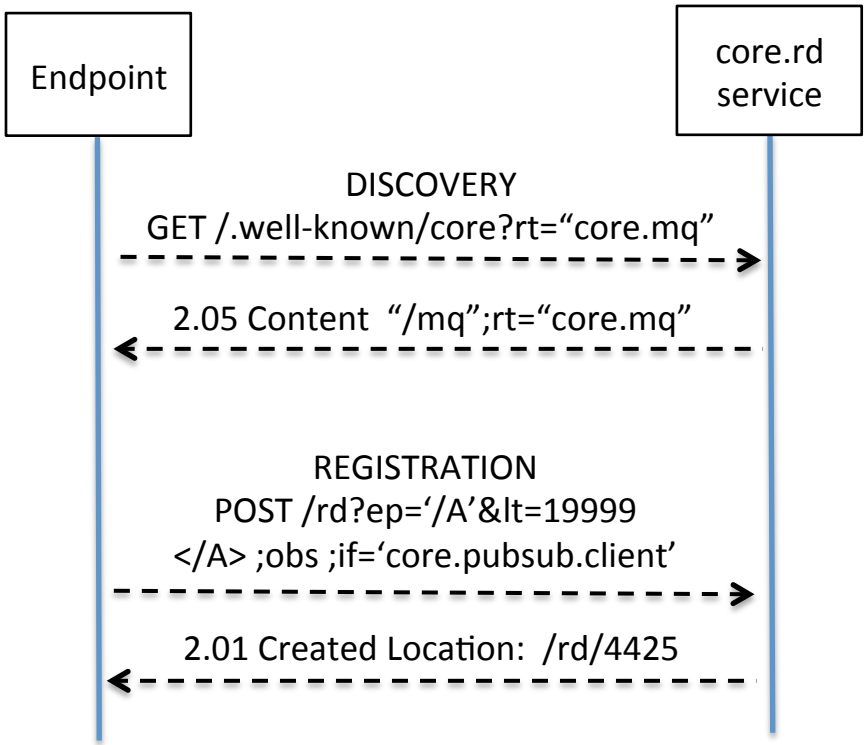
Identifiers and Attributes

- “core.mq” discoverable attribute of a service, indicates CoapMQ function set is supported
- “if=core.pubsub.client” indicates that interface to a resource is expected to support pubsub interaction model in a client role
- “if=core.pubsub.server” indicates that interface to a resource is expected to support pubsub interaction model in a server role
- “b=Q” LWM2M Transport Binding with Queue mode to support endpoint sleep/wakeup cycle with queueing

