IETF 115 ROLL Session
8 November 2022

Chairs: Dominique Barthel, Ines Robles
Secretary: Michael Richardson

This session is being recorded
Note Well

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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)
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- **Wear masks unless actively speaking at the microphone.**

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- Agenda
  https://datatracker.ietf.org/meeting/agenda
- Meetecho and other information:
  https://www.ietf.org/how/meetings/115/preparation
- If you need technical assistance, see the Reporting Issues page:
  http://www.ietf.org/how/meetings/issues/
Resources for ROLL@IETF 115 London

- Remote Participation
  - Meetecho: [https://wws.conf.meetecho.com/conference/?group=roll](https://wws.conf.meetecho.com/conference/?group=roll)
  - Zulip Chat: [https://zulip.ietf.org/#narrow/stream/roll](https://zulip.ietf.org/#narrow/stream/roll)
  - Minute takers: Please volunteer, thank you :)  
  - Datatracker login required to be able to edit the minutes
<table>
<thead>
<tr>
<th>Time (UTC)</th>
<th>Duration</th>
<th>Draft/Topic</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>15:00 - 15:10</td>
<td>10 min</td>
<td>WG Status</td>
<td>Ines/Dominique</td>
</tr>
<tr>
<td>15:10 - 15:25</td>
<td>15 min</td>
<td>more details on documents status: NSA, AODV-RPL, Enrollment-Priority, MOPEX, RNFD</td>
<td>Ines/Dominique</td>
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<tr>
<td>15:25 - 15:40</td>
<td>15 min</td>
<td>draft-ietf-roll-dao-projection</td>
<td>Pascal</td>
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<td>15:40 - 15:55</td>
<td>15 min</td>
<td>draft-ietf-6lo-multicast-registration</td>
<td>Pascal</td>
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<td>15:55 - 16:00</td>
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## Draft status

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<th>Title</th>
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<tr>
<td>Common Ancestor Objective Function and Parent Set DAG Metric Container Extension</td>
<td>draft-ietf-roll-nsa-extension-10</td>
<td>AD evaluation, revised I-D needed</td>
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<tr>
<td>Supporting Asymmetric Links in Low Power Networks: AODV-RPL</td>
<td>draft-ietf-aody-rpl-14</td>
<td>New version addressing open issues</td>
</tr>
<tr>
<td>Root initiated routing state in RPL</td>
<td>draft-ietf-roll-dao-projection-27</td>
<td>WGLC’ed, discussed today</td>
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<tr>
<td>Controlling Secure Network Enrollment in RPL Networks</td>
<td>draft-ietf-roll-enrollment-priority-06</td>
<td>Addressing Open Issues</td>
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<tr>
<td>Mode of Operation extension</td>
<td>draft-ietf-roll-mopex-04</td>
<td>waiting for attention</td>
</tr>
<tr>
<td>RPL Capabilities</td>
<td>draft-ietf-roll-capabilities-09</td>
<td>waiting for attention</td>
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<tr>
<td>RNFD: Fast border router crash detection in RPL</td>
<td>draft-ietf-roll-rnfd-00</td>
<td>New Work adopted by the WG, review/discussion needed</td>
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<tr>
<td>RPL Storing Root-ACK</td>
<td>draft-jadhav-roll-storing-rootack-03</td>
<td>WG adoption to be called</td>
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### Milestones

