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Publish Option for CoAP
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Abstract

This memo defines the Publish Option for the Constrained Application Protocol (CoAP).

The Publish Option is used by a sleepy node to temporarily delegate the authority of one of its resources to another, always on, node which is typically a proxy but doesn't need to be necessarily.

The sleepy node is given a simple RESTful messaging protocol that enables the setup, renew and removal of the authority transfer. The whole process is driven by the (sleepy) origin, which may actually never need to listen or to keep any state.

Status of this Memo

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1. Introduction

The proposal described in this memo covers the following use case: a node N, which is sleeping most of the time, depends one or more resources hosted at another sleepy node M. In cases as such, the probability of an empty intersection between their respective wake periods is very high, making it hard for the two to synchronize.

In this scenario, using the basic observe [I-D.ietf-core-observe] functionality is not enough, as it could lead to lost state updates in case N is offline while M pushes its notifications; further, the observation may never bootstrap since its initialization needs both client and origin awake at the same time.

This memo introduces an extension to the Proxy caching functionality that give the Proxy an explicit mediation role in the sleepy-to-sleepy CoAP [I-D.ietf-core-coap] communication.

1.1. Requirements Language and Motivation

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

This specification makes use of the following terminology:

Sleepy Device: a sensor/actuator (usually battery operated) that powers down its radio beyond the normal radio duty cycle in order to save energy.

and tries to provide an in-protocol solution for the requirement REQ3 stated in [I-D.shelby-core-coap-req]:

> The ability to deal with sleeping nodes. Devices may be powered down at any point in time but periodically "wake up" for brief periods of time.

2. Publish Option

No.	C/E	Name	Format	Length	Default
YY	Critical	Publish	uint	1 B	0x2

The Publish Option enables the sleepy origin to temporarily (i.e. for a specified "lease" time) delegate the authority of one of its hosted

resources to a Proxy node that will start to behave as the origin for the Publish'ed resource. This allows a sleepy sensor to use the Proxy as the rendezvous point for one-way sleepy to sleepy signaling.

2.1. Publishing a Resource

```
P         S
|   PUT   | Proxy-URI: coap://sleepy.example.org/res
|<--------+ Publish: 0110
|    r    | Content-Type: text/plain
|         | ETag: 0xabcd
|         | Max-Age: 1200
|         |
|  2.01   |
+-------->|
|         |
```

Figure 1

The origin server publishes one of its hosted resources, specified by the enclosed Proxy-URI, by PUT'ing it to the Proxy with a Publish Option attached. The Publish Option value specifies the CoAP methods that clients are allowed to use on the resource (see Section 2.4).

The example in Figure 1 shows a delegation where the GET and PUT methods are allowed while POST and DELETE are explicitly prohibited, meaning that the resource can be read and updated by clients, but it can't be deleted nor created.

The Proxy, which is voluntarily charged by the resource owner to act as the delegated origin for the "lease" time specified by Max-Age, replies with a 2.01 if the authority transfer has succeeded. An exact duplicate of the submitted representation is created, and from now on it can be accessed using the original URI provided that clients go through the delegated Proxy. If the Publish operation does not succeed, the origin transfer fails, and an appropriate response code is returned.

An ETag MAY be supplied as a metadata to be included in responses involving the Publish'ed representation. If no Max-Age is given, a default of 3600 seconds MUST be assumed. The Max-Age value, either implicit or explicit, determines the lifetime of the origin delegation. When the Max-Age value is elapsed, the Proxy MUST delete the Publish'ed resource value and fall back to its usual proxying function.

The Publish Option is critical and MUST be present in the request only. If the Proxy does not recognize it, a 4.02 (Bad Option) MUST

be returned to the client. If the option value is not correctly formatted (see Section 2.4), a 4.00 (Bad Request) MUST be returned to the client.

It is sufficient for any client wishing to access the resource to do so using the Proxy node that, following the Publish operation, will start behaving a the origin, satisfying requests on behalf of the sleeping node.

The Proxy MUST save the identity of the resource Publish'er in order to distinguish "maintainance" operations such as update and explicit deletion, from "regular" access to the published resource by clients.

An interesting outcome of this communication strategy is that the sleepy origin may really never need to listen on its radio interface.