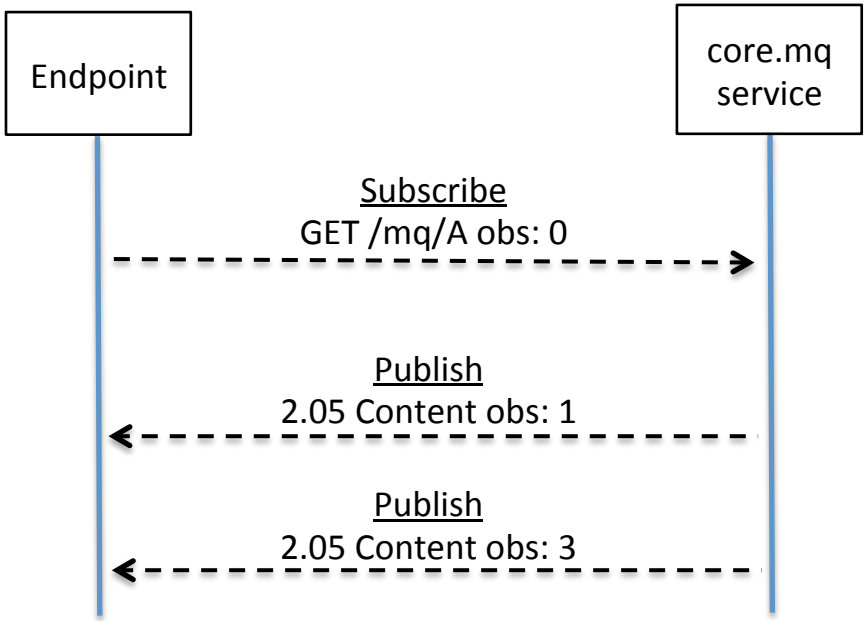
Architecture



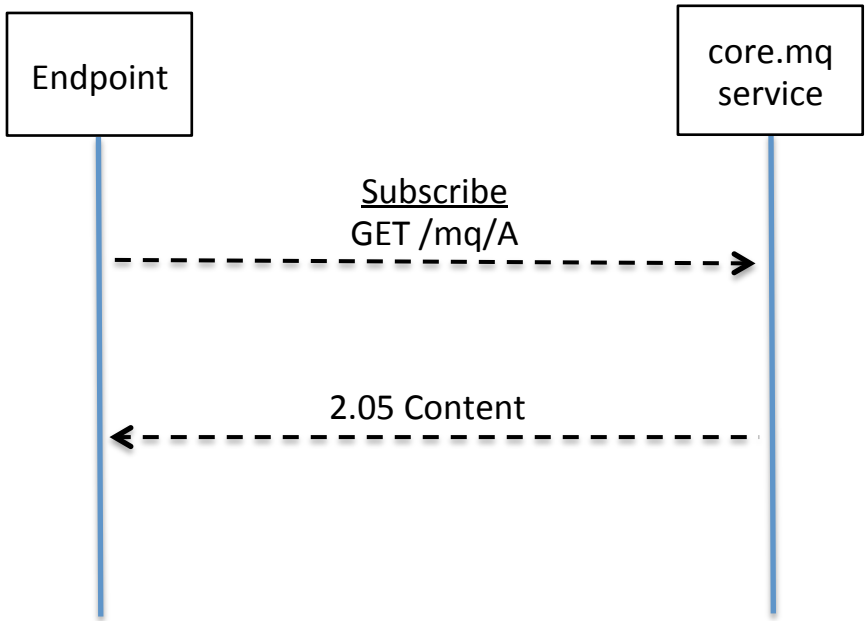
CoAP-MQ Broker Discovery and Registration Using Resource Directory Service



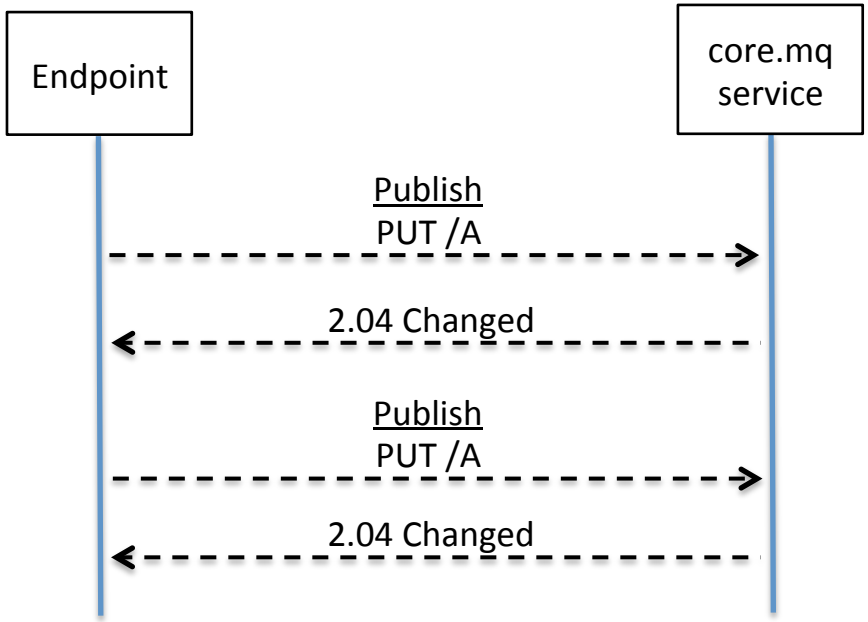
Client Endpoint Subscribes To CoAP-MQ Broker, CoAP-MQ Broker Publishes To EP