<table>
<thead>
<tr>
<th>Date</th>
<th>Milestone</th>
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<tbody>
<tr>
<td>Nov 2023</td>
<td>Initial submission of Fast Border Router Crash Detection in RPL to the IESG</td>
</tr>
<tr>
<td>Nov 2023</td>
<td>Recharter WG or close</td>
</tr>
<tr>
<td>Nov 2023</td>
<td>Initial submission of a proposal to augment DIS flags and options to the IESG</td>
</tr>
<tr>
<td>Nov 2023</td>
<td>Initial submission of a proposal for Source-Route Multicast for RPL to the IESG</td>
</tr>
<tr>
<td>Nov 2023</td>
<td>Initial submission of a YANG model for MPL to the IESG</td>
</tr>
<tr>
<td>Jun 2023</td>
<td>Initial submission of Capabilities for RPL to the IESG</td>
</tr>
<tr>
<td><strong>Nov 2022</strong></td>
<td>Initial submission of Mode of Operation extension for RPL to the IESG</td>
</tr>
<tr>
<td><strong>Sep 2022</strong></td>
<td>Initial submission of Controlling Secure Network Enrollment in RPL networks draft to the IESG</td>
</tr>
<tr>
<td><strong>May 2022</strong></td>
<td>Initial submission of a root initiated routing state in RPL to the IESG</td>
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</table>

### Done milestones

<table>
<thead>
<tr>
<th>Date</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Done</td>
<td>Initial submission to the IESG of mechanism to turn on <a href="https://tools.ietf.org/html/rfc8138">RFC8138</a> compression feature within a RPL network</td>
</tr>
<tr>
<td>Done</td>
<td>Initial submission of Common Ancestor Objective Functions and Parent Set DAG Metric Container Extension to the IESG</td>
</tr>
<tr>
<td>Done</td>
<td>Initial submission of routing for RPL Leaves draft to the IESG</td>
</tr>
<tr>
<td>Done</td>
<td>Initial submission of a reactive P2P route discovery mechanism based on AODV-RPL protocol to the IESG</td>
</tr>
<tr>
<td>Done</td>
<td>Initial Submission of a proposal with uses cases for RPL, RH3 and IPv6-in-IPv6 encapsulation to the IESG</td>
</tr>
<tr>
<td>Done</td>
<td>Initial submission of a solution to the problems due to the use of No-Path DAO Messages to the IESG</td>
</tr>
</tbody>
</table>
more details on documents status
AD review March 17th
  - motivation: is this work usable beyond Packet Replication and Elimination?
    - about 40 comments, 20 noted as “major”
- being addressed by the authors
- Revised draft needed before sending to IESG
AODV-RPL
Supporting Asymmetric Links in Low Power Networks -
Reactive P2P route discovery for hop-by-hop and source routing

- Introduces AODV-RPL DIO Options:
  - AODV-RPL RREQ (Route Request) Option
    - Present in DIO Messages from OrigNode toward TargNode
  - AODV-RPL RREP (Route Reply) Option
    - Present in DIO Messages from TargNode toward OrigNode
  - AODV-RPL Target (ART) Option
    - Present in RREQ DIO and RREP DIO messages

- Introduces a new multicast address with link-local scope: all-AODV-RPL-nodes

- MOP = 4
  - Does not collide with P2P-RPL (RFC6997)
    - They will operate as different RPL Instances
6.3.3. RPLInstanceID Pairing

Since the RPLInstanceID is assigned locally (i.e., there is no coordination between routers in the assignment of RPLInstanceID), the tuple (OrigNode, TargNode, RPLInstanceID) is needed to uniquely identify a discovered route. It is possible that multiple route discoveries with dissimilar Objective Functions are initiated simultaneously. Thus, between the same pair of OrigNode and TargNode, there can be multiple AODV-RPL route discovery instances. So that OrigNode and TargNode can avoid any mismatch, they MUST pair the RREQ-Instance and the RREP-Instance in the same route discovery by using the RPLInstanceID.
• New version 15 published on Sept. 30th
  ○ Address ticket 1 (https://github.com/roll-wg/aodv-rpl/issues/1)
    ■ John Scudder discuss: comments to improve readability
  ○ Address ticket 2 (https://github.com/roll-wg/aodv-rpl/issues/2)
    ■ Ben Kaduk discuss: comments to improve the protocol
  ○ Address ticket 3? (https://github.com/roll-wg/aodv-rpl/issues/3)
    ■ Pascal review.
    ■ Last comments on ML in July
  ○ Review by Konrad, Last comments on ML in Oct
• Next Step: Last Call when all issues closed
## Enrollment-priority
Controlling Secure Network Enrollment in RPL Networks

