

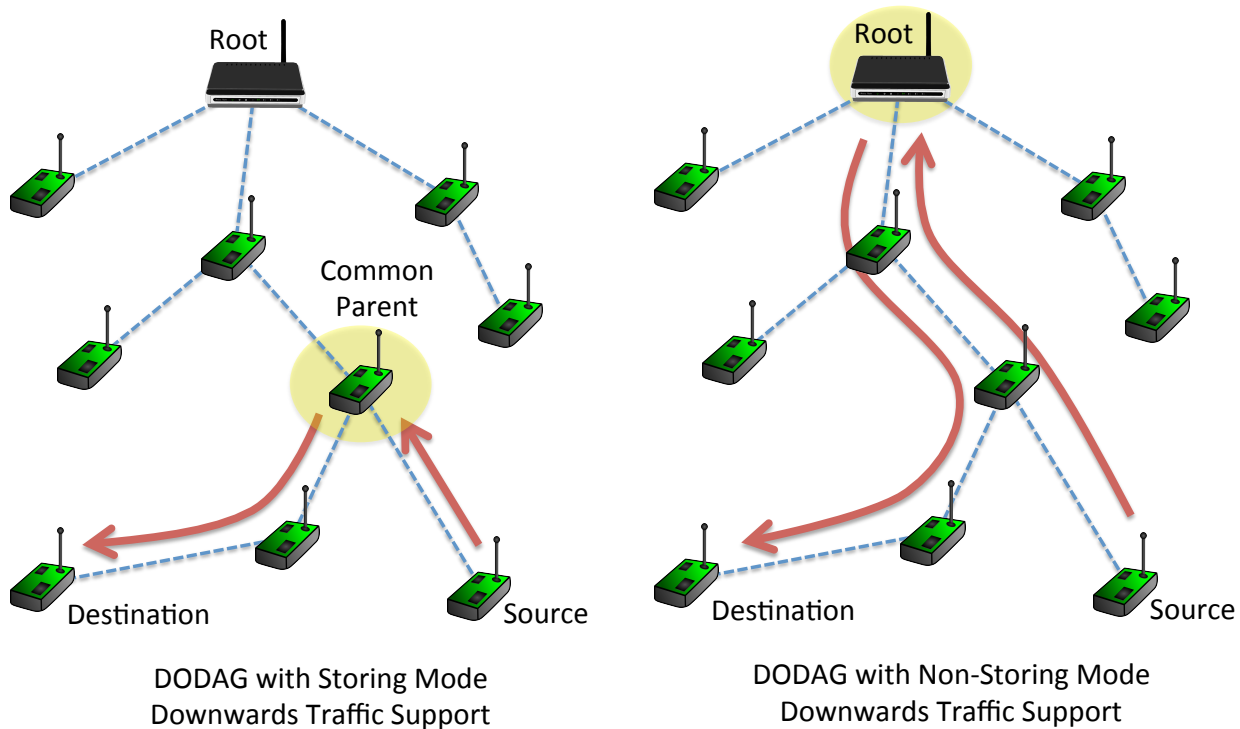
RPL Routing Pathology In a Network With a Mix of Nodes Operating in Storing and Non-Storing Modes

draft-ko-roll-mix-network-pathology

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Recap: Downwards Routing in RPL

- RPL supports two types of downwards routing

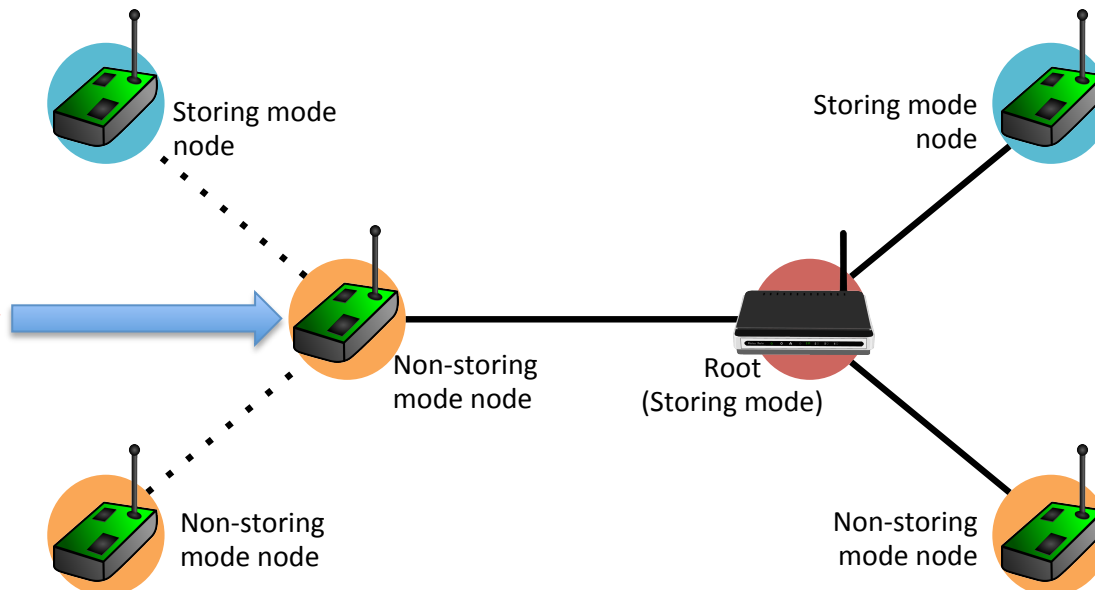


Using Both Types of Downwards Routing Options

- RPL networks are applied to systems with various hardware capabilities
 - Computational power-scarce nodes can only implement the *non-storing mode* downwards routing mode
 - Computational power-rich nodes can implement *storing mode* to increase the network efficiency
 - Shorter routing path
 - Less bandwidth usage due to the lack of SRHs