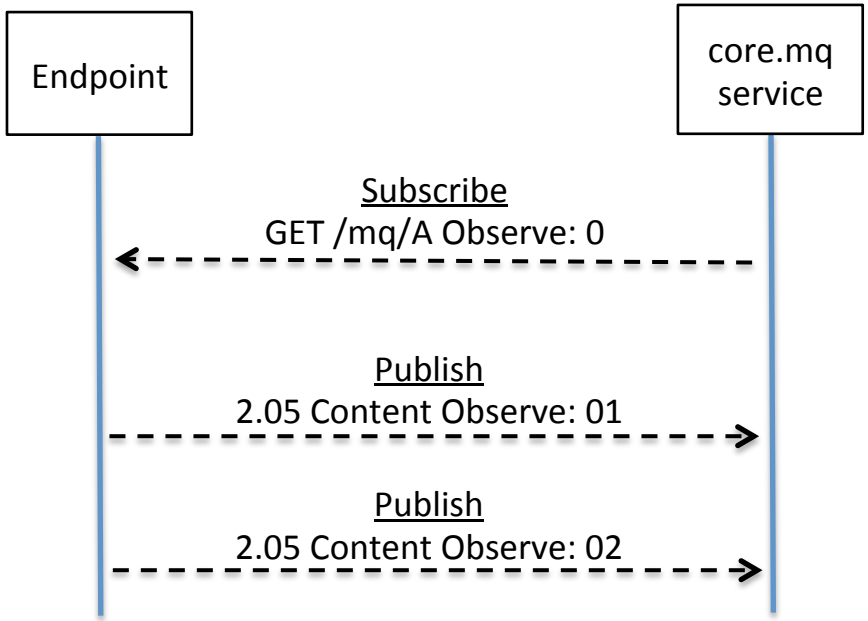
Client Endpoint Obtains Most Recent Representation of Topic Value: Like Retained



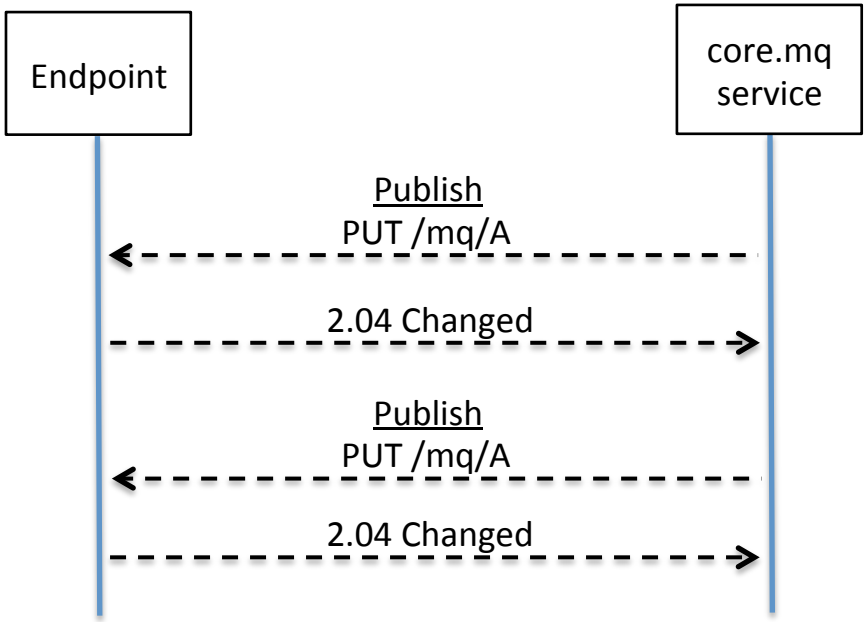
Client endpoint Publishes To CoAP-MQ Broker



