CoAP in space

draft-gomez-core-coap-space-01

Intended Status: Informational

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Extended scope

- Updated abstract:
  - Spatial environments characterized by long delays and intermittent communication opportunities
    - Deep space
    - Some LEO satellite-based scenarios
- Terminology
  - Delay-tolerant (spatial) environments
  - Deep space mentioned as an example when suitable/possible

1. Introduction

- Non-Terrestrial Networks (NTN):
  - Sparse LEO satellite constellations that provide direct connectivity to IoT devices
  - Discontinuous coverage
  - IoT device needs to wait until visited by a satellite
  - Satellite needs to support Store & Forward (S&F)
    - Perhaps no immediate link with a ground station
    - Perhaps no second satellite available
  - Enables delay-tolerant communication

  - Note: extensions for S&F operation being standardized by 3GPP in Rel. 19 [TR23.700-29]

4. Caching

- RFC 7252: "CoAP endpoints MAY cache responses in order to reduce the response time and network bandwidth consumption on future, equivalent requests"
  - Suitable for delay-tolerant space scenarios
  - Needs to be adapted to the scenario, considering latency

- Cached response can be reused if “fresh”
  - Origin server determines when not fresh via Max-Age option
  - By default, Max-Age = 60 seconds
  - Maximum possible Max-Age value = $2^{32} – 1$ seconds (~136 years)
  - Delay-tolerant environments: if a response is intended to be cacheable, Max-Age needs to be set:
    - According to the expected latency from origin server to caching CoAP endpoint
    - If it makes sense that the response will still be fresh after such delay
  - If a response is not fresh, a CoAP endpoint will not store it

5. Observe

- RFC 7641:
  - If the time between the two last notifications received is greater than 128 seconds:
    - Then the last one received is also the latest sent by the server.
  - 128 seconds, chosen as greater than default MAX_LATENCY (100 seconds)

- In delay-tolerant environments (e.g., deep space), the duration needs to be chosen as a value greater than the MAX_LATENCY of the scenario

7. CoAP group communication

- A client sends multicast CoAP request messages over UDP/IP multicast as default transport
- Each server in the destination group sends a response message back to the client
  - A response can be suppressed
- [I-D.ietf-core-groupcomm-bis]:
  - Minimum time between reuse of Token values for different group requests, MIN_TOKEN_REUSE_TIME, to be greater than: MIN_TOKEN_REUSE_TIME = (NON_LIFETIME + MAX_LATENCY + MAX_SERVER_RESPONSE_DELAY)
  - Using the default CoAP parameters, Token reuse time > 250 seconds plus MAX_SERVER_RESPONSE_DELAY (250 seconds suggested)
- MIN_TOKEN_REUSE_TIME in delay-tolerant spacial scenarios:
  - Needs to be adjusted to the scenario

8. Security

- Group OSCORE protocol used to secure CoAP group communication [I-D.ietf-core-oscore-groupcomm]
  - Initial CoAP group communication spec [RFC 7390] assumed that CoAP over IP multicast was not secured

- Protection against replay attacks:
  - OSCORE uses by default an anti-replay sliding window, window size of 32 [RFC 8613]
  - If greater window size needed (e.g., due to high latency), it needs to be known by both sender and receiver at security context establishment

Thanks!
Questions? Comments?

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