Landmark Guided Forwarding

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Outline

- The 802.11 access technology
- Self-organising multi-hop wireless network
- The constraints
- The challenge
- Related work
- The LGF solution
- Results and conclusion

The 802.11

- Operating at unregulated Giga Hertz spectrum
- Data transfer rate: 108 Mbps
- Range: 250 meters

- Mode of connection
  - Infrastructure
    - One or more wireless access point
    - Extending coverage through MobileIP
  - Ad Hoc
    - No Infrastructure
    - Spontaneous setup

Self-organising multi-hop

802.11 Ad Hoc mode

- Fast setup
- Infrastructure-less

- Self-organising multi-hop
  - Mobile Ad Hoc network
  - Mesh network
  - Sensor network

The Constraints

- Single radio channel
  - CSMA/CA uses RTS/CTS/DATA/ACK
  - Forwarding node needs to compete with the last hop and next hop to gain access to the radio channel.
- Updated state vs routing overheads
  - routing overheads > contention at MAC layer

The Challenge for MANET

"To provide a robust packet delivery that can sustain with arbitrary mobility, by efficient use of resources from the network."

Meng

Related Work

- Topological based
  - Proactive
    - Periodic update of routing table
    - Forwarding by the shortest path algorithm
  - Reactive
    - Use flooding technique to locate the destination
    - Forwarding by
      - Soft state
      - Source Path
- Position based
  - Assumption
    - Every node knows its own location
    - Distributed Location service
  - The Algorithm
    - Geodesic proximity
    - Neighbour updates
    - Forwarding
      - greedy
      - traverse along constructed planar graph

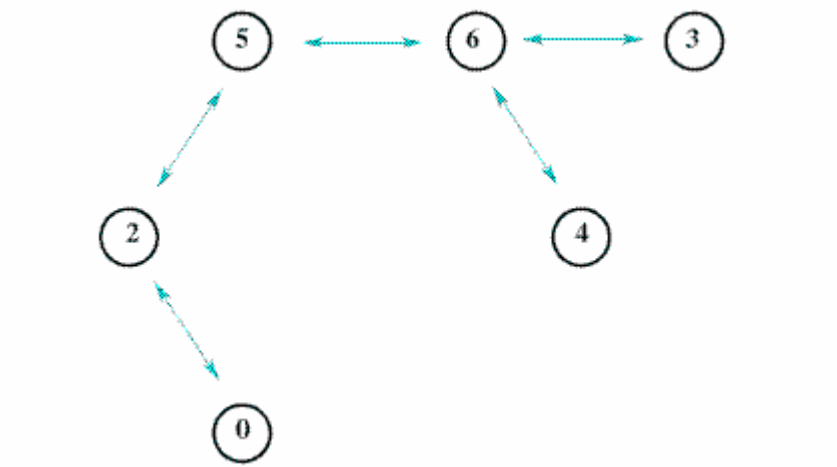
Related Work

	Robust Packet delivery	Efficient use of network resource
Proactive Topology	NO	NO
Reactive Topology	YES	NO
Position Forwarding	NO	YES

The LGF Solution

- Restrictive Hybrid Route advertisement
  - Exchange topology and position states within a neighbourhood of a few hops.
- Forwarding Algorithm
  - Apply the shortest path algorithm If the destination can be found in the routing table.
  - Otherwise, identify a node that is the closest to the destination, and apply the shortest path algorithm to it.