Routing Pathology

- Nodes with different MOP compared to the RPL DODAG root can only join the RPL network as a leaf node
- This affects the downwards routing performance in a mixed RPL network as well as the efficiency of the collection path
- Take the following dumbbell topology as an example...



If the non-storing mode node is forced as a leaf, both *downwards* AND *collection* performance is affected!!!

Benefits of Using Mixed Downwards Routing Mode-based Networks

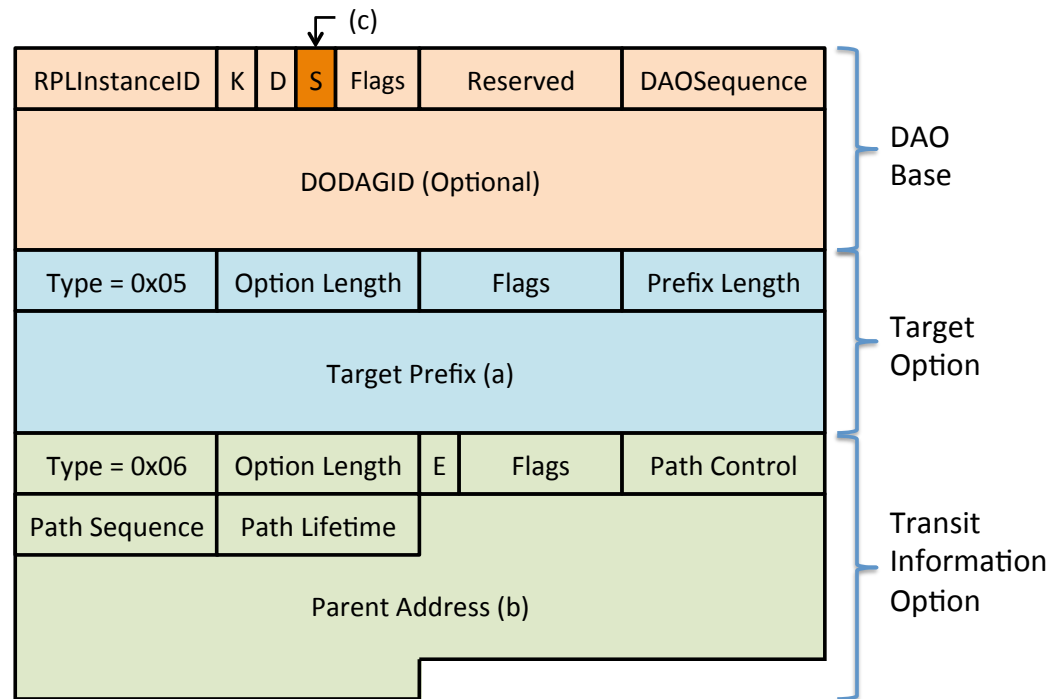
- Intermediate nodes on the upwards path with route storing capabilities can exploit the efficiency of using storing mode
 - Non-storing mode nodes send the packet “up” the DODAG until a route storing mode node with knowledge of the target destination is met
- RPL’s collection performance can be improved by selecting from a larger pool of nodes
 - No need to neglect the selection of specific nodes as parent nodes just because they have a different MOP
- Solves the issue of network performance versus code simplicity
 - Non-storing mode nodes can keep the benefit of being slim implementations

Proposed Changes (1/3)

- A new MOP that allows a node to chose either to implement the storing or non-storing mode features along with the following changes
 - Both storing and non-storing mode should parse SRHs
 - DODAG root should store routes
 - Non-storing nodes send hop-by-hop DAO
 - Storing nodes keep a table of all the targets in its sub-DODAG and has the capability to attach SRHs

Proposed Changes (2/3)

- DAO messages should indicate if the DAO-initiating node is a storing mode or not using a flag



Proposed Changes (3/3)

- Operational Changes for Storing Mode Nodes:
 - Packet without a SRH: If next hop is a storing-mode node, forward as in [RFC6550]. If next hop is a non-storing node, insert the SRH into the packet and forward
 - Using the storing status flag, a node constructing a SRH MAY choose to construct a SRH only up to the next storing mode node.
 - For packets with SRH, a storing mode node SHOULD obey the route specified in the SRH to comply with the strict source routing requirements in [RFC6554]

Discussions

- *draft-ko-roll-mix-network-pathology* as a WG draft?
- Can we simplify this process even further?