<table>
<thead>
<tr>
<th>Ticket</th>
<th>Description</th>
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<tbody>
<tr>
<td>4</td>
<td>Enrollment priority option name</td>
</tr>
<tr>
<td>5</td>
<td>Explain how new option values are related to DODAGVersionNumber</td>
</tr>
<tr>
<td>7</td>
<td>-05 Section 3.1, questions</td>
</tr>
<tr>
<td>10</td>
<td>Should priority have more than 1 bit: join disabled/enabled?</td>
</tr>
<tr>
<td>11</td>
<td>What EB and priority, if any should a node with no feasible parent emit?</td>
</tr>
<tr>
<td>12</td>
<td>should root explicitly reset trickle timer?</td>
</tr>
<tr>
<td>13</td>
<td>add explicit lollipop counter into enrollment priority option</td>
</tr>
</tbody>
</table>

- Work to be resumed when resource available
MOPEX
Mode of Operation extension

- RPL instance operates in one among multiple possible modes
- We are running out of mode code points
- This draft extends the Mode of Operation field

- Ticket #8: Do-not-join-instance flag in RPL ext control option

Currently, the MOPex draft extends the RPL control options with certain flags to handle cases where the control option is not understood by the node: J-flag: Join only as 6LN - C-flag: copy option as-is even if not understood - I-flag: Ignore message altogether.

We could have an option for the node to not join the network at all (not even as 6LN) if a control option is not understood.

- Discussion in ML
RNFD
Fast border router crash detection in RPL - having nodes collaboratively monitoring the status of the root.

- Protocol features:
  - Proposed as extension of RPL
  - Introduces RNFD Option
    - Carried in DIOs and DISs
  - Roles: Acceptor and Sentinel
  - Conflict-Free Replicated Counter (CFRC)
- Presented at last interim meetings:
- Version -01 published Oct. 12th
RNFD
Fast border router crash detection in RPL - having nodes collaboratively monitoring the status of the root.

ML Discussion Points:
https://mailarchive.ietf.org/arch/msg/roll/h6UsXpjAYFfDHADHZ8phDgAoj28/

1. What happens when Sentinels (the root's one-hop neighbors that monitor its state) don't hear each other? Does the algorithm still detect the crash of the root?
2. What if most of the direct links to the root fail but the root is in fact alive?
3. Is rebuilding the DODAG in such a case desirable?
4. Why can't Sentinels ask the root whether it is dead?
5. The threshold that describes how large the majority is is configured into the nodes. It is not conveyed as part of the protocol operation. Should it?
6. What is the effect of the parameter being different on different sentinels/acceptors?

- Discussion to be continued on ML
- Reviews/comments needed.
Root initiated routing state in RPL

draft-ietf-roll-dao-projection

Pascal Thubert, Rahul Arvind Jadhav, Michael Richardson

IETF 115, London

Presenter: Pascal Thubert
DAO Projection (Centralized RPL)

• Root connected-to or acting-as controller
  • Uses topological info from main DODAG
  • New Sibling Information Option (and P-DAO request)
  • Uses Projected DAO to install paths in the network

• Builds Segments to compress SHR
  • Compresses selected long paths in main DODAG
  • Uses Storing Mode Projected DAO to install strict (serial) paths

• Builds new DODAGs called Tracks
  • Enables optimized P2P (east – west) routing
  • Uses Non-Storing Mode Projected DAO to install loose (dotted-line) graphs
  • Leveraging Segments to complete the graph
The RPL Track: A DODAG rooted at Ingress

