IETF 110 ROLL - online

Routing over Low-Power And Lossy Networks

Chairs:
Dominique Barthel
Ines Robles

Secretary:
Michael Richardson
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BCP 25 (Working Group processes)
BCP 25 (Anti-Harassment Procedures)
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Source: https://www.ietf.org/about/note-well/
Meeting Materials

● Session: Thursday, 11th March 2021 - 14:30-15:30 UTC

● Remote Participation
  ○ Meetecho: https://meetings.conf.meetecho.com/ietf110/?group=roll&short=&item=1
  ○ CodiMD: https://codimd.ietf.org/notes-ietf-110-roll
  ○ Material: https://datatracker.ietf.org/meeting/110/session/roll
  ○ Jabber: xmpp:roll@jabber.ietf.org?join
  ○ Minute takers: Please volunteer, thank you :)

Please volunteer, thank you :)

Please volunteer, thank you :)
<table>
<thead>
<tr>
<th>Time</th>
<th>Duration</th>
<th>Draft/Topic</th>
<th>Presenter</th>
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<tr>
<td>14:30 - 14:38</td>
<td>8 min</td>
<td>WG Status</td>
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<tr>
<td>14:38 - 14:53</td>
<td>15 min</td>
<td>draft-ietf-roll-dao-projection</td>
<td>Pascal</td>
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<td>14:53 - 15:13</td>
<td>20 min</td>
<td>RFC6550bis status</td>
<td>Michael</td>
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<td>15:13 - 15:21</td>
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<td>draft-ietf-roll-enrollment-priority</td>
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<td>draft-ietf-roll-mopex</td>
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<td></td>
<td></td>
<td>draft-ietf-roll-capabilities</td>
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<tr>
<td>15:29 - 15:30</td>
<td>As time</td>
<td>Open Floor</td>
<td>Everyone</td>
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# State of Active Internet-Drafts

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<tr>
<td>draft-ietf-roll-efficient-npdao-18</td>
<td>RFC Ed Queue</td>
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<tr>
<td>draft-ietf-roll-turnon-rfc8138-18</td>
<td>RFC Ed Queue</td>
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<tr>
<td>draft-ietf-roll-unaware-leaves-30</td>
<td>RFC Ed Queue</td>
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<tr>
<td>draft-ietf-roll-useofrplinfo-44</td>
<td>RFC Ed Queue</td>
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<tr>
<td>draft-ietf-roll-capabilities-07</td>
<td>Discussion Today</td>
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<td>draft-ietf-roll-dao-projection-16</td>
<td>Discussion Today</td>
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<tr>
<td>draft-ietf-roll-enrollment-priority-04</td>
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<tr>
<td>draft-ietf-roll-mopex-02</td>
<td>Discussion Today</td>
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<tr>
<td>draft-ietf-roll-nsa-extension-10</td>
<td>Submitted to the IESG for publication</td>
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<tr>
<td>draft-ietf-roll-aodv-rpl-09</td>
<td>AD Evaluation::Revised I-D Needed</td>
</tr>
<tr>
<td>draft-ietf-roll-dis-modifications-01</td>
<td>Stand By</td>
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<tr>
<td>draft-ietf-roll-rpl-observations-05</td>
<td>Work in progress</td>
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- **2 IPRs**
- **1 IPR**
- **2 IPRs**
## Related Internet-Drafts

<table>
<thead>
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<tr>
<td>draft-jadhav-roll-storing-rootack-02</td>
<td>Call for adoption issued Jan 26th</td>
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<tr>
<td>draft-thubert-roll-eliding-dio-information</td>
<td>Expired - To be Continued later -</td>
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<td>Draft</td>
<td>Status</td>
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<tr>
<td>Draft-ietf-roll-mpl-yang-02 (Expired)</td>
<td>To be continued</td>
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<tr>
<td>Draft-ietf-roll-bier-ccast-01 (Expired)</td>
<td>To be continued</td>
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State of inactive Internet-Drafts
# Done Milestones