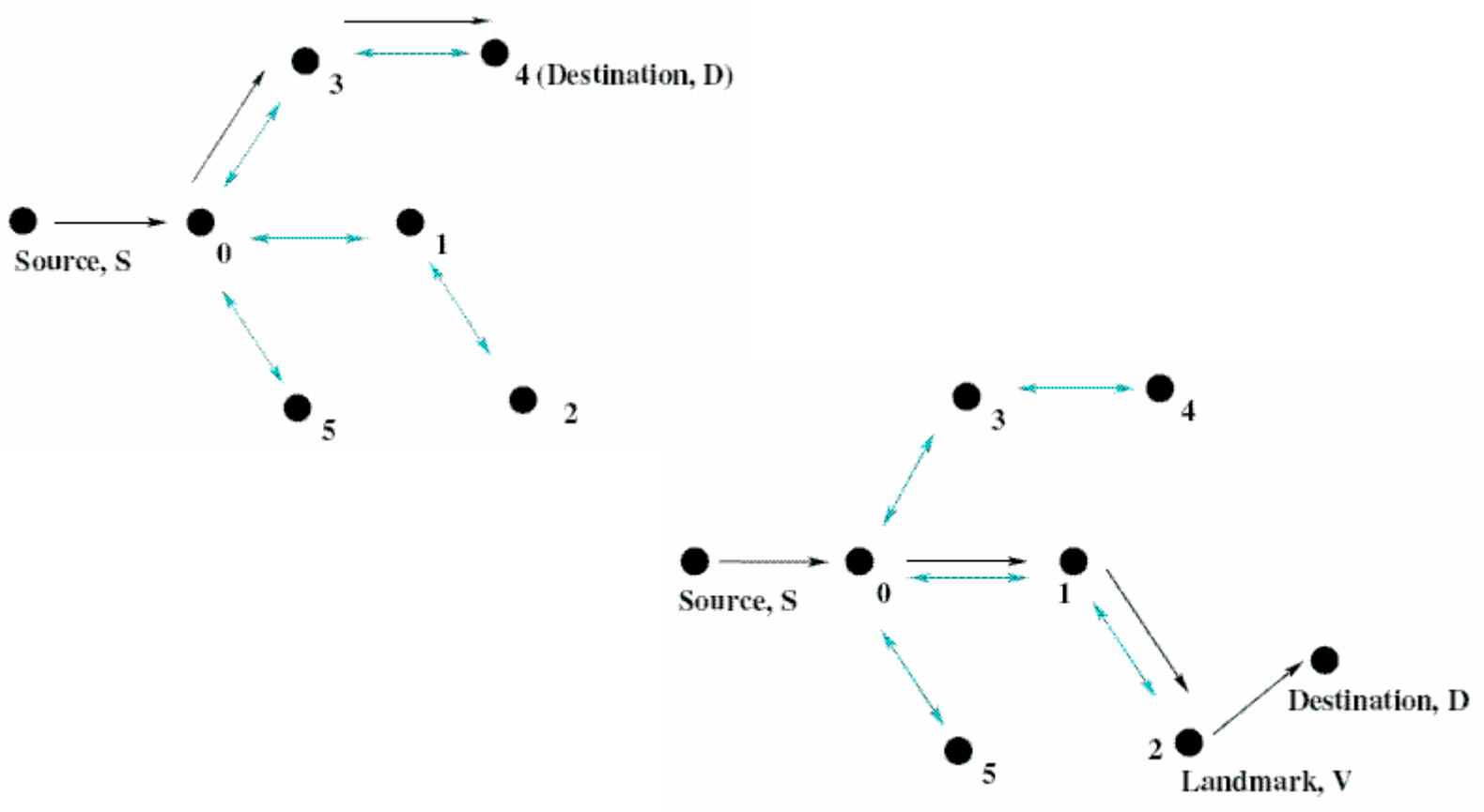
The LGF Solution



Dst	Next Hop	Metric	x	y	z
0	2	2	300.00	2.00	0.00
2	2	1	225.00	132.00	0.00
3	6	2	600.00	262.00	0.00
4	6	2	525.00	132.00	0.00
5	5	0	300.00	262.00	0.00
6	6	1	450.00	262.00	0.00

Restrictive Hybrid Route Advertisement

The LGF Solution



Landmark Guided Forwarding

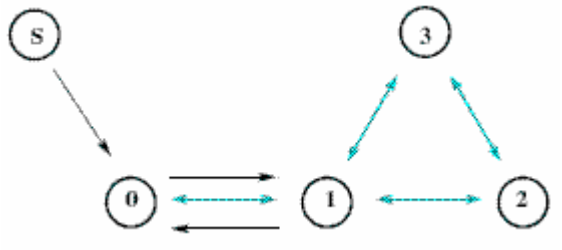
The LGF Solution

- Link failure handling
  - Drop packet immediately
- Adaptive Neighbourhood update
  - Use the distance to the furthest one hop neighbour to regulate the update frequency