Non-Storing mode
P-DAO for L1
Targets = \{Ti\}

Root

P-DAO
Ack

P-DAO
Ack

Storing mode
P-DAO for S1
Targets = \{E\}

Relay A

Fwd node F

Fwd node G

Relay B

Egress E

Target Tn

Ingress I

Segments

\{S1 = A=>F=>G to E, S2 = I=>H to B\}

Legs

\{L1 = I->A->E to \{Ti\}, L2 = I->B->E to \{Ti\}, L3 = I->A->B->E to \{Ti\}\}

Targets

\{Tx\}

SubTracks

Any Set $\subset \{L1, L2, L3\}$ but $\{\}$

Packet flow

East

West
Draft Status

• WGLC at -26
• All known issues addressed at current ( -29 )
• Ready for publication
-28 (as promised at IETF 114) refine on WGLC issues:

• Clarify that each instance implies a RIB
• Multi-topology routing loop avoidance rules:
  - neighbor > indirect via common neighbor > Segment > Track
  - Partial order between RPL instances to allow jumping
• Crossing Segments discussion
• Clarifying mcast DAO exposes neighbors in SIOs
Status of the draft (cont.)

-> 29 Clean up:
  • Remove duplicated text in intro
  • Lower case “main” in “main DODAG”
Next

• Publication request?
DAO Projection

Backup Slides
DAO Projection (Centralized RPL)

• Root connected-to or acting-as controller
  • Uses topological info from main DODAG
  • New Sibling Information Option (and P-DAO request)
  • Uses Projected DAO to install paths in the network

• Builds Segments to compress SHR
  • Compresses selected long paths in main DODAG
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• Builds new DODAGs called Tracks
  • Enables optimized P2P (east – west) routing
  • Uses Non-Storing Mode Projected DAO to install loose (dotted-line) graphs
  • Leveraging Segments to complete the graph
Projected-DAO to target 56 with path segment via 24 (ingress), 35, and then 46 (egress)
Storing mode DAO to 56 upwards segment (24, 35, 46)
Storing mode DAO to 56 upwards segment (24, 35, 46)
DAO from 46 installs a route via 35 to 56 in 24

56 via 35

DAO from 46 installs a route via 46 to 56 in 35

56 via 46

Preexisting connected route to 56
Non source routed DATA Path
DAG Root

Loose Source routed
DATA Path
Packet to 13,
RH 24, 56

Non source routed
DATA Path

draft-ietf-roll-dao-projection
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
New Via Information Option Format

```
<table>
<thead>
<tr>
<th>Type</th>
<th>Option Length</th>
<th>Flags</th>
<th>P-RouteID</th>
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</table>
```

- **SRH-6LoRH head**
- **Via Address 1 (compressed by RFC 8138)**
- **Via Address n (compressed by RFC 8138)**
- **Additional SRH-6LoRH Header(s)**

May be more than one in Non-storing Mode

Must be optimized in Non-storing Mode, to be used as is in packets
New Sibling Information Option Format

In DAO and mcast DAO; mcast DAO allows indirect forwarding
The RPL Track: A local DODAG rooted at Ingress

Non-Storing mode
P-DAO for L1
Targets = \{Ti\}

P-DAO Ack

Root

Ingress I

P-DAO Ack

Fwd node F

Fwd node G

Storing mode
P-DAO for S1
Targets = \{E\}

P-DAO Ack

Relay A

Another Track

Relay B

Egress E

Target Tn

Segments

\{S1 = A=>F=>G to E, S2 = I=>H to B\}

Targets

\{Tx\}

L1 = I->A->E to \{Ti\}, L2 = I->B->E to \{Ti\}, L3 = I->A->B->E to \{Ti\}

Legs

Packet flow

East

West

SubTracks

Any Set \(\subset\) \{L1, L2, L3\} but \{\}
Some rules

• Track is set up by installing Legs and Segment
  • with the same Track ID
• Non-Storing Mode P-DAO signals a Leg
• Storing Mode P-DAO signals a Segment
• Storing Mode P-DAO enables loose hops
  • in Non-Storing main DODAG (typically TrackId is Global instance ID)
  • in Tracks (typically TrackId is Local instance ID to track Ingress)
• Track Egress is implicit Target in Non-Storing Mode
• Leg hop is either a Segment of this Track or another Track
Complex track

