SMURF – Simplified Manet Multicast Routing/Forwarding

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Design Requirements

- IANA allocation for ALL_IPv{4,6}_MANET_NODES
  - members MUST suppress duplicates (Smurf-aware or not)
- No group-specific tree maintenance
- Can be used for generic multicast delivery
- No dependence on last hop
  - Else, how do receivers detect sender's identity? Encapsulation?
- Native IPv4 or IPv6 forwarding (←??)
- Work with unaware nodes
- Insure bidirectional links between relay nodes
- Useful with (most?) applications, route discovery (e.g, also in case TTL == 1)
- Compatible with various/advanced algorithms
  - However, baseline algorithm needed for aware nodes

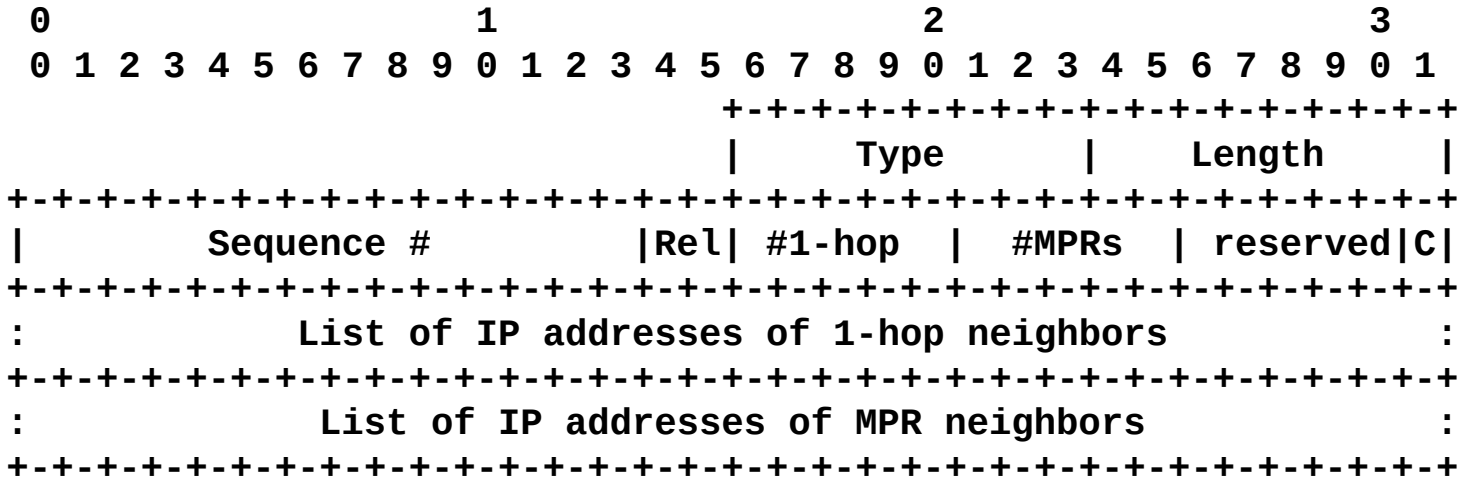
Connected dominating set (CDS)

- A dominating set covers the whole network
- A *connected* dominating set simplifies forwarding
- The set of all nodes in a network is a (big) CDS (assuming the network is connected)
- The set of MPRs emanating from a node is a (relatively big) CDS