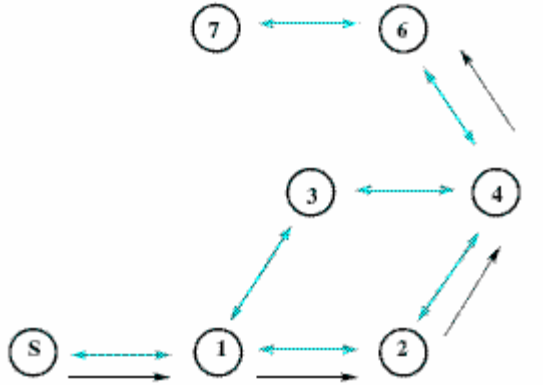
The LGF Solution

Systematic Exploration

- Source path
  - a trail for roll back
  - detect loop formation
- Soft state
  - Mark visited link

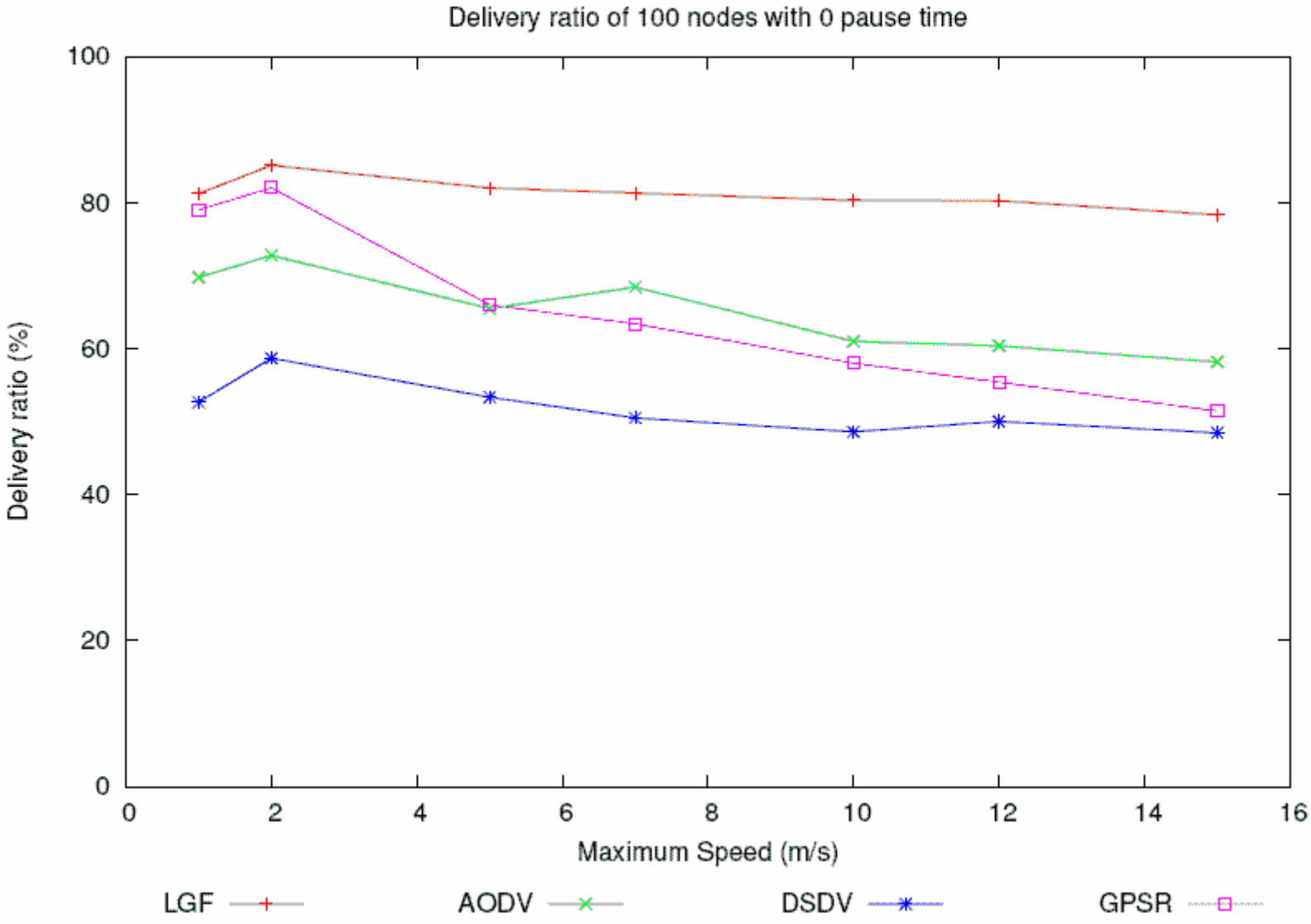


Dead-end Detection and Rollback

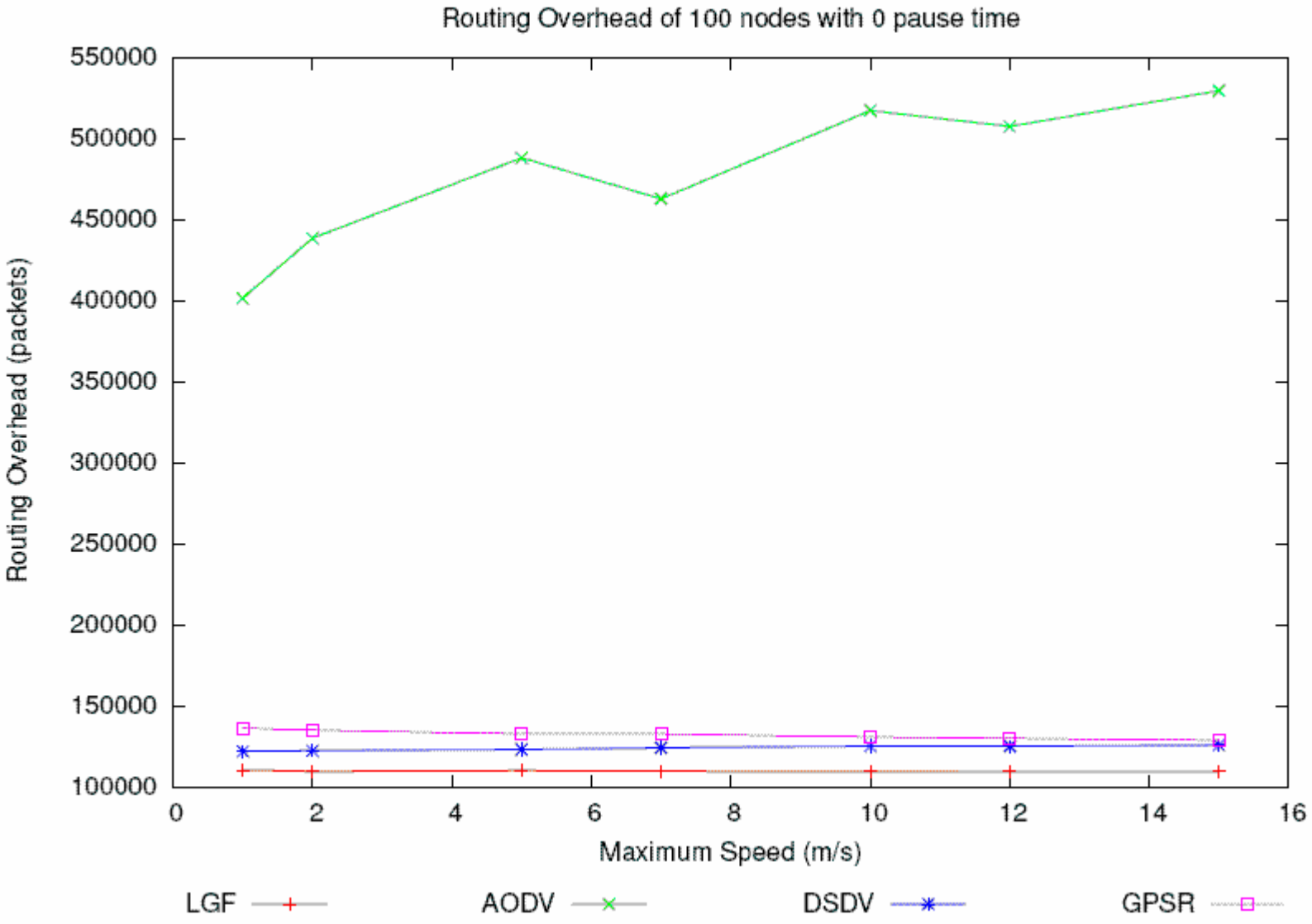


Loop Avoidance

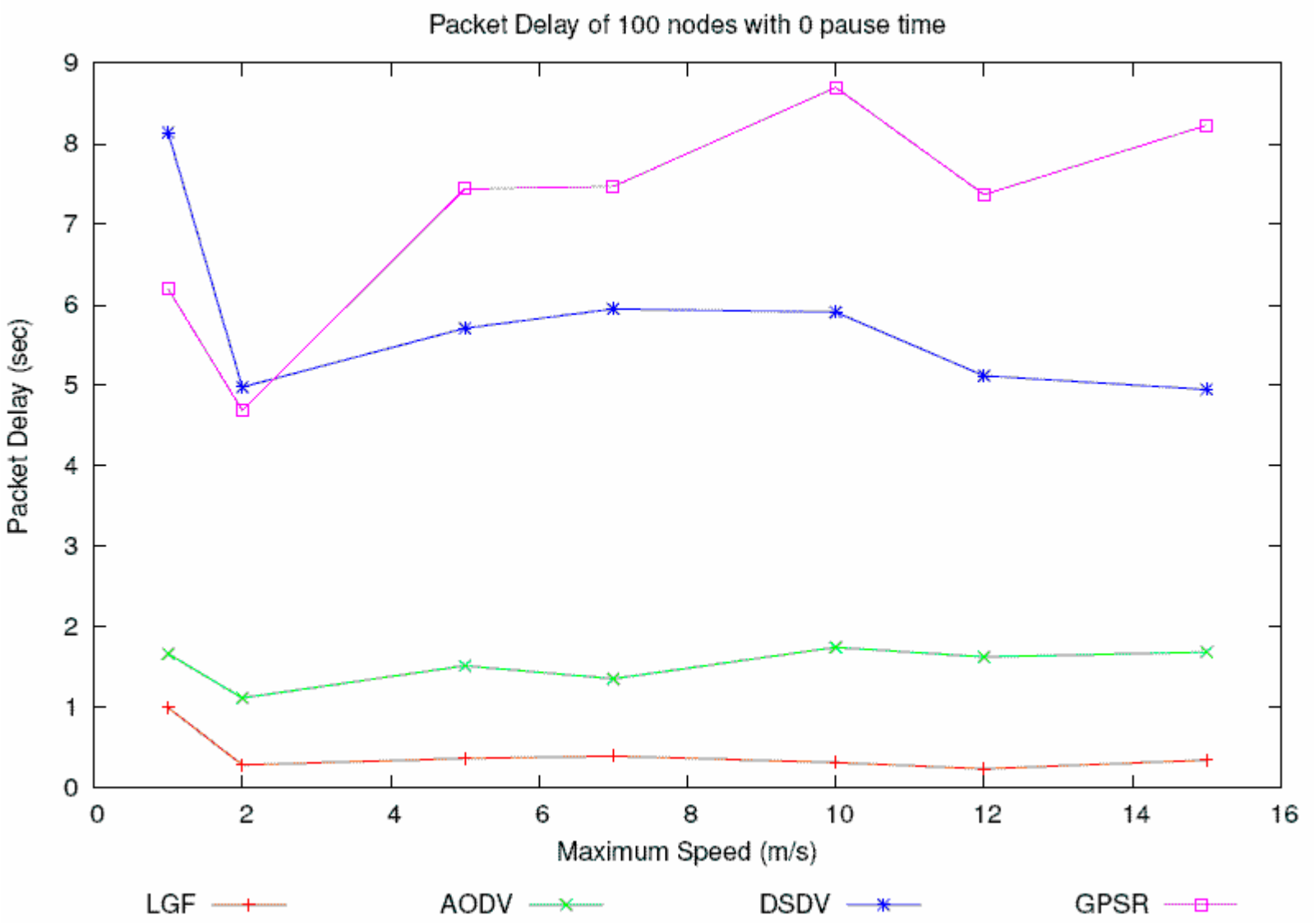
Results- varying max. velocity



Results-varying max. velocity



Results-varying velocity



Conclusion

- Restrictive hybrid state scale well.
- Packet delivery is robust.
- Average packet delay is low.

