Enhanced Beacon

Metrics and Values (version 2)

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https://www.sandelman.ca/SSW/ietf/meeting/ietf101/ietf101_6tisch_roll_beacon_info

Overview

- What's the problem?
- What's the 6tisch part?
- What's the ROLL part?
- What's the problem?
- Discussion and Questions.

Same slides for 6tisch and for ROLL, but different discussion!

What's the problem? Network Selection

- A (new!) device (pledge!) will not know which network it should enroll in.
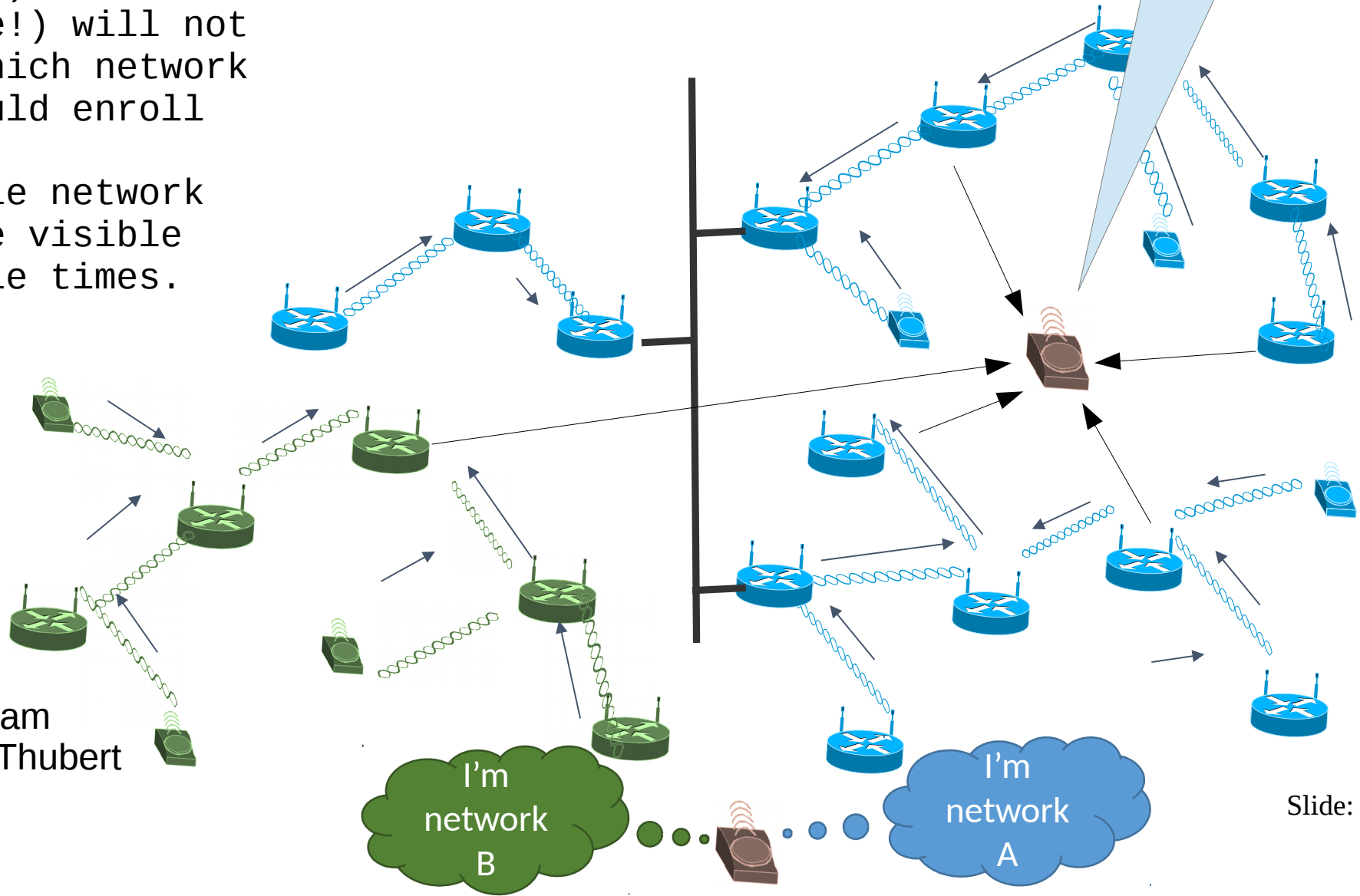- A single network will be visible multiple times.

