To Repair or Not To Repair: Helping Ad Hoc Routing Protocols to Distinguish Mobility from Congestion

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Outline

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Introduction

• One of the difficult problems in mobile ad hoc networks involves distinguishing whether frame loss at the MAC layer has occurred due to mobility or congestion.

• Unfortunately, most ad hoc routing protocols have a major design flaw in that they react to all frame loss as a sign of mobility, without any regard to congestion. (Likes AODV & DSR)

• In this paper, we solve this problem by designing Mobility Detection Algorithm, that uses MAC-layer statistics to distinguish between mobility and congestion-based losses.
Related Works

• AODV-LR

Propagation of RREQ
Propagation of RREP
Data flow
Related Works

• Dynamic Source Routing (DSR)
Related Works

- Congestion
Proposed Scheme

- **MDA (Mobility Detection Algorithm)**

```plaintext
1  credibility = threshold;
2  if transmission failure to node X then
3      if received CTS from X during attempt then
4          credibility = 0;
5      else
6          timer.set(t, X);
7          if credibility == threshold then
8              notify routing protocol node X has moved;
9      end
10  end
11 end
12 if timer for node Y expires then
13    credibility = min(threshold, credibility++);
14 end
15 if hear from any node Z then
16    if timer.isset(Z) then
17        timer.cancel(Z);
18        credibility = 0;
19    end
20 end
```
Proposed Scheme

- Proposed Scheme

Data flow

After 2 seconds (Timer Expires)

Credibility++
If credibility == threshold, notify routing protocol e has moved. (Start route repair)
Proposed Scheme

- Proposed Scheme

Data flow

If b hear from e:

Credibility = 0 and
Cancel timer for node e.
Simulation

• Simulation Environment
  – Simulator: ns-2 network simulator
  – Area: 1000m × 1000m
  – Node: 100 nodes
  – Mobility: Random Waypoint
  – Node Transmission Range: 250m
  – Simulation Time: 600 s
  – Node Speed: 20m/s
  – Pause Time: 10s
  – Simulation Result: Average of 5 rounds simulation
Simulation

- Random Scenario with ATP flows over DSR
Simulation

(b) Routing Overhead
Simulation

Throughput (Kbps)

Number of Senders

(c) Throughput
Simulation

- Random Scenario with ATP flows over AODV

(a) Correct Route Failure Decisions
Simulation

(b) Routing Overhead
Simulation

(c) Throughput
Simulation

- Mobile Random Scenario with ATP flows
Conclusion

• In this paper they have demonstrated the benefits of using Mobility Detection Algorithm to determine whether a lost frame in a wireless network is due to mobility or congestion.

• By determining when a lost frame is truly a sign of a route failure, MDA significantly reduces routing overhead and can increase throughput.

• In future work, maybe they can improve MDA to detect frames being lost due to interference from other technologies.