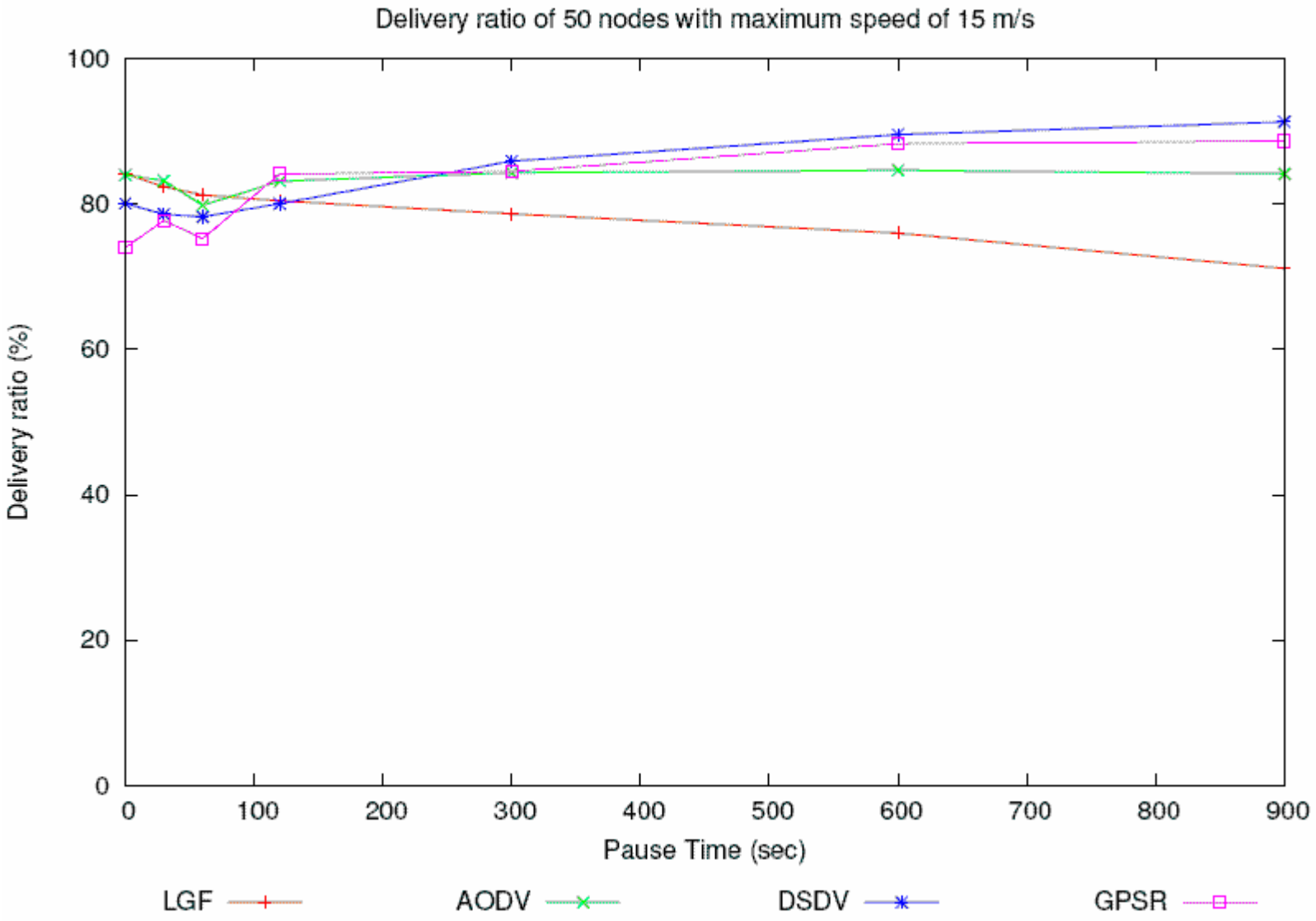
"Local optimal routing sidestep the constraint of establishing global optimal path, which generally used by existing MANET protocols."