Diagram
By P.Thubert

I'm network B

I'm network A

Are you my mummy?

Different meaning of Join

- getting the network keys/ credentials
  - ENROLLMENT

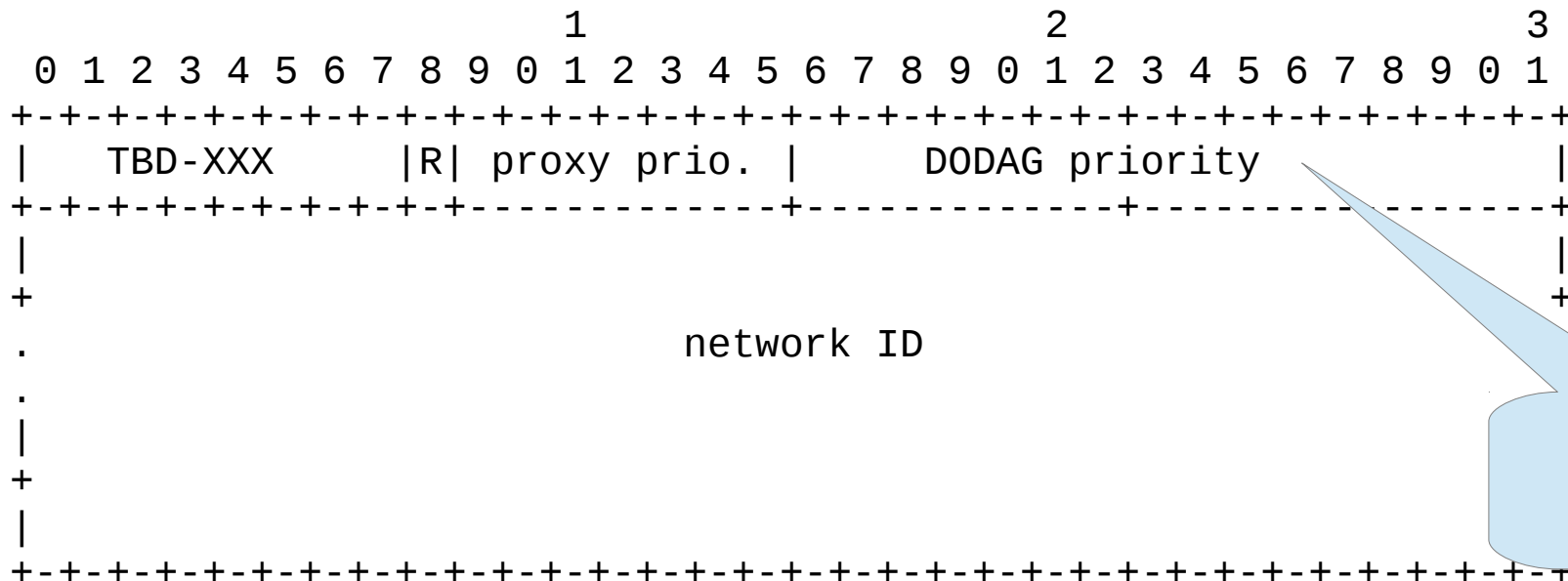- JOINing a DODAG
  - Parent Selection

Observations

- Clearly, Blue network and Green network are different.
- Blue Network may have three PANids, and therefore MUST have three different keys.
- Different PANids leads to different IPv6 derived addresses.

- In order to balance the load on the network, the ENROLLMENT decision must be informed by the network load.
- We prefer intelligent end nodes, so express some of the network information into Beacon.

What's the 6tisch part?

