

ExOR: Opportunistic Multi-Hop Routing for Wireless Networks

The paper proposes a new protocol ExOR providing MAC and routing functionality for over wireless networks which provides the benefits of diversity routing on conventional radio hardware. The protocol results in increased end-to-end throughput and better network utilization over multi-hop wireless networks.

The basic technique proposed in the paper is to use hop-by-hop routing selection for packets. The sender broadcasts a batch of packets to the nodes with a list of forwarding nodes in priority. Each of the nodes who hear the transmission and are in the list buffer the batch of packets. Next, the highest priority forwarding node broadcasts the packet along with its batch map indicating the fragments it received and is thus able to forward. The remaining packets are then forwarded by subsequent lower priority nodes until 90% of packets are transmitted, the remaining are then transmitted using traditional routing.

The authors provide results of experiments performed on Roofnet. The results indicate that the effectiveness of ExOR increases with the number of hops. With single hops, ExOR achieves about 35% increase in throughput which is due to reduced resends when ACKs are lost in traditional routing. With multiple hops, ExOR provides 2 to 4 times more throughput.

PROS:

- ExOR provides dynamism in routing at each hop which can better react to variations in links
- ExOR enables the use of opportunistic scenarios where reception of packets is highly variable. Transmissions that reach unexpectedly far as well as those that reach unexpectedly short are better leveraged by ExOR
- ExOR's performance increases with the number of hops

CONS:

- ExOR imposed a strict TDMA type scheduling for medium access, this prevents the reuse of spectrum for simultaneously receiving packets are multiple receivers.
- Clearly, the coupling of routing and MAC creates problems in extending functionality of the protocol, for e.g. multicasting
- The evaluation of the protocol done by the authors is not completely fair given the fact that they have ignored the last 10% packets which need to be delivered via traditional mechanism.
- The authors haven't completely explored the optimal batch sizes for use, although they hint in their simulations that optimality is important in the interaction of throughput and batch size.