Thank You

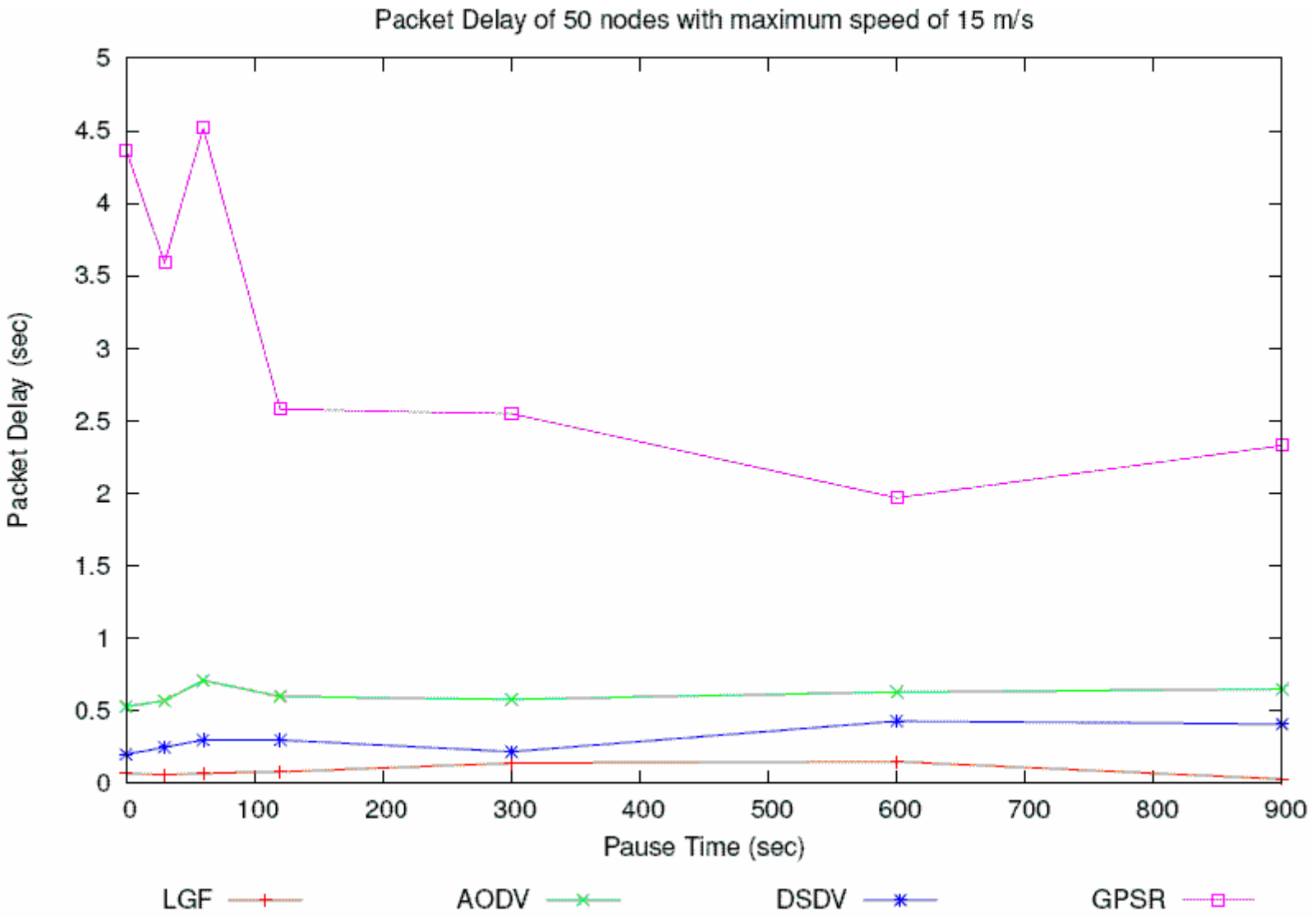
Results

- Simulations
  - with varying pause time
    - 50 nodes
    - 1500x 300 meter square
  - with varying maximum velocity
    - 100 nodes
    - 1500 x 500 meter square