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<tbody>
<tr>
<td><strong>Done</strong></td>
<td>Initial submission to the IESG of mechanism to turn on RFC8138 compression feature within a RPL network</td>
</tr>
<tr>
<td></td>
<td>draft-ietf-roll-turnon-rfc8138</td>
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<tr>
<td><strong>Done</strong></td>
<td>Initial submission of routing for RPL Leaves draft to the IESG</td>
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<tr>
<td></td>
<td>draft-ietf-roll-unaware-leaves</td>
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<tr>
<td><strong>Done</strong></td>
<td>Initial submission of a reactive P2P route discovery mechanism based on AODV-RPL protocol to the IESG</td>
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<td>draft-ietf-roll-aodv-rpl</td>
</tr>
<tr>
<td><strong>Done</strong></td>
<td>Initial Submission of a proposal with uses cases for RPI, RH3 and IPv6-in-IPv6 encapsulation to the IESG</td>
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<tr>
<td></td>
<td>draft-ietf-roll-useofrplinfo</td>
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<td><strong>Done</strong></td>
<td>Initial submission of a solution to the problems due to the use of No-Path DAO Messages to the IESG</td>
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<td>Date</td>
<td>Milestone</td>
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<tr>
<td>Jun 2020</td>
<td>Initial submission of a proposal for Source-Route Multicast for RPL to the IESG</td>
</tr>
<tr>
<td>Jun 2020</td>
<td>Initial submission of a proposal to augment DIS flags and options to the IESG</td>
</tr>
<tr>
<td>Jul 2020</td>
<td>Initial submission of a root initiated routing state in RPL to the IESG</td>
</tr>
<tr>
<td>Jul 2020</td>
<td>Initial submission of a YANG model for MPL to the IESG</td>
</tr>
<tr>
<td>Mar 2020</td>
<td>Initial submission of Common Ancestor Objective Functions and Parent Set DAG Metric Container Extension to the IESG</td>
</tr>
<tr>
<td>Jun 2020</td>
<td>Initial submission of Enabling secure network enrollment in RPL networks draft to the IESG</td>
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<tr>
<td>Dec 2020</td>
<td>Initial submission of Mode of Operation extension and Capabilities for RPL to the IESG</td>
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<tr>
<td>Oct 2021</td>
<td>Recharter WG or close</td>
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Tickets

- [https://trac.ietf.org/trac/roll/report/2](https://trac.ietf.org/trac/roll/report/2)
  - aodv-rpl (#199, #200), dao-projection (#179, #180), RPLv2 (#187, #188)

- [https://github.com/roll-wg/xxx/issues](https://github.com/roll-wg/xxx/issues)
  - rpl-observations (4)
  - dao-projections (5)
  - efficient-route-invalidation (1)
  - Capabilities (6)
Root initiated routing state in RPL

draft-ietf-roll-dao-projection

P. Thubert, Ed.; R.A. Jadhav, M. Gillmore
Status to the draft

• Published -15 and -16 since last IETF
• Non-Storing Mode SRH may be loose
• Main DODAG MUST be Non-Storing Mode
• Track <=> Non-Storing Mode main DODAG:
  • Root is Track Ingress,
  • Signaled by one or more Non-Storing-Mode P-DAO messages
  • Track Ingress encapsulates external packets (as in useofrplinfo)
  • Track Ingress places the SRH in the packet in source routed tracks
  • There cannot be non-storing segments (only Tracks within Tracks)
• Storing Mode P-DAO signals Segment of a Track or of main DODAG
  • Does not need re-encapsulation
  • Unless implicit Track => Do we support that?
Status to the draft (cont)

• RPI modified to indicate P-Route
• Extending RFC 6553 and RFC 8138

```
+---------------+---------------+---------------+
|              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
```

• New P-RPI-6LoRH, both elective and non-elective forms
P-DAO construction

• RPL Target Options can be factorized
• But there is one and only one VIO (SF-VIO or SR-VIO)
• So the Ack management is easier
• VIO sent to egress; SR-VIO sent to ingress
• Track ID is a RPL local instance ID
• Taken from the Track Egress Name Space
Encapsulation and signaling

• Several Profiles to simplify implementations
• All with the same model based on
  • non-storing mode for the loose tracks: segment routing
  • Storing mode to signal the segments that fill the loose hops
• Tracks are local instances
• useofrplinfo applies for encapsulation of external targets
Encapsulaton Details

