IETF 109 ROLL - Virtual

Routing over Low-Power And Lossy Networks

Chairs:
Dominique Barthel
Ines Robles

Secretary:
Michael Richardson
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- BCP 9 (Internet Standards Process)
- BCP 25 (Working Group processes)
- BCP 25 (Anti-Harassment Procedures)
- BCP 54 (Code of Conduct)
- BCP 78 (Copyright)
- BCP 79 (Patents, Participation)

Source: https://www.ietf.org/about/note-well/
Meeting Materials

- Session: Thursday, 19th November 2020 - 9:00-11:00 UTC
- Remote Participation
  - Slides: https://datatracker.ietf.org/meeting/109/session/roll
  - Minutes taker: Please volunteer, thank you :)
<table>
<thead>
<tr>
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<th>Duration</th>
<th>Draft/Topic</th>
<th>Presenter</th>
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<td>15 min</td>
<td>WG Status</td>
<td>Ines/Dominique</td>
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<td>RFC6550bis status</td>
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<td>Oct 2021</td>
<td>Rechart WG or close</td>
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<td>Dec 2020</td>
<td>Initial submission of Mode of Operation extension and Capabilities for RPL to the IESG draft-ietf-roll-mopex-cap</td>
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<td>Initial submission of a root initiated routing state in RPL to the IESG draft-ietf-roll-dao-projection</td>
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<td>Initial submission of Enabling secure network enrollment in RPL networks draft to the IESG draft-ietf-roll-enrollment-priority</td>
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<td>draft-ietf-roll-turnon-rfc8138-17</td>
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<td>draft-ietf-roll-unaware-leaves-23</td>
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<td>draft-ietf-roll-useofrplinfo-42</td>
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<td>draft-ietf-roll-dao-projection-14</td>
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<td>draft-ietf-roll-mopex-02</td>
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<td>draft-ietf-roll-nsa-extension-10</td>
<td>Shepherd write up in progress</td>
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<td>draft-ietf-roll-aodv-rpl-08</td>
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<td>draft-ietf-roll-dis-modifications-01</td>
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<tr>
<td>draft-ietf-roll-rpl-observations-04</td>
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**2 IPRs**
- draft-ietf-roll-efficient-npdao-18
- draft-ietf-roll-turnon-rfc8138-17
- draft-ietf-roll-unaware-leaves-23
- draft-ietf-roll-useofrplinfo-42

**1 IPR**
- draft-ietf-roll-capabilities-07

**2 IPRs**
- draft-ietf-roll-dao-projection-14
- draft-ietf-roll-enrollment-priority-03
- draft-ietf-roll-mopex-02
- draft-ietf-roll-nsa-extension-10
- draft-ietf-roll-aodv-rpl-08
- draft-ietf-roll-dis-modifications-01
- draft-ietf-roll-rpl-observations-04
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## Related Internet-Drafts

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<td>draft-jadhav-roll-storing-rootack-01</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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Open tickets

https://github.com/roll-wg/efficient-route-invalidation/issues

https://github.com/roll-wg/Capabilities/issues

https://github.com/roll-wg/rpl-observations/issues
Open tickets

https://github.com/roll-wg/dao-projection/issues

- Issues to address in dao projection draft (lifetime, MOP, retransmissions, route cleanup)
  - #7 opened on Nov 15, 2019 by mesoob

- Security considerations for dao projection
  - #6 opened on Nov 15, 2019 by mesoob

- should DAO projection have a new MOP?
  - #5 opened on Oct 26, 2019 by mcr

- Information Missing in VIO abbreviation
  - #3 opened on Oct 27, 2019 by radimahoo

- cleanup handling of common network segment for two P-DAO
  - #2 opened on Dec 16, 2019 by rynthu
Open tickets