• A complex track is multi-legged, e.g., 2 Legs below
• Allows 1+n
RPL vs RAW

- RPL has no North-South Segment
Inter Leg

• RFC 6550 non-storing Target and Transit to indicate loose parent child relationship, many of them in one P-DAO
Encapsulation 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

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

- **Loose hop 2 = C**
  - Ingress=Root TrackID=0
  - SF-VIO =A, C, E
  - Target =B, C
  - Segment 1

- **Loose hop 3 = E**
  - Ingress=Root TrackID=0
  - SF-VIO =C, D, E
  - Target = E

- **Dest = F**

- **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

Main DODAG Root

Loose hop 1 = A

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

Loose SRH = A, C, E, F
SRC = Root
TrackID = 0

Loose hop 2 = C

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

Dest = F

Loose hop 3 = E

• 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

Implicit Ingress = A

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

- Same as Profile 1, but for Track

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

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

- Tunnel within Tunnel

Ingress=A
TrackID=(A, 141)
SR-VIO =C, E
Target = F

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

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

External node S

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

Dest = C
Src= A, RPI=141
Dest = C
SRH = E

Track 2
Track 1

Dest = F
Src=S, Dst=F

Src=S, Dst=F

Ingress
TrackID
SR-VIO
Target

Loose Hop
Src
RPI
Dest
SRH
Extending RFC 9010: IPv6 Neighbor Discovery Multicast Address Listener and Prefix Registration

draft-ietf-6lo-multicast-registration
draft-thubert-6lo-prefix-registration (NEW!)

Pascal Thubert
IETF 115
London
6LoWPAN ND (IPv6 Stateful Address Autoconfiguration)

**RFC 6775** (original 6LoWPAN ND)
Defines ARO for registration and DAD operations for stateful AAC

**RFC 8505** (Issued 11/2018)
The protocol agnostic registration for ULA/GUA for proxy ND and routing services
Analogous to a Wi-Fi association but at Layer 3: a deterministic and query-able state for all addresses

**RFC 8929** (Issued 11/2020)
Federates 6lo meshes over a high-speed backbone
ND proxy analogous to Wi-Fi bridging but at Layer 3

**RFC 8928** (Issued 11/2020)
Protects addresses against theft (Crypto ID in registration)

**draft-ietf-6lo-multicast-registration**
Extends RFC 8505 for multicast and anycast

**draft-thubert-6lo-prefix-registration**
Extends RFC 8505 for prefixes

**draft-thubert-6lo-unicast-lookup**
Provides a 6LBR on the backbone to speed up DAD and lookup
Coexistence with classical ND
Changes in `draft-ietf-6lo-multicast-registration` since IETF 114

• Moved from 7 to 11, introduced terminology
• “Update RFC 6550” beefed up,
  • discussion on merging different sources vs lifetime and ROVR
• Freshness comparison only from the same source
• New P field instead of flags (though same binary) -> next slide
• Use “subscription” instead of “registration” for A and M
• Updated Consistent Uptime Option; (in vs separate) still not resolved, kept in -> next slide
P Field: Adding Room For Prefix Registration

P is a new 2-bits field in EARO, DAR, and RTO

Turning the A and M flags into a field frees up one value:

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Registration for a Unicast Address</td>
<td>This RFC</td>
</tr>
<tr>
<td>1</td>
<td>Registration for a Multicast Address</td>
<td>This RFC</td>
</tr>
<tr>
<td>2</td>
<td>Registration for an Anycast Address</td>
<td>This RFC</td>
</tr>
<tr>
<td>3</td>
<td>Unassigned</td>
<td>This RFC</td>
</tr>
</tbody>
</table>

