A Modified Approach to Dynamic Source Routing in Mobile Ad-Hoc Networks

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Outline

- Motivation
- Original dynamic source routing
- Our modifications
- Performance comparison
- Related work
- Conclusion
- Future work

Motivation

- Dynamics of ad-hoc networks
- Efficient alternate route discovery
  - Alternate routes should be available before they are required
- Can we reuse existing routes?
  - Likely to be valid
  - Bandwidth reservation
  - Likely to provide requested bandwidth
- Do we have multiple alternate routes?
  - Load balancing among alternate routes

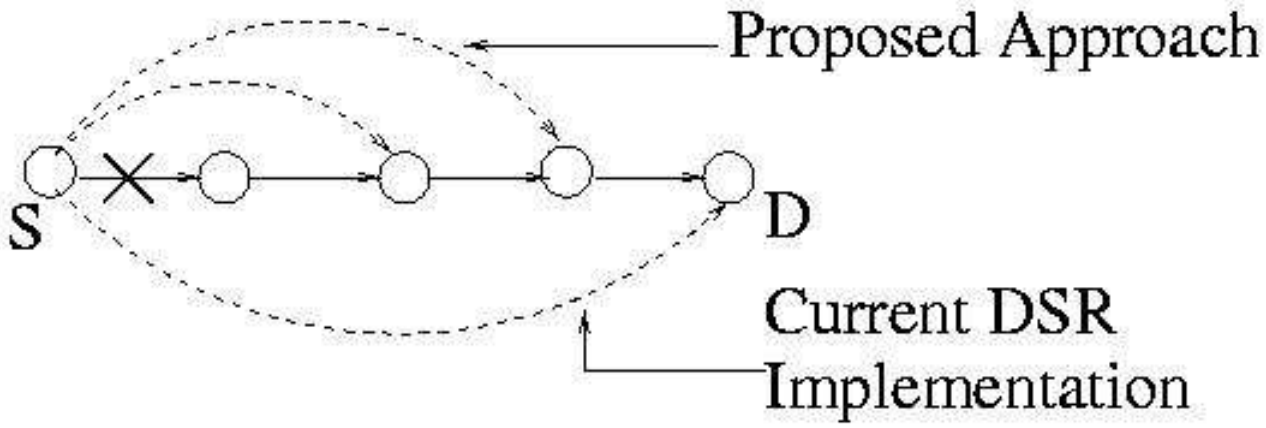
Original Dynamic Source Routing

- Route discovery
  - Route request, route reply packets
- Route maintenance
  - Route error packets

Current Modifications to DSR

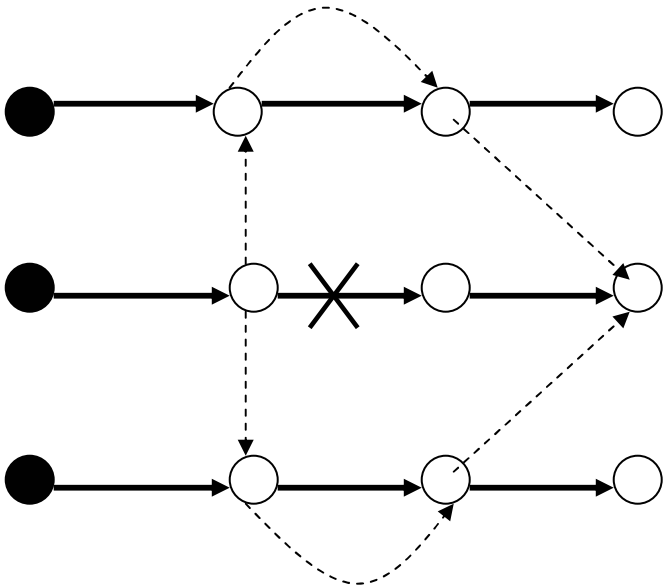
- *Use of bidirectional routes*
  - RTS/CTS/DATA/ACK
- *Nodes in promiscuous mode*
- *Use of cache for alternate routes*
- *Snooping into routes while forwarding*

Modification 1: Reuse of Existing Routes



- Why?
  - Likely to be valid
  - Bandwidth reservation
  - Likely to provide requested bandwidth

Modification 2: Load Balancing



- Minimize interference with other flows
- Original flow has priority over rerouted flows

Load Balancing (Continued)

- Use multiple alternate routes in round robin order
- Caching updates
  - Snoop into a source route to determine a route to the source
  - Preserve routes in cache that are currently in use

Modification 3: Route Reservation

- *Route Request* packets
  - specify bandwidth required
  - are forwarded only if requested bandwidth is available
  - need to reach the destination
- Timeouts used to teardown reservations
  - route reply timeout
  - data start timeout
  - data timeout

Modification 4: Implicit Route Reservation on Alternate Routes

- Cannot reserve the bandwidth on all alternate routes that may be used
- Cannot explicitly reserve bandwidth
- Reserve some bandwidth to be shared by rerouted flows

