New CoAP Block-Wise Transfer Options For Faster Transmission

draft-bosh-core-new-block-04

IETF CoRE Meeting, 28th July 2020

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Agenda

• Handling blocks in lossy environments: The DOTS Case

• The Solution
  – Block3 Option
  – Block4 Option

• Next Steps
Sample Target Deployment

- DDoS Open Threat Signalling (DOTS)
- Client requests mitigation (NON)
- Server updates with simple DOTS mitigation status (NON)
- Inbound Pipe Overload
  - Clients can still request mitigations
  - Mitigation should be able to control pipe overload
- See [RFC8782](https://tools.ietf.org/html/rfc8782) for more details
DOTS-inferred CoAP Requirements

• Need to transfer body with *multiple payloads*
• Handle packet loss
  – *Need recovery* mechanism
• Cannot rely on getting responses (*Pipe overload*)
  – Request/Response model lock-step fails
• **Fast** transfer for large bodies
  – Lock-step model slows things down (RTT)
  – Packet interchange reduction
• **Utilize** other CoAP options where possible
• **Maintain existing CoAP** ethos/methodology
Solution

- BLOCK3 with BLOCK1 characteristics
- BLOCK4 with BLOCK2 characteristics

<table>
<thead>
<tr>
<th>Number</th>
<th>C</th>
<th>U</th>
<th>N</th>
<th>R</th>
<th>Name</th>
<th>Format</th>
<th>Length</th>
<th>Default</th>
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<tbody>
<tr>
<td>TBA1</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>Block3</td>
<td>uint</td>
<td>0-3</td>
<td>(none)</td>
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<td>TBA2</td>
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<td>x</td>
<td>Block4</td>
<td>uint</td>
<td>0-3</td>
<td>(none)</td>
</tr>
</tbody>
</table>

- OSCORE Class E and Class U
BLOCK3

• BLOCK3 has BLOCK1 characteristics
• *Individual payload 2.xx response not required*
  – 2.31 (Continue) not used
• Use of NON (recommended) or increase of NSTART
• Requires CoAP Option Request-Tag unique per body
• Each request payload has unique Token
• New TBA3 4.xx (Missing Payloads) to indicate missing payloads

• Every MAX_PAYLOAD (default 10) pause/check guard (ACK_TIMEOUT or CON)
• Body subject to PROBING_RATE
Response TBA3 4.xx (Missing Payloads)

• CBOR encoded diagnostic response
• Content-Format
  “application/missing-blocks+cbor-seq”
• CDDL

TBA3-payload = (request-tag, missing-block-list)
; A copy of the opaque Request-Tag value
request-tag = bstr
missing-block-list = [1 * missing-block-number]
; A unique block number not received
missing-block-number = uint
BLOCK3 Example

CoAP CoAP
Client Server
| Success |
+----------+| NON PUT /path M:0x01 T:0xf0 RTag=10 B3:0/1/1024
+----------+| NON PUT /path M:0x02 T:0xf1 RTag=10 B3:1/1/1024
+----------+| NON PUT /path M:0x03 T:0xf2 RTag=10 B3:2/1/1024
+----------+| NON PUT /path M:0x04 T:0xf3 RTag=10 B3:3/0/1024
|<----------+ NON 2.04 M:0xf1 T:0xf3

| Failure |
+----------+| NON PUT /path M:0x05 T:0xe0 RTag=11 B3:0/1/1024
+-->X | NON PUT /path M:0x06 T:0xe1 RTag=11 B3:1/1/1024
+-->X | NON PUT /path M:0x07 T:0xe2 RTag=11 B3:2/1/1024
+----------+| NON PUT /path M:0x08 T:0xe3 RTag=11 B3:3/0/1024
| Retry |
|<----------+ NON TBA3 M:0xf2 T:0xe3 [Missing 1,2 for RTag=11]
+----------+| NON PUT /path M:0x09 T:0xe4 RTag=11 B3:1/1/1024
+-->X | NON PUT /path M:0x0a T:0xe5 RTag=11 B3:2/1/1024
| Retry |
|<----------+ NON TBA3 M:0xf3 T:0xe4 [Missing 2 for RTag=11]
+----------+| NON PUT /path M:0x0b T:0xe6 RTag=11 B3:2/1/1024
|<----------+ NON 2.04 M:0xf4 T:0xe6
BLOCK4

- BLOCK4 has BLOCK2 characteristics
- GET with BLOCK4 triggers BLOCK4 response instead of BLOCK2 if needed
  - Missing blocks indicated by GET with multiple BLOCK4
- Use of NON (recommended) or increase of NSTART
- Requires CoAP Option ETag unique per body
- Every MAX_PAYLOAD (default 10) pause/check guard (ACK_TIMEOUT or CON)
- Body subject to PROBING_RATE
BLOCK4 with Observe

• Same Observe value returned in all of the pseudo responses for the same body
  – Block Number 0 could get dropped
• Same Token is used in the set of pseudo responses
• New Token used for requesting missing blocks
  – Set of retry pseudo responses use new Token
• Next Observe pseudo response uses original Observe setup Token
 BLOCK4 Example 1

CoAP Client       CoAP Server
|                |              |
+----------------+------------------|
NON GET /path M:0x01 T:0xf0 O:0 B4:0/0/1024
NON 2.05 M:0xf1 T:0xf0 O:1234 ETag=21 B4:0/1/1024
NON 2.05 M:0xf2 T:0xf0 O:1234 ETag=21 B4:1/1/1024
NON 2.05 M:0xf3 T:0xf0 O:1234 ETag=21 B4:2/1/1024
NON 2.05 M:0xf4 T:0xf0 O:1234 ETag=21 B4:3/0/1024
...
[[Observe triggered]]
NON 2.05 M:0xf5 T:0xf0 O:1235 ETag=22 B4:0/1/1024
NON 2.05 M:0xf6 T:0xf0 O:1235 ETag=22 B4:1/1/1024
NON 2.05 M:0xf7 T:0xf0 O:1235 ETag=22 B4:2/1/1024
NON 2.05 M:0xf8 T:0xf0 O:1235 ETag=22 B4:3/0/1024
...
Block4 Example 2

CoAP  CoAP
Client  Server
|      |
...  ...
[[Observe triggered]]
|<--------+ NON 2.05 M:0xf9 T:0xf0 O:1236 ETag=23 B4:0/1/1024
|  X<----+ NON 2.05 M:0xfa T:0xf0 O:1236 ETag=23 B4:1/1/1024
|  X<----+ NON 2.05 M:0xfb T:0xf0 O:1236 ETag=23 B4:2/1/1024
|<--------+ NON 2.05 M:0xfc T:0xf0 O:1236 ETag=23 B4:3/0/1024
|      |
[[Client realizes blocks are missing and asks for the missing ones in one go]]
+-------->| NON GET /path M:0x02 T:0xf1 B4:1/0/1024 B4:2/0/1024
|  X<----+ NON 2.05 M:0xfd T:0xf1 ETag=23 B4:1/1/1024
|<--------+ NON 2.05 M:0xfe T:0xf1 ETag=23 B4:2/1/1024
|      |
[[Get the final missing block]]
+-------->| NON GET /path M:0x03 T:0xf2 B4:1/0/1024
|<--------+ NON 2.05 M:0xff T:0xf2 ETag=23 B4:1/1/1024
...
Status & Next Steps

• The draft was discussed in two dedicated interim meetings
  – All comments raised in these interims and also in the mailing list are addressed
  – Simplified design with reuse of existing CoAP options

• Request adoption as a WG Document

Thank You