For Prefix Registration

Was: M flag
Was: A flag
Reserved

draft-ietf-6lo-multicast-registration
RFC 9010 (RUL)

6LR advertises A:: in RAs
6LN autoconfigures A::L
6LN registers A::L with « R » flag set
6LR injects the address as external host route in RPL

A::A

A::L

A::B

A::C

A::D

Target A::L via Transit A::C (Ext)

A: (root)
A::A self
A::B connected
A::C via A::B
A::L via A::C
A::D via A::B
A:: ~onlink

A::L via

A::C via A::B connected
Let it be for prefixes!

• Hosts may own prefixes -> and routers may connect to prefixes
  • Network in Node / recursive networking
  • Kubernetes / Private IPv4 realms
  • Directly connected (no routing)
Owned prefix routing (non-storing mode)

Parent is default GW, advertizes owned PIO (L bit on)
RPL Router autoconfigures Address from parent PIO
RPL Router advertises Prefix via Address to Root
Root recursively builds a Routing Header back

Target C::/ via Transit B::C

A: (root)
A:: connected
B:: via A::A
C:: via B::C
D:: via B::D

D::3 via B::D via A::B connected

A::A
B::B
B::C
B::D

C::
::/0 via B::B
B:: connected
C:: connected

B:
::/0 via A::A
A:: connected
B:: connected

D:
::/0 via B::B
B:: connected
D:: connected

D::3
B::3
Owned prefix routing (non-storing mode)

C::L is reachable but L:: is not
Missing equivalent of RFC 8505/9010 for prefixes

Target C::/ via Transit B::C

A: (root)
A:: connected
B:: via A::B
C:: via B::C
D:: via B::D

L:: unreachable
C::L via B::C via A::B connected
What becomes of DAD?

• Need to consider prefix aggregation and nesting
  • Provisioned Mobile Networks should be unique
  • Auto-allocation?
How would that work?

Injecting Route

RS To replaces NS?

RS(SRO) « R » set)

RS(SRO) « R » not set)

Stub registration option EARO with P=3
Extending the P field

- P is a 2-bits field in EARO, DAR, and RTO
- Defined the Multicast Address Registration draft

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Registration for a Unicast Address</td>
<td>mcast RFC</td>
</tr>
<tr>
<td>01</td>
<td>Registration for a Multicast Address</td>
<td>mcast RFC</td>
</tr>
<tr>
<td>10</td>
<td>Registration for an Anycast Address</td>
<td>mcast RFC</td>
</tr>
<tr>
<td>11</td>
<td>Unassigned</td>
<td>mcast RFC</td>
</tr>
<tr>
<td>11</td>
<td>Registration for a prefix</td>
<td>This RFC</td>
</tr>
</tbody>
</table>
RS or NS?

NS (target = IPv6 address, EARO (ROVR=Crypto-ID PoO))

NA (EARO(status=Validation Requested), Nonce)

NS (EARO, CIPO*, Nonce and NDPSO**)

EARO becomes A stub registration

NA (EARO(status=0))

* Crypto-ID Parameters Option
** NDP Signature Option

Challenge round trip

Extend or replace DAR / DAC ?

ACCESS LINK
Could do’s

• Adding stub prefix advertisement vs. host today
  • Indicate prefix type e.g., a /96 to embed an IPv4 address
  • Proof of ownership (PoO) per RFC 8928

• Adding policy / ACLs
  • Signal partial micro-segmentation (offload), who can talk to me

• Adding preference to influence load balancing
  • worker capacity (clusters / containers)
  • Access bandwidth /
  • multihoming / preferred interface / anycast

• Tenant ID / VRF ID / RPL instanceID
  • Route tags, RH
Ask

• NS vs RS?
• Name EARO with P=3 an SRO?
• Support of IPv4 with a /96 to embed an IPv4 subnet?
• Proof of ownership (PoO) per RFC 8928
Open Floor