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**
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
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)
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
Owned prefix routing (non-storing mode)

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

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

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

ROLL – IETF 115
draft-ietf-6lo-multicast-registration
Extending the P field

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

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</tr>
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<td>10</td>
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<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>
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</table>
RS or NS?

6LN

6LR

EDAR

Challenge round trip

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

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

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

EARO becomes A stub registration

NA (EARO(status=0))

* Crypto-ID Parameters Option
** NDP Signature Option

Extend or replace DAR / DAC?

EDAC

LLN

MS/MR LB DNS

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