

Neighbor Discovery Changes in Lowpan

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Problem Statement

- IPv6 ND requires frequent signaling messages
- RA to all node multicasts, NS, DAD, NUD messages
- IEEE 802.15.4 does not have multicast support at the MAC layer
- LowPan network is essentially low-energy network - reducing number of signaling messages are necessary
- Current IPv6 ND is designed for larger systems with constant source of power
- LowPan network could be an adhoc network of low-power devices
- LowPan assumes routing to happen at the Link-layer

Our Goal

- Minimizing periodic ND multicast messages
- Reducing total number of Neighbor Discovery related messages
- Defining default ND parameters that work for LowPan networks
- The same changes may apply to other adhoc networks

Minimizing ND multicasts

- All-node multicasts for unsolicited RA
- Solicited node multicast for DAD
- All-router multicast for Router solicitation
- **Routing at Link-layer** : Is RA necessary to propagate to all nodes at the LowPan network?
- Who does the prefix advertisement ?

Strawman Solution Ideas

- Star Topology – Use co-ordinators as prefix advertisers/routers
- Mesh Topology – Find a leader to assign a prefix to its neighbors; The leaders are chosen dynamically. Distributed assignments save energy because, otherwise, packets need to travel through the LowPan network to reach the IPv6 Router at the edge of LowPan network
- A distributed algorithm for DAD – the link is the entire LowPan
- Mesh Topology – The leaders are designated routers for ND purpose although each node may be capable of routing at layer 2

NS/NA Messages

An idea to reduce NS/NA signaling

- Do not use on-link flag for prefix advertisements
- Each node sends a packet through the router/leader which keeps track of the neighbors addresses
- The router/leader then sends a redirect message for on-link direct communication
- A node can ask the router using unicast message for NS and receives NA
- No NS/NA required host-to-hosts in this model
- Already part of RFC 2461

NUD Messages

NUD Messages to a Router

- Handles the case when one router dies and there is an alternative default router
- Should the frequency be lowered for LowPan nodes?

NUD Messages from a Router to Host

- Handles the case when the L2 address of the host changes. Will this happen?
- Without any improvements, when a host moves out of range:
 - After 30 seconds the router sends 3 unicast NUD messages
 - Since no response, the router switches to sending multicast Neighbor Solicitations
 - Subsequent packets for the host will trigger multicast NS messages (at most one per second)
- If host moved out of range, would be better to drop packets on the floor (e.g., by sending unicasts to the cached L2 address)

Summary

- LowPan IPv6 network is different than traditional powered network with L3 Routing
- Should we device ND optimizations for LowPan Adhoc network?
- Should this draft be a WG item in v6lowpan?