• Source of outer header MUST be Track Ingress - think DODAG Root
• RPL Instance ID in RPI MUST indicate TrackID (if not main DODAG)
• SR-VIO: Loose from Track Ingress, excluded, to Egress, included
  • Copied Verbatim in inserted SRH-6LoRH,
  • Requires encapsulation (can be recursive)
• SF-VIO: Strict from Segment Ingress to Egress, both included
  • No Encapsulation if Source and RPI both match Segment definition
  • A Segment is an Implicit Track if P-DAO Ingress == 1st SF-VIO entry
• TBD: matching rules, Flow Info option, when to tunnel?
Profile 1:
Compress SRH in main DODAG with strict SM Segments

- **Ingress=Root**
  - TrackID=0
  - SF-VIO =A, B
  - Target =B, C

- **Ingress=Root**
  - TrackID=0
  - SF-VIO =C, D, E
  - Target = E

- **Loose hop 1** = A
  - SRC=Root
  - TrackID=0
  - Loose SRH = A, C, E, F

- **Loose hop 2** = C
  - Loose hop 2 = C

- **Loose hop 3** = E
  - Loose hop 3 = E

- **Dest** = F

- **Segment 1**

- **Segment 2**

- **ACK 2**

- **P-DAO 1**

- **P-DAO 2**

- **2 ways of saying roughly the same thing**

- **Should hops in SF-VIO be implicit targets?**
Profile 2: Compress SRH in main DODAG with Strict NSM Tracks

- **Ingress=A**
  - TrackID=(A, 129)
  - SR-VIO = B
  - Target = C

- **Ingress=C**
  - TrackID=(C, 131)
  - SR-VIO = D, E
  - Target =

**Main DODAG**

- **Root**

**Loose hop 1 = A**

**Track 2**

**Loose hop 2 = C**

**Track 1**

**Loose hop 3 = E**

**Dest = F**

**Ingress=A**

- TrackID=(A, 129)
- SR-VIO = B
- Target = C

**Ingress=C**

- TrackID=(C, 131)
- SR-VIO = D, E
- Target =

- 2 ways of saying roughly the same thing
- Last hop (Egress) in SR-VIO is implicit target
Profile 3: Implicit Track with Strict SM Segments,

- The track is Implicit
- Can we inject packets along?

Need Sibling Information

External node S

Ingress=A
TrackID=129
SF-VIO = A,B,C,D,E
Target = E,F

Segment 1

Src=S, Dst=F
RPI = 0

SRC=A
TrackID=129

Dest = E

Dest = F

Src=S, Dst=F
Profile 4: Strict NSM Explicit Track

- The track is Explicit
- Same encap as profile 2
Profile 5: Compress SRH in Track with Strict SM Segments

- Ingress=A
  - TrackID=(A, 129)
  - SR-VIO =C, E
  - Target = F

- Ingress=A
  - TrackID=(A, 129)
  - SF-VIO =A, B
  - Target =B, C

- Ingress=A
  - TrackID=(A, 129)
  - SF-VIO =C, D, E
  - Target = E

• Same as Profile 1, but for Track

Need Sibling Information
Profile 6: Compress SRH in Track with NSM Tracks (Recursive?)

- **External node S**
  - Ingress=A
  - Track ID = (A, 141)
  - SR-VIO = C, E
  - Target = F

- **Loose hop 1 = A**
  - Dest = B
  - Src = A, RPI = 129

- **Loose hop 2 = C**
  - SRH = E
  - Src = A, RPI = 141

- **Track 2**
  - **Track 1**
    - **Ingress=C**
      - Track ID = (C, 131)
      - SR-VIO = D, E
      - Target =

- **Dest = C**
  - **Dest = E**
    - **Dest = F**

- **Ingress=A**
  - Track ID = (A, 129)
  - SR-VIO = B
  - Target = C

- **Dest = F**
  - **Dest = E**
    - **Dest = F**

- **Tunnel within Tunnel**
Topography awareness

• Initially out of scope
• Now we have non storing mode + Sibling info option
  • Acronym conflict with RPL’s Solicited Information Option
• Needed for profiles >= 3
• Which sibling to advertise is still out of scope
  • Separate draft?
Huimin’s comments / suggestions

- Lifetime unit: ReqLifetime, Track lifetime, and Segment Lifetime are defined as 8 bits. And their lifetime Unit is obtained from the DODAG configuration option. It will lead to inflexibility as all tracks in the PAN use the same lifetime unit. We propose to define lifetime unit separately for each track (for example adding a 2-bit flag to indicate second, minute, hour, day). Details can be discussed later.