IEEE802.15.4 Informational Element encapsulation of 6tisch Join and Enrollment Information
draft-richardson-6tisch-enrollment-enhanced-beacon-00

Creates a new 802.15.4 **Informational Element**, using the IETF allocation in rfc8137

```
                      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
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |    TBD-XXX       |R| proxy prio. |      DODAG priority         |
 +-+-+-+-+-+-+-+-+-+-+------------+------------+-------------------+
 |                                                               |
 +                                                               +
 .                       network ID
 .
 |
 +
 |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Size of each
Part TBD

- R a flag to indicate device will answer unicast Router Solicitations
- Network ID is variable length nonce, probably derived from PIO.
- DODAG Priority: how desirable is this **network**
- Proxy prio: how desirable is this **proxy**
- Rank Priority: already part of another IE

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Different preferences

- Network ID
  - Shows which networks are the same

    (blue networks vs green networks)
- DODAG Preference ID (needs to be sent in DIO)
  - Less desirable as network gets more busy.
- Proxy Preference ID (calculated locally by Proxy)
  - Determines which proxy has more capacity.
- Join proxy rank
  - Tie breaker between different proxy, a local property.

What's the ROLL part?

Enabling secure network join in RPL networks
draft-richardson-6tisch-roll-enrollment-priority-02

Defines a new metric Option:

```
    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| dodag prefere  |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

   DODAG preference: a 7 bit field which provides a base value for the
      Enhanced Beacon Join priority. A value of 0x7f (127) disables the
      Join Proxy function entirely.
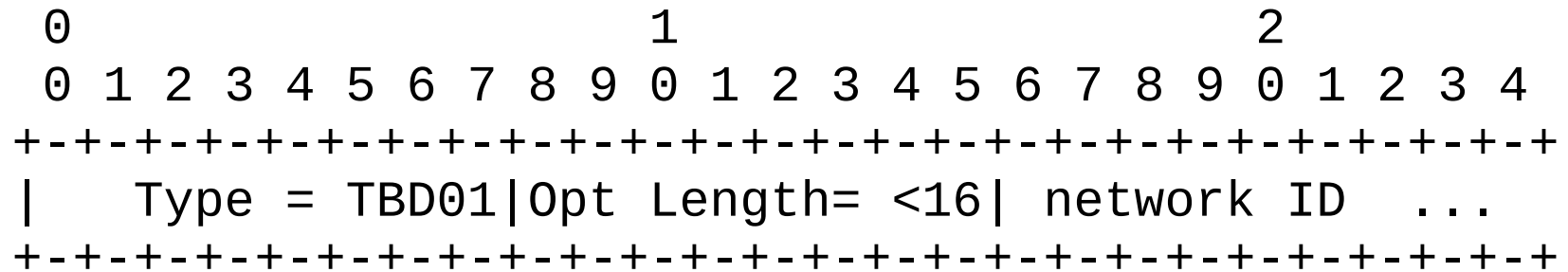
   R a reserved bit that SHOULD be set to 0 by senders, and MUST be
      ignored by receivers. The reserved bit SHOULD be copied to
      options created.

The Minimum Priority influences the Proxy Priority that is announced in the Enhanced Beacon. The local node will apply additional criteria (such as number of neighbor cache entries it can allocate for untrusted nodes).

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What's the ROLL part? (2)

```
Enabling secure network join in RPL networks
draft-richardson-6tisch-roll-enrollment-priority-02


Defines a new DIO configuration Option:


      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= <16| network ID  ...
     +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
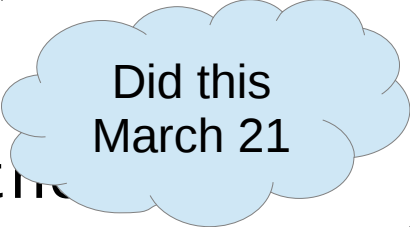
- Network ID: a 1 to 16 byte identifier which is set by the operator. Suggestion, is SHA256 hash of PIO, sent by DODAG root. Maybe created any other way.

Goals in 6tisch

Did this March 21

- Decide what set of things we want in the Enhanced Beacon.
  - Write this down somewhere, and ask ROLL to document how those numbers are derived, creating any new metrics or configuration containers needed.

- Document the security risk of exposure of these values.

ADOPT
richardson-6tisch-enrollment-enhanced-beacon

Goals in ROLL

- Determine how the newly exposed metrics interact with or are derived from DIO things.
  - A value in an enhanced beacon vs a value in a subsequent DIO.
- There are two additional things related to Enrollment Priority and also the Parent Selection:
  - Number of children
    - Multiple drafts about balancing children
      - Children require (privileged) neighbour cache entries.
      - Enrollment requires unprivileged neighbor cache entries
  - Availability of bandwidth for Enrollment
    - Turn off enrollment when there are issues.

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Questions/Discussion

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