- ✓ Observation: At least 2 alternate routes available in most situations
- ✓ 1/3rd bandwidth reserved for alternate flows

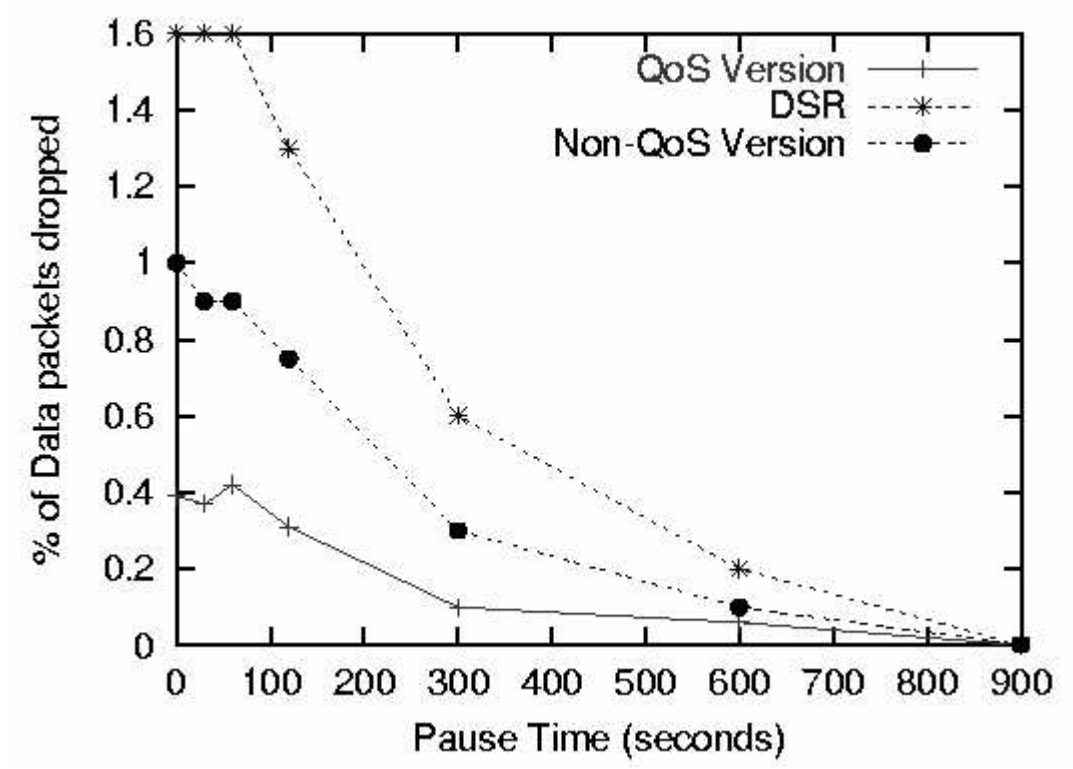
Performance Comparison

- 50 nodes
- 900 seconds simulation time
- Link bandwidth 2Mbit/sec
- Random waypoint model
- Node speed: Uniformly distributed between 0 and 20 meters/sec
- Area: 1500m x 300m, 1800m x 1000m
- Used *ns* (ns 2.1b8a)

Performance Comparison (Continued)

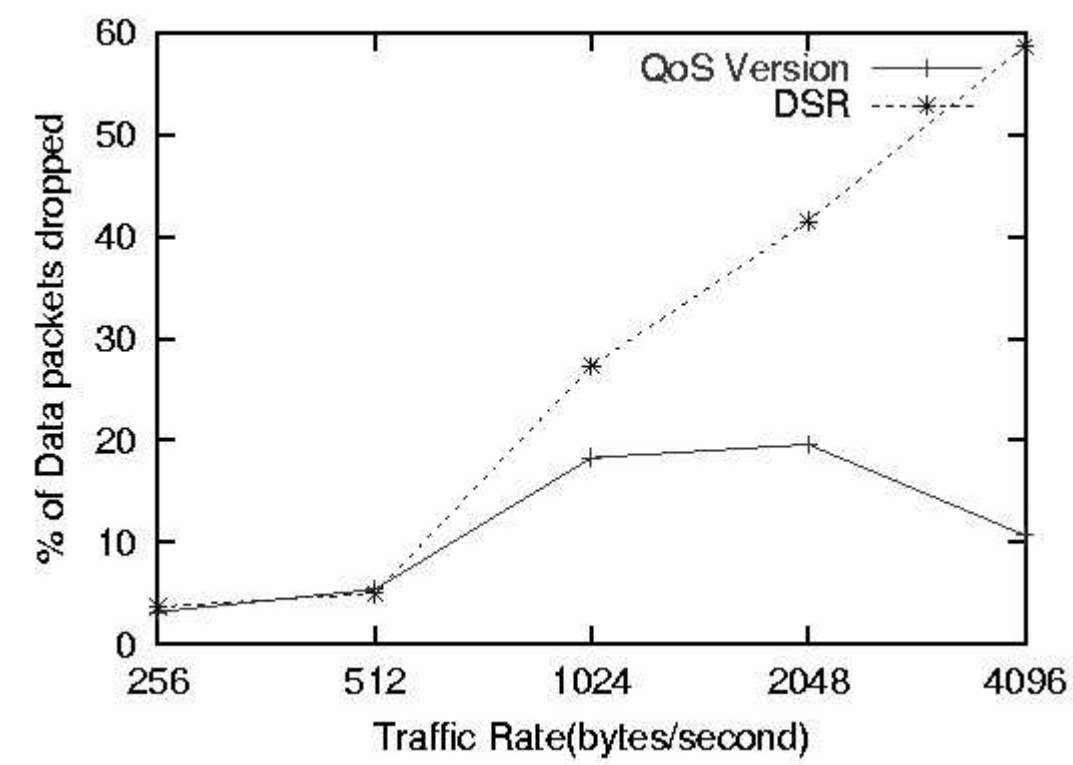
- Our QoS version incorporates all modifications
- Our non-QoS version incorporates all modifications except those for explicit/implicit route reservations