- Now the TrackID has the same meaning as Local RplInstanceID. How does a node judge whether the received message is a P-DAO message or Local RPL instance DAO message? Is it possible to define a flag in the P-DAO message?

- The P-DAO track/segment is single-directional. I suggest to add the possibility for creating bi-directional segments/tracks. We can add a flag in the PDR message to indicate the requested track is single-directional or bi-directional.

- I suggest to add a flow of message exchanges for “PDR, PDR-ACK, P-DAO, P-DAO ACK” in the draft.
Other to be done

• Loop avoidance

• Who sends PDR? If it was destination, then it could select the trackID from its name space

• ND (RFC 8505) to maintain sibling neighbor state

• Be very specific if Ingress and Egress are listed in VIOs
  • Ingress to indicate which source address to use
  • Egress to build the full SRH 6LoRH
RFC6550bis

Michael Richardson
RFC6550bis

This repository aims to collect the topics to be covered in RPLv2/RFC6550bis

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Controlling Secure Network Enrollment in RPL Networks

draft-ietf-roll-enrollment-priority-04

Rahul Arvind Jadhav <rahul.ietf@gmail.com>
Pascal Thubert <pthubert@cisco.com>
Huimin She <hushe@cisco.com>
Michael Richardson mcr+ietf@sandelman.ca

IETF110, March 2021
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
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 likelihood 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 constraining 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 likelihood of an unenrolled node sending enrollment traffic via this path.
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

| Type = TBD01 | Opt Length = 1 | R | min. priority |

| Type | Opt Length = 3 | exp | DODAG Size |

| R | min priority |

...Version -04 changes 2...

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?
draft-ietf-roll-enrollment-priority-04
Example enrollment priority

base diagram from PThubert
With impaired node (24)
Capabilities Status

draft-ietf-roll-capabilities
ROLL IETF 110
What does the document contain?

- Capability Options that can be carried in any RPL messages
- Two specific capabilities
  - Capability Indicator flags
  - Routing Resource Capability
- Capability Query/Response signalling
- Guidelines for defining new capabilities

MUSTs:

- Handling of Capabilities MUST be supported if the network uses MOPex [I-D.ietf-roll-mopex].
Capability Options

CapType=0x01
Capability Indicators

CapType=0x02
Routing Resource

Join as Leaf if cap not understood
Ignore msg if cap not understood
Copy cap if not understood
Capability Query/Response

And the corresponding secure messages.

Figure 8: Query supported Cap Types

Figure 9: Query specific Cap Set
MOPex Status

draft-ietf-roll-mopex
What does the document contain?

- Defines MOPex
  - Base MOP == 7, expect MOPex control option to be present
- Explains handling of MOPex under various conditions
- Extending RPL control options
Extending RPL Control Options

Problem Statement: How to handle unknown RPL Control Options?

Problem Statement: What to do if the control options is not known?

Figure 2: Extended RPL Option Format

<table>
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<tr>
<th>'J' bit</th>
<th>'C' bit</th>
<th>Handling</th>
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<tr>
<td>0</td>
<td>0</td>
<td>Strip off the option, and the node can join as 6LR</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Copy the option, and the node can join as 6LR</td>
</tr>
<tr>
<td>1</td>
<td>NA</td>
<td>Join as 6LN</td>
</tr>
</tbody>
</table>
Overall Status

- No tickets open
- Received one detailed review from Dominique
- Updates were presented in the past interims too

MOPex does not have any complex handling or introduction of any new messages. Capabilities does have somewhat complex handling. MOPex is precursor for capabilities.

Can we go for LC for MOPex?
Open Floor