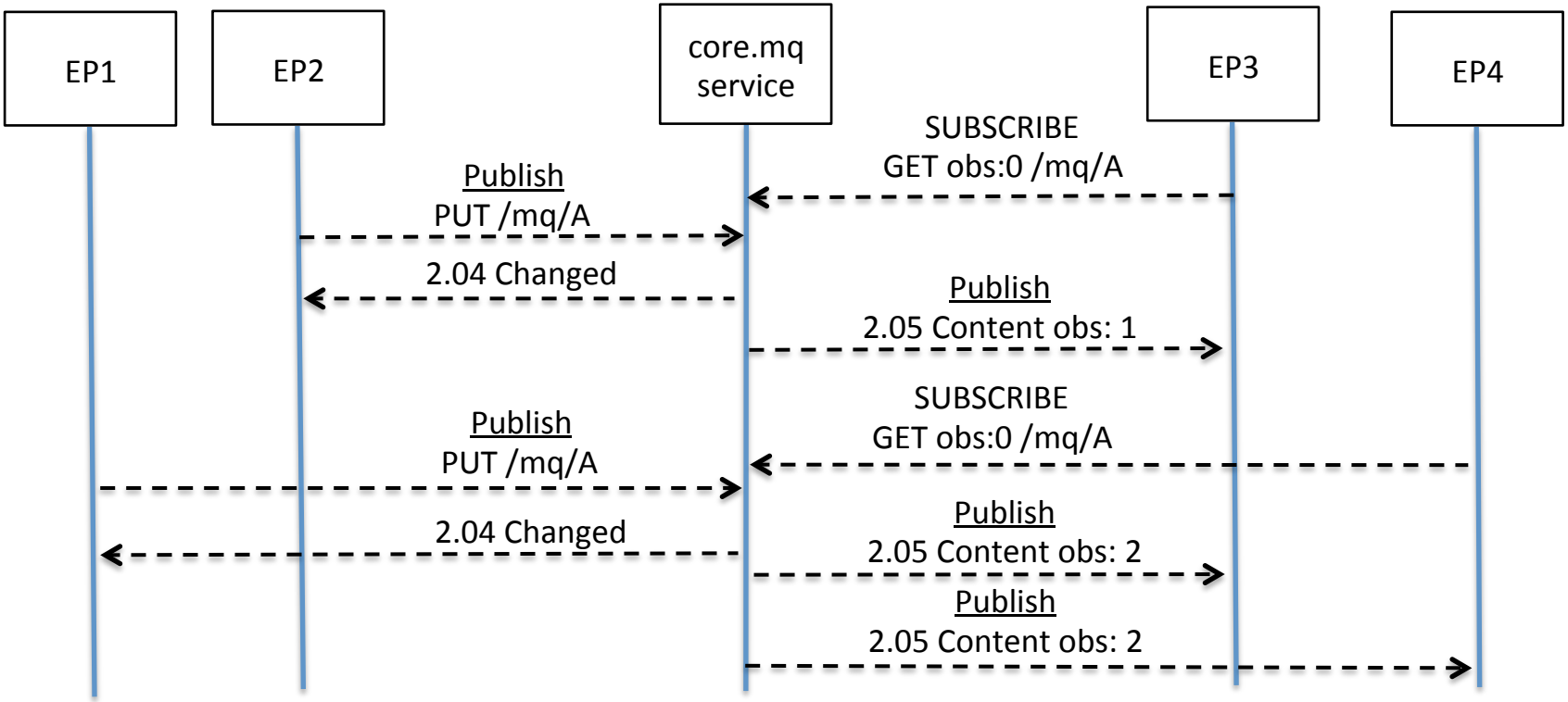
Server endpoint accepts subscriptions from CoAP-MQ broker



CoAP-MQ Broker Publishes to Server endpoint



Multiple Publishers and Subscribers(2)



Differences and Issues

- Topics are registered in addition to endpoints; need to use context parameter to point to topic location
- Nonexistent topic can not be subscribed to – does removal of last EP remove topic?
- Server role endpoints may only be single publishers
- Server EP subscribe mechanism is out of band, needs registration parameter or something
- How do endpoint roles interoperate on a topic?
- Rules for path construction and wildcards needed
- CoAP-MQ can act as a Pub-Sub to REST bridge

Thursday

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- 18:15–18:30 Flextime

“new work” (continued)

CoAP NodeId Option Extension

draft-li-core-coap-node-id-option-01 (***Kepeng Li***, Gengyu Wei)

draft-hong-core-coap-endpoint-unit-id-00 (Yong-Geun Hong,etc)

draft-kleine-core-coap-endpoint-id-00 (Oliver Kleine)

Motivation

- ✓The proposed “NodeId” option
  - ✓To identify the Node (Client or Server)
    - ✓ IP address is easily to be changed
    - ✓Useful to correlate request and response in case of IP address change
    - ✓Useful for alternative transport, e.g. SMS
    - ✓Useful for multicast and observe use cases
  - ✓To be used for authentication and authorization

NodeId Option

✓ Definition

Type	C	U	N	R	Name	Format	Length	Default
TBD	-	-	-	-	NodeId	string	1-255 B	(none)

Or

Type	C	U	N	R	Name	Format	Length	Default
124	E	U	-	-	ENDPOINT_ID_1	opaque	0-4 B	(none)
189	C	U	-	-	ENDPOINT_ID_2	opaque	0-4 B	(none)