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<th>Ticket</th>
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<th>Component</th>
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<td>Security considerations for dao projection</td>
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<tr>
<td>#180</td>
<td>13 issues to address in dao projection draft ([lifetime, MOP, retransmissions, route cleanup])</td>
<td>dao-projection</td>
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<td>#187</td>
<td>New version of RFC6550 - Topics to include</td>
<td>rpl</td>
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<tr>
<td>#188</td>
<td>Should 6LBR be included into the DODAG root?</td>
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<td>#199</td>
<td>Issues in version 08</td>
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<td>#200</td>
<td>Issues in version 08 - Part II</td>
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https://trac.ietf.org/trac/roll/report/2
Root initiated routing state in RPL

draft-ietf-roll-dao-projection

P. Thubert, Ed.; R.A. Jadhav, M. Gillmore

Pascal Thubert
IETF 109
ROLL Virtual Meeting
Status to the draft

• Moved from 11 to 14 since last IETF
• Main DODAG must be non-storing Mode
  • To advertise the DODAG structure to the Root
  • Topology knowledge augmented with Sibling Info Option
  • VIA Option lists hops within one DODAG

• 1 P-DAO == 1 Segment == n* RTO (target) + 1 RPO (Via)
• 1 Track == p*segments
• RFC 8138 compression of the address list in RPOs
Topology awareness

- Initially out of scope
- Now we have non storing mode + Sibling info option
- Which sibling to advertise is still out of scope
P-DAO construction

• RPL Target Options can still be factorized
• But there is one and only one RPO (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 (Segment ID too?)
• Taken from the Track Egress Name Space
P-DAO Format

May be more than one in Non-storing Mode

Must be optimized in Non-storing Mode, to be used as in packets
Encapsulation Rules

- Final destination of outer header MUST be Track Egress
- RPL Instance ID in RPI is TrackID
- Encapsulation needed if either
  - IP source != Track ingress or IP destination != Track egress
- Fine in Storing mode
  - but in non-storing how do we signal segments?
- As written RH is « inserted », 6LORH-SRH added in front
- Else we’ll need to consider a segment as another encaps.
Encapsulation single segment, all MOPs

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>TrackId</th>
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<tbody>
<tr>
<td>IP Header</td>
<td>RPI</td>
<td>P-DAO</td>
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</table>

TrackIngress

SimpleTrack

TrackEgress

IP Src = Trk Ingress

IP Dest = Trk Egress

IP Dest = Target

Track fully-qualified identifier
Loose non-storing mode

DODAG Root

Loose hop 1 (LH1)

IP Src = LH1

Loose SRH = LH1, LH2, LH3

Simple Track, target = LH2

Track 1

Loose hop 2 (LH2)

IP Dest = LH2 or LH2 parent

P-DAO 1

P-DAO 2

Track 2

Loose Hop 3

Dest

IETF 109 - ROLL
draft-ietf-roll-dao-projection
Encapsulation storing mode

- **Track Ingress**
  - IP Src = Trk Ingress

- **Segment 1**
  - IP Dest = Trk Ingress

- **Relay**
  - Segment 2
  - No decapsulation

- **Track Egress**
  - IP Dest = Trk Egress

- **P-DAO 1**
- **P-DAO 2**

- **IP Dest = Target**

Loop avoidance?
Encapsulation non storing mode

SRH ‘reload’ is easy with RFC 8138 since 6LoRH is 1st header; but that’s a new operation with similarities with header insertion; updates both source and RH but is not destination.
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 RPOs
  • Ingress to indicate which source address to use
  • Egress to build the full SRH 6LoRH
RPL Unaware Leaves

draft-ietf-roll-unaware-leaves

Pascal Thubert

IETF 109

ROLL Virtual Meeting
Status to the draft

• Moved from 18 to 23 since last IETF
  • Mostly Alvaro’s A-D review
• Updates + 6775 – NPDAO
  • Reformats the RPL status (but NPDAO defines status 1)
  • Add ROVR to the RPL Target Option
• Restructured / Reordered sections
  • RUL requirements
• Submitted to IETF last call
Major changes

• Alignment with use of RPL Info
  • MOP 7 update inherited
  • Define “Root Proxies EDAR/EDAC” ‘P’ flag
  • Define default behavior of ‘P’ flag (on) for MOP 7
  • Encapsulation for external routes
  • RPI rewriting at the 6LR
  • Section 3 “RPL External Routes and Dataplane Artifacts”
Configuration option for RFC 8138

draft-ietf-roll-turnon-rfc8138

Pascal Thubert
IETF 109
ROLL Virtual Meeting
Status to the draft

• Moved from 08 to 17 since last IETF
• Through IESG cycle
• Aligning to use of RPL Info for new flag
• MOP 7 operation: flag raised on 6LoWPAN HC links
• Many editorials, no core functionality change
Root-ACK

