Enabling secure network enrollment in RPL networks
draft-ietf-roll-enrollment-priority-04

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Status of Document

- Adopted March 2020
- Merged with draft-hushe-roll-dodag-metric after virtual interim meeting January 2021.
- Version -04 posted with merged document

version -04

This document describes an RPL DIO option that can be used to announce a minimum enrollment priority. Each potential _Join Proxy_ would this value as a base on which to add values relating to local conditions. As explained in [I-D.ietf-6tisch-enrollment-enhanced-beacon], higher values decrease the likelyhood of an unenrolled node sending enrollment traffic via this path.

This document describes a RPL DIO option that can be used to announce a minimum enrollment priority. The minimum priority expresses the (lack of) willingness by the RPL DODAG globally to accept new joins. It may derive from multiple constaining factors, e.g., the size of the DODAG, the occupancy of the bandwidth at the Root, the memory capacity at the DODAG Root, or an administrative decision.

Each potential _Join Proxy_ would this value as a base on which to add values relating to local conditions such as its Rank and number of pending joins, which would degrade even further the willingness to take more joins.

When a RPL domain is composed of multiple DODAGs, nodes at the edge of 2 DODAGs may not only join either DODAG but also move from one to the other in order to keep their relative sizes balanced. For this, the approximate knowledge of size of the DODAG is an essential metric. Depending on the network policy, the size of the DODAG may or may not affect the minimum enrollment priority. It would be limiting its value to enforce that one is proportional to the other. This is why the current size of the DODAG is advertised separately in the new option.

As explained in [I-D.ietf-6tisch-enrollment-enhanced-beacon], higher values decrease the likelyhood of an unenrolled node sending enrollment traffic via this path.
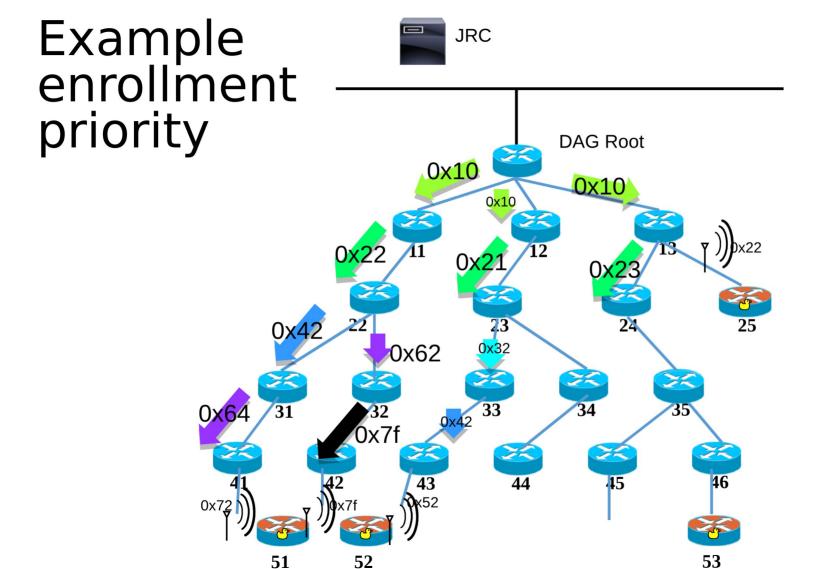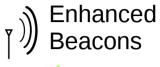
Version -04 changes 2

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announce a minimum enrollment priority. Each potential _Join Proxy_
would this value as a base on which to add values relating to local
conditions. As explained in

```
        0                   1                   2
        0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |   Type = TBD01|Opt Length = 1|R| min. priority  |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

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a minimum enrollment priority. The minimum priority expresses the
(lack of) willingness by the RPL DODAG globally to accept new joins.
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```
        0                   1                   2                   3
        0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |   Type        |Opt Length = 3 |   exp  |      DODAG_Size      |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |R| min priority|
       +-+-+-+-+-+-+-+-+
```

Type To be assigned by IANA
exp   a 4 bit unsigned integer, indicating the power of 2 that defines
      the unit of the DODAG Size, such that (unit=2^exp).

DODAG_Size a 12 bit unsigned integer, expressing the size of the
      DODAG in units that depend on the exp field. The size of the
      DODAG is computed as (DAG_Size*2^exp).

the new option.

As explained in [I-D.ietf-6tisch-enrollment-enhanced-beacon], higher
values decrease the likelihood of an unenrolled node sending
enrollment traffic via this path.

Questions?

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Example enrollment priority

JRC

DAG Root

Enhanced Beacons

DIOs

base diagram from PThubert

With impaired node (24)