Example Usage

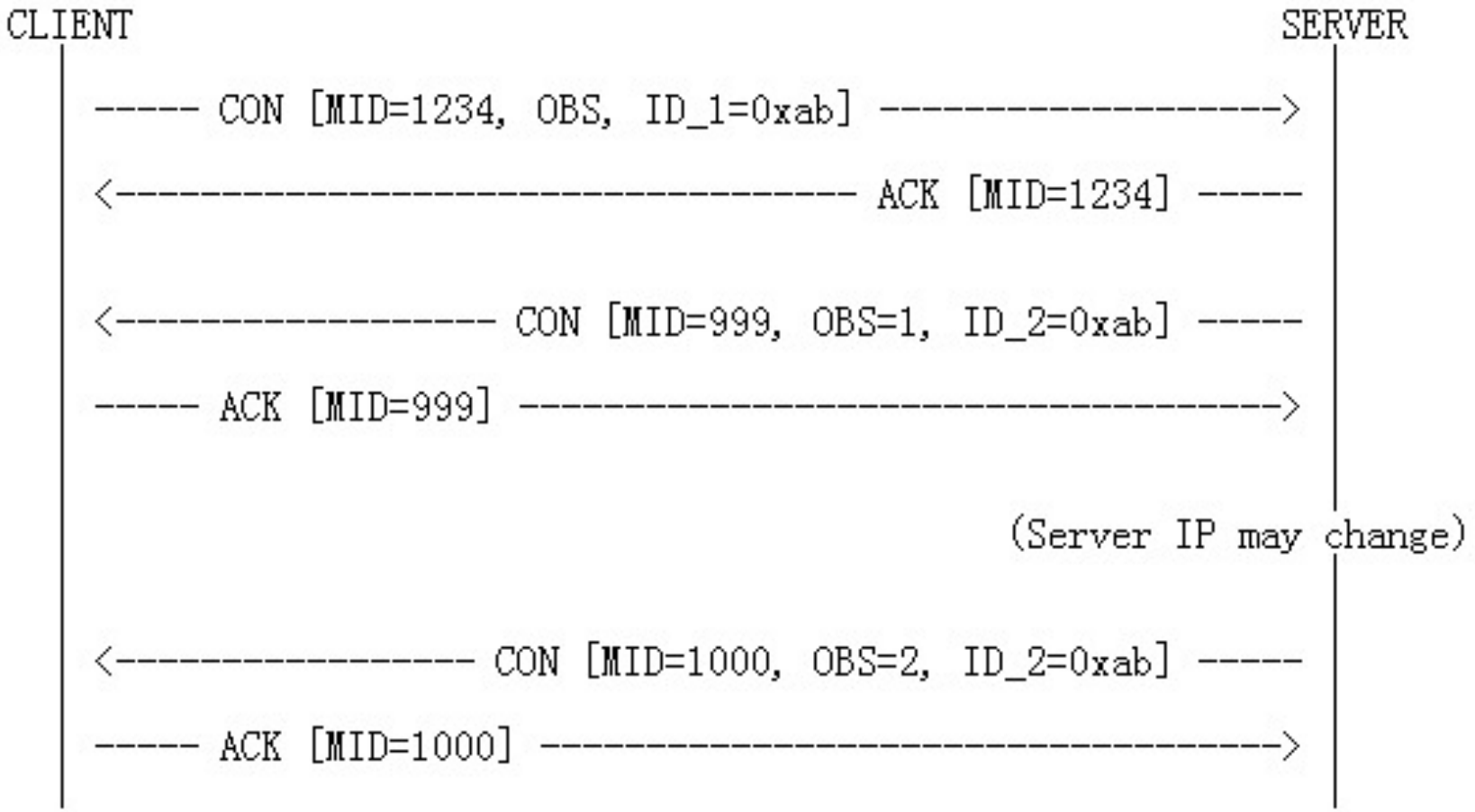


Figure 11: Server IP address changes during observation

Another Proposal: unit Id

- Usage: Identify resources.
- Benefit: Reduction in message transmission because it is shorter than Resource URI.