Performance Comparison (Continued)



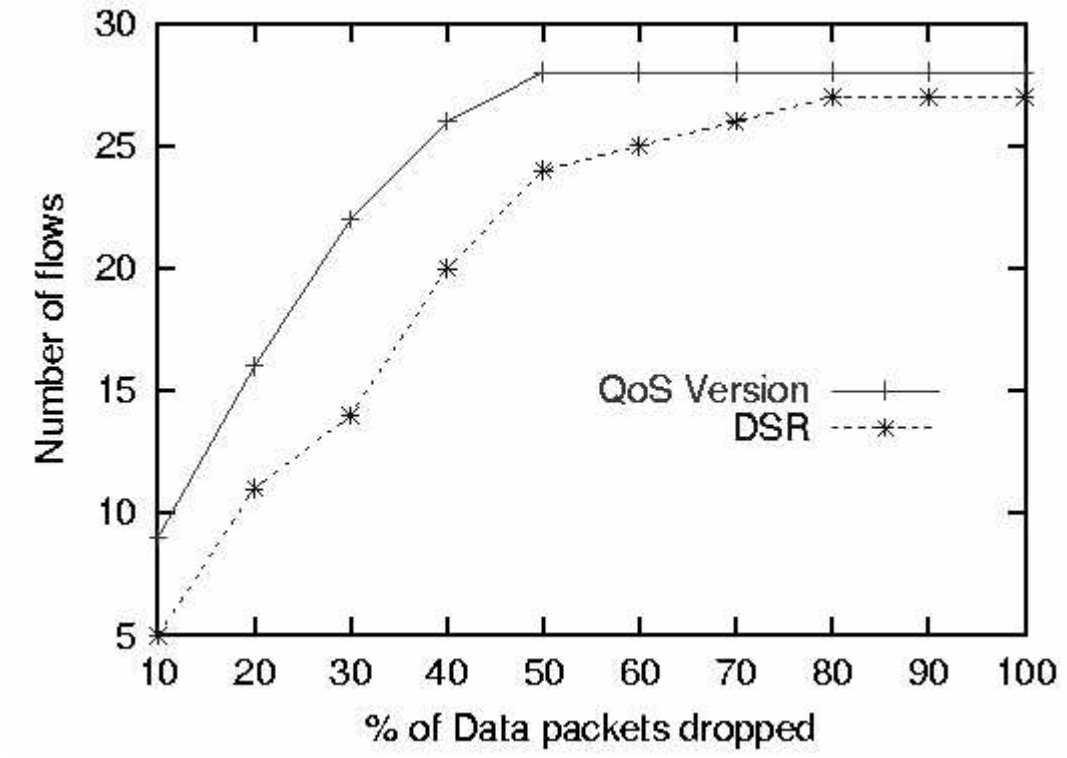
Number of sources: 10, Data Rate: 256 bytes/sec

Performance Comparison (Continued)



Pause time: 600 seconds, 20 sources, 30 data flows

Performance Comparison (Continued)



Data Rate: 1024 bytes/sec, 600 sec. pause time, 20 sources, 30 data flows

Related Work

- Neighborhood Aware Source Routing
- Alternate Path Routing
- Dynamic Load-Aware Routing
- Load Sensitive Routing
- INSIGNIA
- CEDAR

Conclusion

- Reuse of existing routes
- Load balancing
- Route reservation
- Implicit reservation on alternate routes
- Performance improvements over DSR for both low/high data rates, and low/high mobility

Future Work

- Varying the implicit reservations on alternate routes dynamically
- Adding FEC to our protocol