- draft-jadhav-roll-storing-rootack-01
Motivation

- **End to end path establishment indication**
  - Node can initiate app traffic on this indication
  - Section 4 of RPL-Observations draft details the problem stmt
- For RUL-scenario to send NA in response to e2e path establishment

---

**Figure 2:** NS-MOP DAO/DAO-ACK handling

**Figure 3:** Storing MOP DAO/DAO-ACK handling
Basic Operation

- RootACK sent directly from the root to the Target
- K-flag in TIO to indicate root to send RootACK
- PathSeq is used to tally RootACK to DAO

Figure 4: Updated Transit Information Option (New K flag added)
K flag in TIO

- **K flag is set by the target in the TIO**
  - Used by the root to send the RootACK
  - Target may set the K flag only once after startup
  - RootAck may be sent asynchronously by the root
    - Useful for CAP query

- **Intermediate 6LRs K-flag handling**
  - DAO is regenerated on 6LRs on behalf of target node
  - K flag has to be stored in context to the target. Similar to E-flag.
  - When the intermediate nodes see the K flag disabled from the target the K flag could be reset
RULs with RootACK

- Send NA to RUL only when e2e path is estd
  - Send NA in response to RootACK
- For RUL targets, the 6LR sends DAO directly to the root even in storing MOP
  - As specified in unaware-leaves

[Diagram showing network topology with RPL and Root ACK/NA interactions]
Updates in the last version

- Calling RootACK consistently in the document
- Implications of DelayDAO
- Explicit section for RULs

Next Steps:

- Reviews
- Adoption?
RFC 6550bis

IETF 109 Virtual
Github repository - Please feel free to add/modify as needed!!!
Topics to be addressed in RFI08558bis

Source: https://mailarchive.ietf.org/arch/msg/roll/NUjtg3jOSaA7fva5XXywoM71E/

https://mailarchive.ietf.org/arch/msg/R0l/5w3X8E4ue_Ars66c6GCI4Qa2z4jgc/

1. Use of revised Option Type (0x23) in RPI ... (Obsolete use of 0x63 RPI Option Type value).
2. Mandating the use of 6LoRH (RFC 8138), turn-on
3. MOPex
4. Support for Ext Control Options. (Allows backward compatibility for new extns... part for same mopex draft)
5. Support for Capabilities. (Enables backward compatibility, allows incremental feature support)
6) P-DAO for SDN-RPL and
7) ADDV-RPL.
RPL Observations Issues
By Pascal:

# RPLv2

Todo List

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* Alvero: Note that "SHOULD respond with a DAO-ACK" leaves the door open to not doing it. Unfortunately rfc6550 didn't explicitly mention what may be the reasons to not send a

* Benjamin: about draft-ietf-roll-turnon-rfc8138-17

I will say a bit more inline, but want to note upfront that my primary unease here is that we seem to be assigning some (partial) semantics to MOP value 7 here (even though we

For a MOP value of 7, [RFC8138] MUST be used on Links where DLowPAN Header Compression [RFC6282] applies and MUST NOT be used otherwise.

yet there is no "trail of breadcrumbs" for someone to follow from "I want to implement MOP 7" and end up at the sentence I quoted above. A formal Update to 6550 would provide

"
Review RFC 6550 checking the "future work features"

#1 opened now by inesrob
Some thoughts about process: Proposed Standard -> Internet Standard

RFC6550
- Stuff we use
- Stuff never used

RFC6553

RFC6554

RFC6550bis
- Stuff we use
- Clarifications
RFC6550 + RPL-v2-profile

Stuff we use

Stuff never used

Don’t do this!

Do this!

RFC6550

RFC6553

RFC6554

RPL-"v2"

*profile*

RFC8138

unaware-leaves

roll-mopex

capabilities

useofrpinfo

npdao

dao-projection
Action Points? - Open Discussion
Open Floor