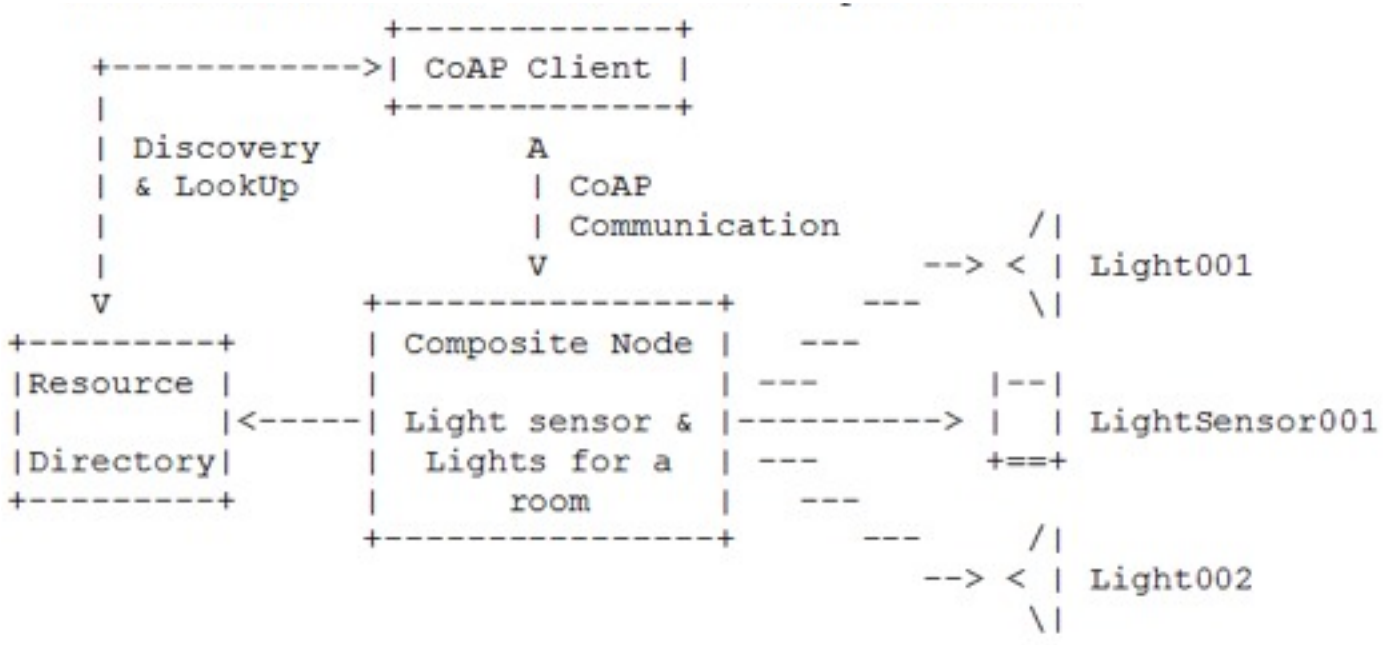


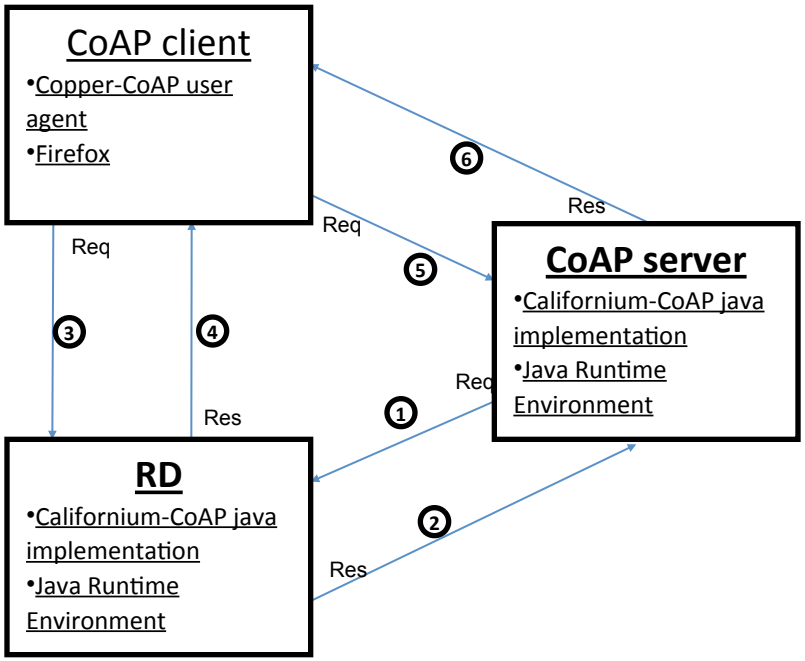
Figure 2: Multiple UnitID based composite CoAP node interaction use Case