2.2. Updating a Resource

```
   P         S
   |   PUT   | Proxy-URI: coap://sleepy.example.org/res
   |<--------+ Publish: 0110
   |    r    | Content-Type: text/plain
   |         | ETag: 0xdcba
   |         | Max-Age: 1200
   |         |
   |  2.04   |
   +-------->|
   |         |
```

Figure 2

In order to update the delegated resource state, the sleepy node shall send the very same request to the Proxy, which in turn replies with a 2.04 (Changed) status code in case the update operation has succeeded, or an appropriate error code in case it fails.

2.3. Unpublishing a Resource

```
   P          S
   |  DELETE  | Proxy-URI: coap://sleepy.example.org/res
   |<---------+ Publish: 0x0
   |          |
   |          |
   |   2.02   |
   +--------->|
   |          |
```

The delegation of a given resource can be explicitly revoked by the

real origin at any time before the lease time expires, by issuing a DELETE request to the Proxy hosting the resource duplicate with a Publish Option with value 0x0.

On successful deletion of the delegation a 2.02 (Deleted) response code is returned by the Proxy.

2.4. Value Format

```
0 1 2 3 4 5 6 7
+-+-+-+-+-+-+-+-+
|C R U D 0 0 0 0|
+-+-+-+-+-+-+-+-+
```

Each of the first 4 bits is a flag field indicating whether the associated CoAP method (respectively: POST, GET, PUT and DELETE) is allowed on the Publish'ed resource. The remaining 4 bits are unused and MUST be set to 0.

In case the value is missing, the default is assumed to be 0x2, i.e. the resource is read-only.

An all-0 value is used to explicitly revoke the delegation (see Section 2.3.)

If the delegated Proxy receives a request with a method that is not compatible with the supplied mask, it MUST respond with a 4.05 (Method Not Allowed) response code.

2.5. Discovery

2.5.1. Publishing the /.well-known/core Resource

The [I-D.ietf-core-link-format] has no explicit text about "well-known" discovery of devices through a Proxy, nor about the cacheability rules for such resource. Even if it seems reasonable to assume that the /.well-known/core URI is both query-able and cacheable through a Proxy, on the contrary the situation is not very much so.

In fact, since the "well-known" interface relies on the resource origin being implicitly defined by the source address of the UDP packet carrying the response, quering the "well-known" interface (either unicast or multicast) through a Proxy-URI has little hope to be fully functional. The (ab)use of a an implicit L3 locator as the identifier of the resource authority makes "well-known" discovery generally incompatible with Proxy mediated communication, unless each target URI in a link is given as a URI and not as a relative-ref

(section 4.1 of [RFC3986]).

Consequently, in this proposal we assume that the /.well-known/core of a sleepy node can be Publish'ed if and only if the target URI in the each link is not a relative-ref.

Its registration is the same as in Figure 1, but the Proxy MAY need to treat it in a way that is slightly different from other "normal" delegated resources. In fact, while delegation is in place (i.e. the lease period is not elapsed, and neither explicit revocation has happened) the Proxy MAY be able to respond to filtered queries (section 4.1 of [I-D.ietf-core-link-format]) regarding the Publish'ed /.well-known/core.

2.5.2. Resource Directory

Given the strong requirement on the link formatting given in Section 2.5.1, it could be preferable (or even necessary) to use the Resource Directory [I-D.shelby-core-resource-directory] as a means of delegating the discovery of the resources hosted at a sleepy node.

This can be done either by the sleepy node, or automatically by the delegated Proxy when a Publish request is received.

[[Automatic push to RD: check it out]]

3. Acknowledgements

Bruce Nordman and Matthieu Vial for discussing and giving advice on some of the ideas contained in this document.

4. IANA Considerations

The following entries are added to the CoAP Option Numbers registry:

Number	Name	Reference
2n+1	Publish	RFC XXXX

5. Security Considerations

Threat: cache poisoning.
Countermeasure: authenticate sender.

Threat: unauthorized de-registration
Countermeasure: authenticate requester.

Threat: Proxy resources' exhaustion.
Countermeasure: authenticate requester + quota limit.

Threat: global state loss.
Countermeasure: cache redundancy.

6. References

6.1. Normative References

[I-D.ietf-core-coap]
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6.2. Informative References

[I-D.shelby-core-coap-req]
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