

A Quantitative Comparison of Ad Hoc Routing Protocols with and without Channel Adaptation

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Introduction

- Mobile ad hoc networks are wireless networks with no infrastructure.
- Every node takes part in routing, which is difficult when the topology is changing.
- Changing topology also means changing channel conditions.
- Most routing protocols do not take channel conditions into account.
- Can we?

Introduction

- Paper presents two new routing protocols that can adapt routes to channel conditions.
 - Bandwidth-Guarded Channel Adaptive (BGCA)
 - Receiver Initiated Channel Adaptive (RICA)
- BGCA and RICA can route around weak links if a better path exists.

Protocol Basics

- Most ad hoc routing protocols look for the shortest path from source to destination by hop count without considering channel conditions.
- Analogous to shortest path of a non-weighted graph.
- BGCA and RICA assign higher “hop counts” to weaker links.
- Analogous to shortest path of a weighted graph.

Protocol Basics

- Channel model uses ABICM for variable throughput.
- Four throughput levels used
 - A 250kbps 1 hop
 - B 150kbps 1.67 hops
 - C 75 kpbs 3.33 hops
 - D 50 kpbs 5 hops
- Hop counts assigned to links with different throughputs.

BGCA

- Local protocol – conservatively optimizes partial routes.
- When a downstream node senses channel degradation, it notifies the upstream node.
- The upstream node can do a local search to find a better route.
- If a better route is found, the old route altered.

RICA

- Global protocol – replaces entire routes.
- Receiver periodically broadcasts CSI-checking (Channel State Information) packets that collect the weighted hop count as they go.
- Sender receives CSI-checking packets that have traversed different routes.
- Sender picks the route with the shortest weighted hop count.

Results

- Better delay.
- Better throughput.
- Better packet delivery percentage.
- Higher routing overhead.
- Uses more energy.

Questions

- Assumption of CDMA and an adaptive physical layer.
 - How well can this be applied to other network scenarios?
- The optimal CIS-checking packet interval is determined for their environment.
 - Can this be made adaptive?
- Single network type.
 - What happens when a node moves through different networks?

References

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