Benefits of unit id

- Multiple resources can be uniquely identified by using just multiple unit IDs.
- Single CoAP message can be used to control multiple unit resources by using special characters in conjunction with multi-ID CoAP protocol.
- The reduction in message transmission results in reduced traffic and hence energy conservation in constrained resources.

Prototype Development Environment

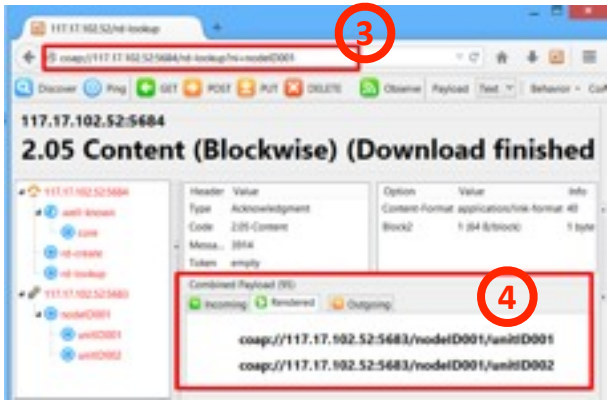
- Prototype development environment for CoAP endpoint unit identification

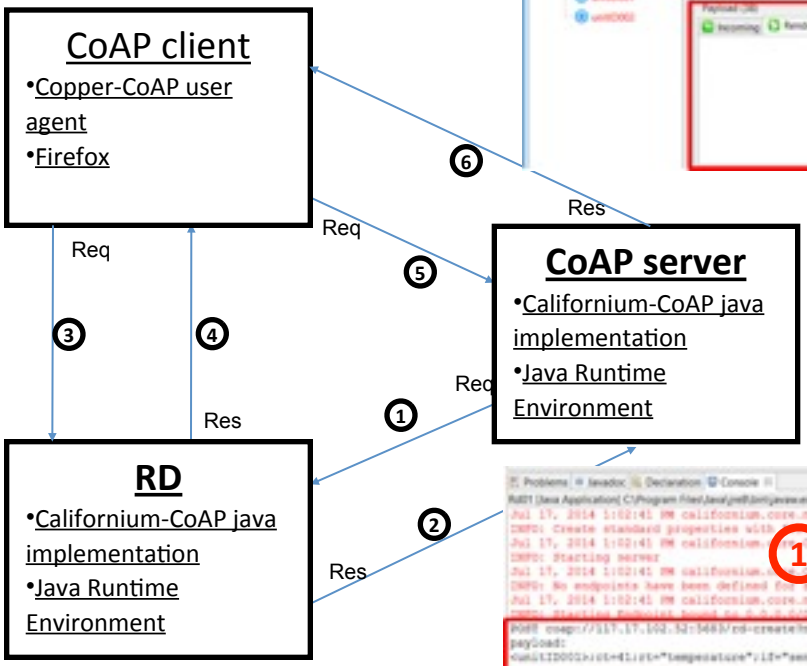


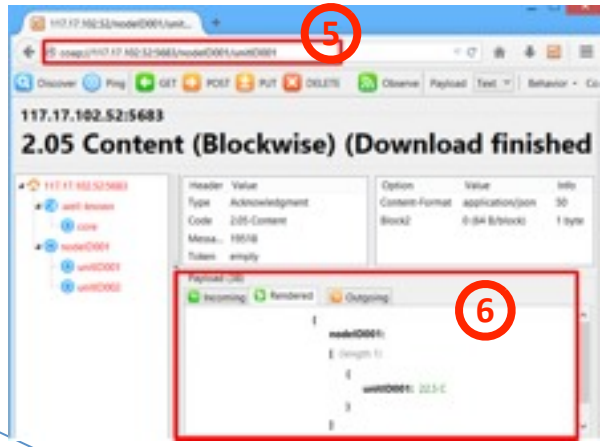
1. Req: POST coap://{rd-ip:port}/rd-create?ni=nodeID001
   Payload:
   <unitID001>;ct=41;rt="temperature";if="sensor",
   <unitID002>;ct=41;rt="luminance";if="sensor"
   ---
2. Res: 2.01 Created
   ==========
3. Req: GET coap://{rd-ip:port}/rd-lookup/ni=nodeID001
   ---
4. Res: 2.05 Content
   <coap://{node-ip:port}/nodeID001/unitID001>,
   <coap://{node-ip:port}/nodeID001/unitID002>
   ==========
5. Req: GET coap:// {node-ip:port}/nodeID001/unitID001
   ---
6. Res: 2.05 Content
   {nodeID001:[{"unitID001":"22.5 C"}]}
   ==========
5. Req: GET coap://{node-ip:port}/nodeID001?
   unitID001&unitID002
   ---
6. Res: 2.05 Content
   {"nodeID001":[{"unitID001":"22.5 C","unitID002":"1000 LUX"}]}
   ==========

Prototype Development Results

- Prototype development results for CoAP endpoint unit identification







Next Steps

- ✓ Socialize the idea with ACE WG about the usage in Authentication and Authorization
- ✓ Cover more usages in the draft, e.g. SMS transport
- ✓ Get implementation experience

CoAP Patience Option Extension

draft-li-core-coap-patience-option-04

Kepeng Li
Bert Greevenbosch
Esko Dijk
Salvatore Loreto

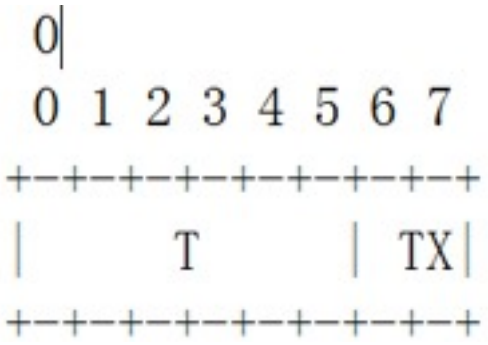
Motivation

- ✓Current “Leisure” defined in RFC7252
  - ✓The server SHOULD then pick a random point of time within the chosen leisure period to send back the unicast response to the multicast request.
- ✓The proposed “Patience” option
  - ✓In multicast case, the Patience option in a CoAP request can be used as an upper bound for the Leisure.