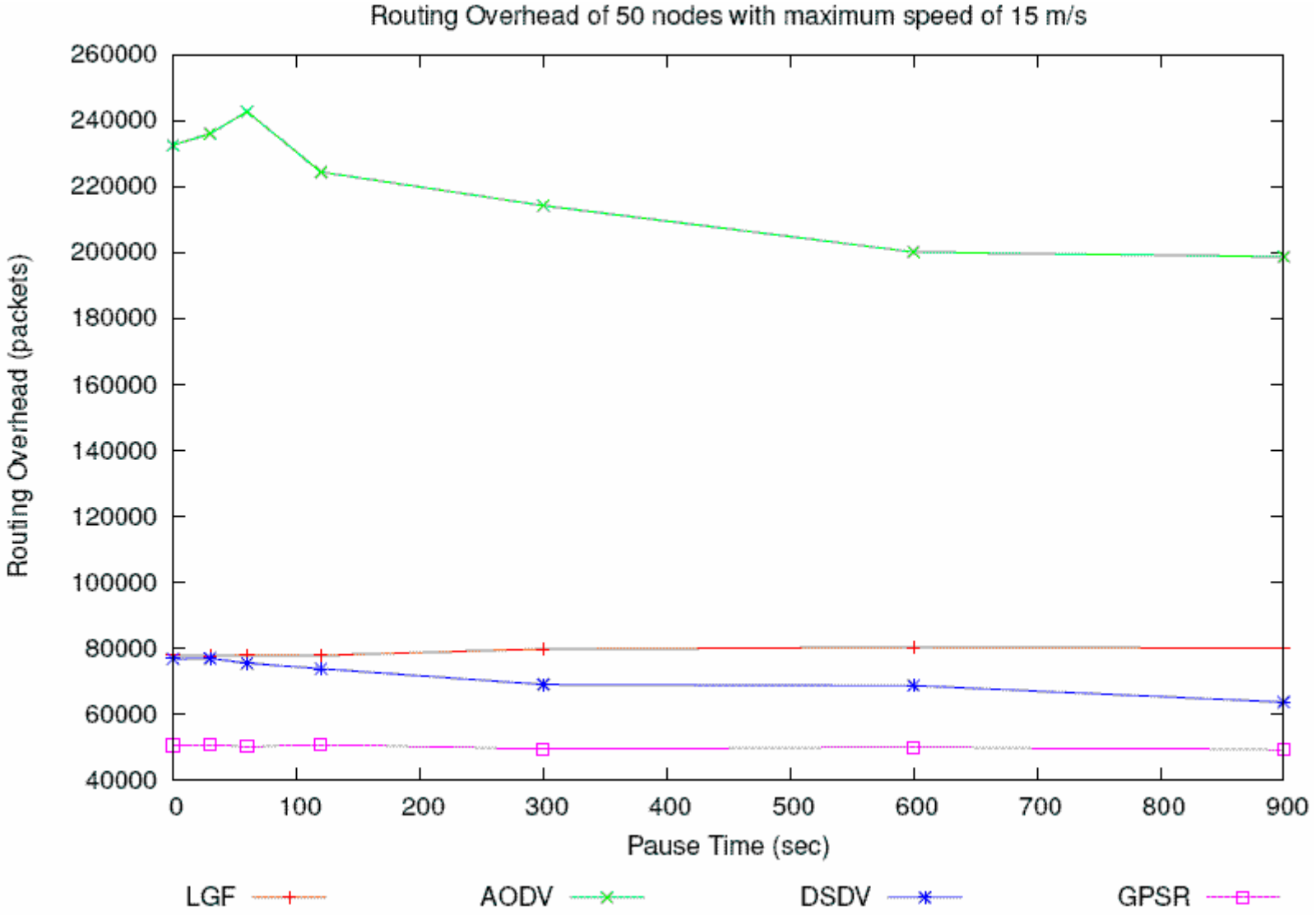
Results- varying pause time



Results- varying pause time



Results- varying pause time



Results- path length