One way to get a CDS from MPRs

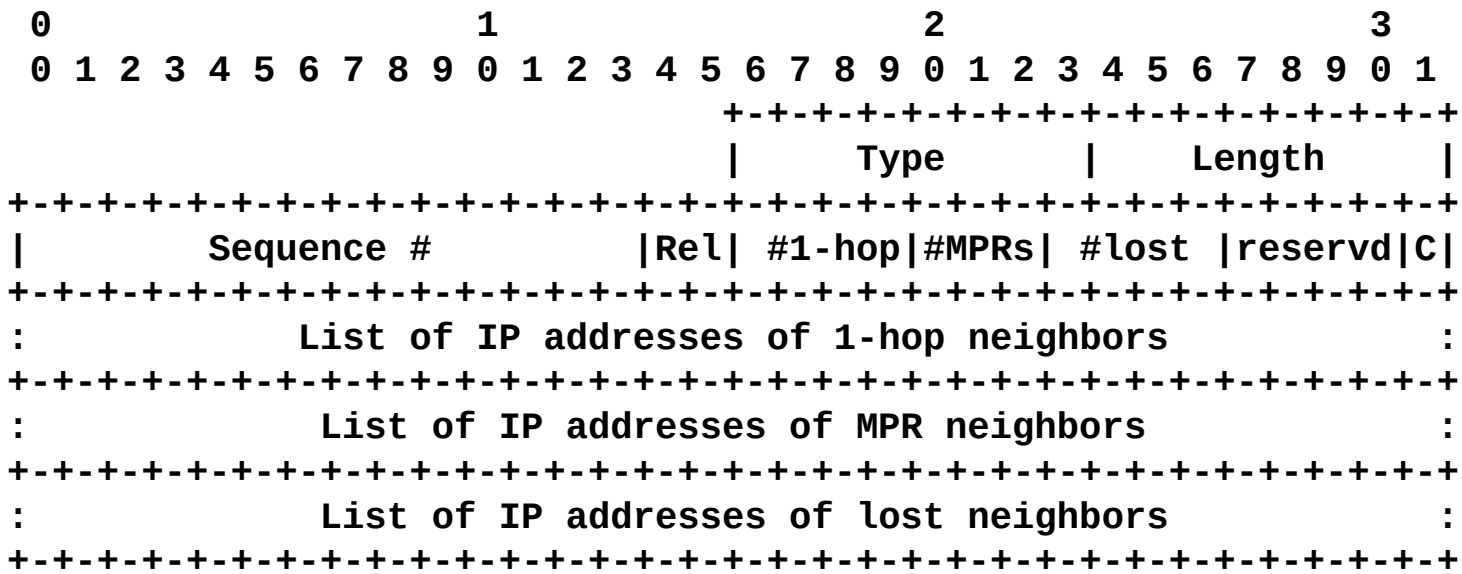
- First, pick the MPRs
  - Do it like OLSR, or …
  - It's O.K. to use the "greedy" algorithm with a few changes, or …
  - Any algorithm is O.K. – no constraint placed by SMURF
- Algorithm for getting a smaller CDS from MPRs:
  - Node joins the CDS if it has smallest ID in the its neighborhood
  - Node joins the CDS if it is an MPR of its neighbor that has the smallest ID.
- This CDS is _not_ "source specific"; see proof in INRIA Research Report 4597 (C. Adjih et al.)
- A node's ID is formed by concatenating its "reluctance" with its IP address. High reluctance ➔ less probable membership in CDS

SMURF full advertisement



- 'C' ==1 if the node is in the CDS
- A node in the list of 1-hop neighbors is, by agreement, NOT one of the selected MPRs

SMURF incremental advertisement



- A “lost” neighbor is not an MPR and not in the one-hop neighborhood
- A node in the list of 1-hop neighbors is NOT one of the MPRs
- All other neighbors, not listed, have the same status as reported in the last full advertisement (as indicated by the sequence #).

Issues/features connected with use of CDS

- Use of *all-manet-nodes* multicast address
- Fewer nodes in CDS → fewer redundant broadcasts
- Savings not very great in low-degree networks
- What if the two-hop neighborhood data isn't really correct?
- *Bundling* for multiple simultaneous messages?
- ICMP vs. UDP vs. IP vs. ??
- Should SMURF use a non-MPR-based algorithm?
- Only CDS nodes can be relays → non-optimal routing!
- CDS nodes in all routes → reduced CDS node battery lifetime!
- Unneeded for uncongested or transient networks?
  - Should use be adaptive, depending on conditions?

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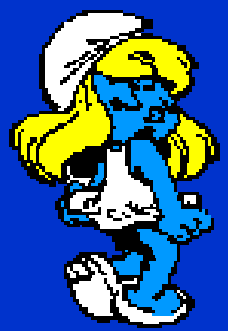

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