  - ✓In unicast case, used by a CoAP client to indicate the maximum time a requester is prepared to wait for a response.
  - ✓In observe case, the Patience Option MAY be used in a notification to indicate the maximum time an observer should wait before starting any observation relationship recovery.

Patience Option

✓ Definition

No.	C	U	N	R	Name	Format	Length	Default
28			x		Patience	see below	1 B	(none)



T = Time
TX = Time Exponent

Patience time = 2^(TX * 4 + 3) * T

Usage 1: in unicast request

- ✓Use case
  - Client sends a request to a server, but receives a response much later than expected. The response is discarded.
- ✓Proposal
  - Use Patience option to indicate the maximum time a requester is prepared to wait for a response.
- ✓Benefit
  - It can avoid that the recipient wastes resources by sending a response which already exceeds the set patience timeout.

Usage 2: in multicast request

- ✓Use case
  - ✓ Client sends multicast request to many servers, and receives many responses almost at the same time, which introduces congestion control issues.
- ✓Proposal
  - ✓Use Patience option in a request to indicate that the response SHOULD be replied with a dithered delay, i.e. a randomly chosen delay between 0 and the time indicated in the option.
- ✓Benefit
  - ✓Helps avoiding congestion i.e. multicast response storms in constrained networks.

Usage 3: in observe notification

- ✓Use case:
  - ✓ When the Max-Age of the observed resource state expires, client issues a new GET request to refresh observation relationship. This may introduce congestion issues.
- ✓Proposal:
  - ✓Server to use Patience option to indicate that, after the period of time in the Max-Age option has expired, a new notification will be sent within the time interval.
- ✓Benefit:
  - ✓Maintain a robust observation relationship; avoid network congestion issues.

Next Steps

- ✓ Remove multicast usage and observe usage?
  - ✓ Keep only one semantics for unicast usage
  - ✓ Make this option simpler
- ✓ Improve the algorithm to calculate the patience time

Thursday

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Flextime