

Routing for RPL Leaves

draft-ietf-roll-unaware-leaves

Pascal Thubert

IETF 105

Montreal

6lo standard work



A proactive setting of proxy/routing state to avoid multicast due to reactive Duplicate address detection and lookup in IPv6 ND

- [RFC 8505](#) (Issued 11/2018)
 - The registration mechanism for proxy and routing services
 - Analogous to a Wi-Fi association but at Layer 3
- [draft-ietf-6lo-backbone-router](#) (WGLC complete 1/25)
 - Federates 6lo meshes over a high-speed backbone
 - ND proxy analogous to Wi-Fi bridging but at Layer 3
- [draft-ietf-6lo-ap-nd](#) (WGLC complete 3/26)
 - Protects addresses against theft (Crypto ID in registration)
- [draft-thubert-6lo-unicast-lookup](#)
 - Provides a 6LBR on the backbone to speed up DAD and lookup
- [draft-thubert-6man-ipv6-over-wireless](#) (new draft)
 - IPv6 ND vs. WiND applicability to wireless networks



Unmet expectations

- Connectivity for a Non-RPL aware node in a RPL domain
 - Forwarding is described but not the control plane
- Integration of the EDA Exchange (EDAR/EDAC) used as keep-alive with the RPL signaling to avoid duplication
 - At the moment both are needed periodically
 - This spec uses a common lifetime and the EDA exchange is proxied
- Separation of the RPL Root and the 6LBR and proxy registration to the 6BBR
 - The RPL root proxies the EDA with the 6LBR and the NS(EARO) with the 6BBR
 - Could be used to replace 6LBR with DHCPv6 server
 - Note: Missing TID in DAO to do a full proxy operation

Terminology

- RFC 6550:
 - A RPL leaf may understand RPL
 - But does not act as a router
- This draft:
 - A RPL-unaware leaf does not implement anything specific to RPL,
 - but it **MUST** support RFC 8505,
 - and it **MUST** ask the 6LR for abstract reachability services

Status

- Now WG document
- Forces IP in IP to the parent 6LR
 - If leaf does not support RPL artifacts or RFC 8138
 - It is preferred that leaf supports artifacts to save IP in IP in storing mode
 - In Non-Storing Mode, encapsulation to parent is 'E' flag.
- In Non-Storing Mode, Keep-alive EDAR nested in DAO/DAO-ACK
 - But not in Storing Mode since parent acknowledges before prop. DAO
- Work mostly complete. Anything missing?

ML questions: Should we discuss MPL in the draft?

1. The HbH option cannot be ignored because of the first bits
2. A MPL unaware leaf will drop the packet due to the HbH

If we want to serve MULs we need to either

- use a new value for the option (e.g., x6D => x2D)
- encapsulate IP in IP and each router that has unaware leaves broadcasts a decapsulated packet to its leaves
- add a capability bit with the registration

backup

Notes on the 'R' flag (defined in RFC 8505)

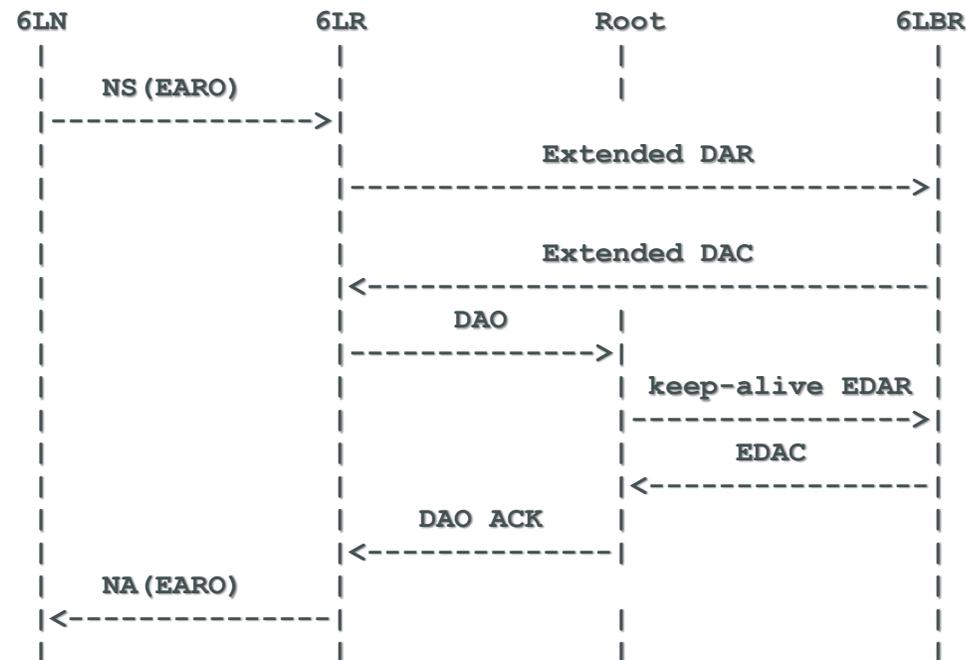
- A RPL Unaware Leaf does not know that there is routing in place and that the routing is RPL; draft-thubert-roll-unaware-leaves does not require anything from the Leaf.
- RFC 8505 specifies a new flag in the EARO, the 'R' flag.
- If the 'R' flag is set, the Registering Node expects that the 6LR ensures reachability for the Registered Address, e.g., by means of routing or proxying ND.
- Conversely, when it is not set, the 'R' flag indicates that the Registering Node is a router, which for instance participates to RPL and that it will take care of injecting its Address over the routing protocol by itself.
- A 6LN that acts only as a host, when registering, **MUST** set the 'R' to indicate that it is not a router and that it will not handle its own reachability.
- A 6LR that manages its reachability **SHOULD NOT** set the 'R' flag; if it does, routes towards this router may be installed on its behalf and may interfere with those it injects.

Mapping Fields from RPL DAO to NS(EARO) and EDA

- The Registered Address in a RPL Target Option is a direct match to the Registered Address field of the EDAR message and in the Target field of the NS, respectively
- EARO's TID is a direct match to Path Sequence in Transit Information option (TIO)
- EARO's opaque field carries the RPLInstanceID, 0 means 6LR's default
- EARO's Lifetime unit is 60s. RPL uses Lifetime Units that is passed in the DODAG Configuration Option. Converting EARO to DAO and back requires mapping of units.
- The Registration Ownership Verifier (ROVR) field in keep-alive EDAR messages by the Root is set to 64-bits of all ones to indicate that it is not provided. It is obtained in the EDAC from the 6LBR and used in proxy registration.
 - Q: Should we carry it in a RPL option in DAO messages?

First registration

- Upon the first registration, the EDAR / EDAC populates a state in the 6LBR including the ROVR field and the 6LR sends a first DAO message.
- The RPL Root acts as a proxy on behalf of the 6LR upon the reception of the DAO propagation initiated at the 6LR.



EDA (DAR, DAC) message Proxying

- Upon the renewal of a 6lowPAN ND registration: if the 'R' flag is set, the 6LR injects a DAO targeting the Registered Address, and refrains from sending a DAR message.
- With a Root/6LBR split, the proxy keep alive flow is like:

