

# Evaluation of AODV, DSR and DSDV Routing Protocols using NS2 Simulator

Group Member: Weidong Guo, Yuxiang Liu, Chiyao Shen, Yue Li, Shujun Bian

# Outline

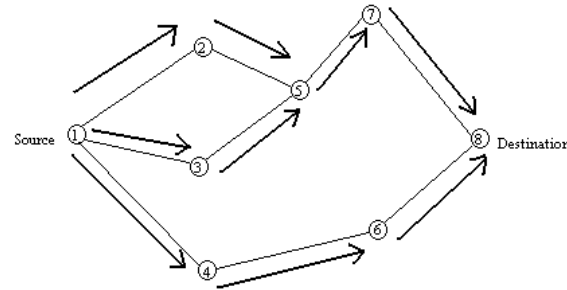
- Introduction
- AODV, DSR and DSDV Protocols
- NS-2 Simulator
- Experiment Approach
- Main Results
- Analysis and Conclusion

# Introduction

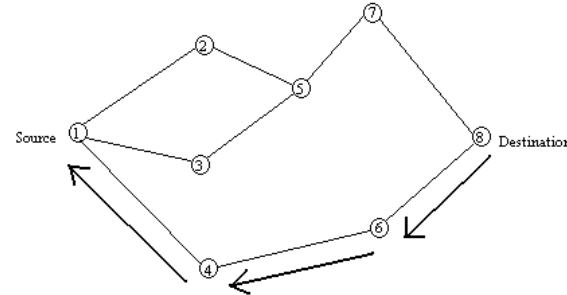
- Wireless ad-hoc network (WANET)
- Mobile ad-hoc networks (MANET)
  - Ad hoc On-Demand Distance Vector (AODV) Routing
  - Dynamic Source Routing (DSR)
  - Destination -Sequenced Distance-Vector (DSDV) Routing
- NS-2 simulator

# AODV Protocol

- Sender tries to find destination:
  - broadcasts a Route Request Packet (RREQ).
- Nodes maintain route cache and use destination sequence number for each route entry
- State is installed at nodes per destination
- Does nothing when connection between end points is still valid
- When route fails
  - Local recovery
  - Sender repeats a Route Discovery



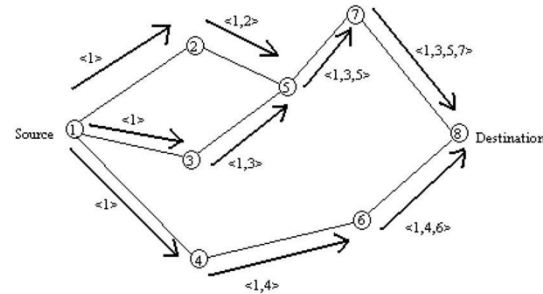
(a) Propagation of Route Request (RREQ) Packet



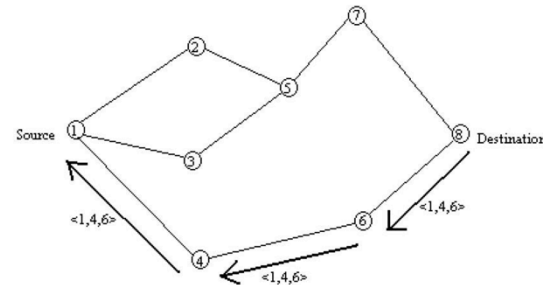
(b) Path taken by the Route Reply (RREP) Packet

# DSR Protocol

- Two mechanisms: Route Maintenance and Route Discovery
- Route Discovery mechanism is similar to the one in AODV but with source routing instead
- Nodes maintain route caches
- Entries in route caches are updated as nodes learn new routes.
- Packet send carries complete, ordered list of nodes through which packet will pass
- When sending the packets:
  - Sender checks its route cache, if route exists, sender constructs a source route in the packet's header
  - If route expires or does not exist, sender initiates the Route Discovery Mechanism



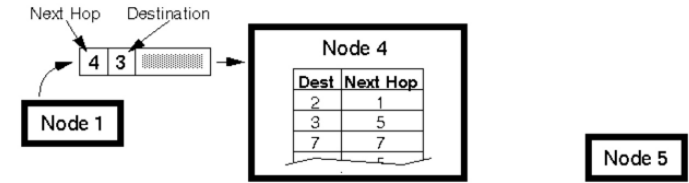
(a) Building Record Route during Route Discovery



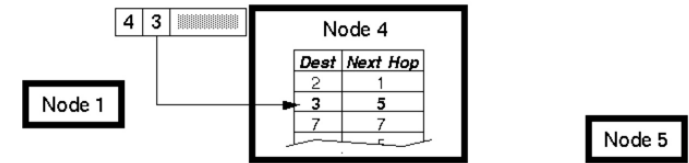
(b) Propagation of Route Reply with the Route Record

# DSDV Protocol

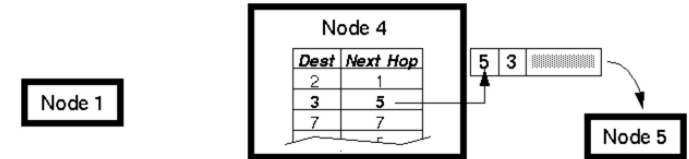
- DSDV is Proactive (Table Driven)
  - Each node maintains routing information for all known destinations
  - Routing information must be updated periodically
  - Traffic overhead even if there is no change in network topology
  - Maintains routes which are never used
- Keep the simplicity of Distance Vector
- Guarantee Loop Freeness
  - New Table Entry for Destination Sequence Number
- Allow fast reaction to topology changes
  - Make immediate route advertisement on significant changes in routing table
  - but wait with advertising of unstable routes (damping fluctuations)



a) Node 1 transmits packet to node 4 for forwarding



b) Node 4 looks up the destination in its routing table



c) Node 4 retransmits the packet to the next hop

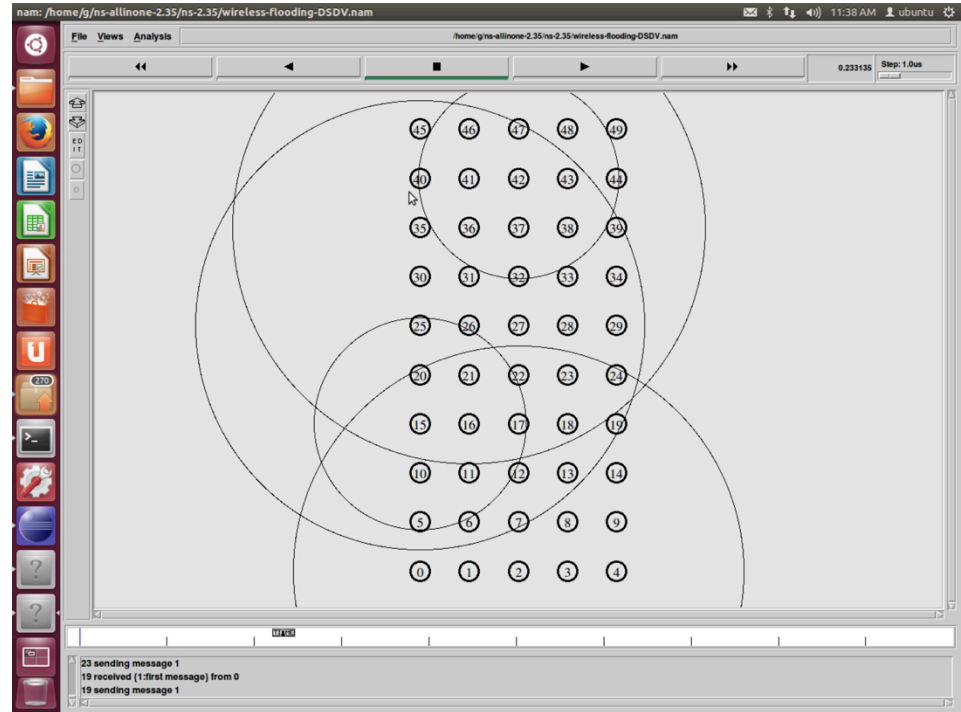
# NS-2 Simulator



- NS-2 is a discrete event simulator targeted at networking research. It provides substantial support for simulation of TCP, routing, and multicast protocols over wired and wireless (local and satellite) networks.

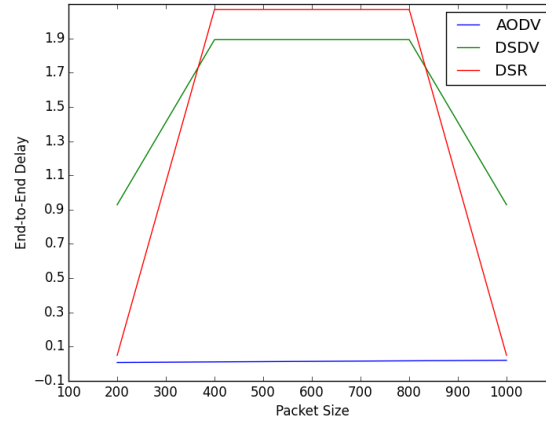
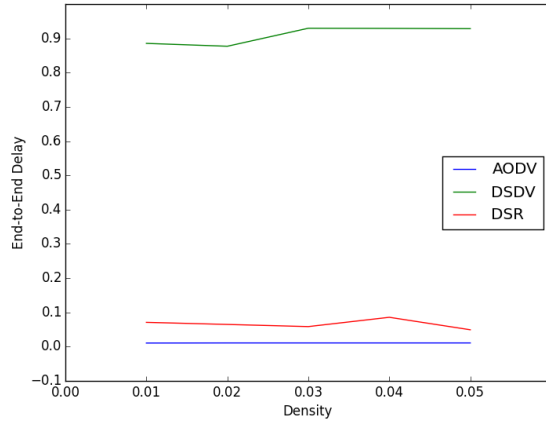
# Experiment Approach

- 1. Install NS-2.34
- 2. Install Eclipse and CDT plugin
- 3. Modify configuration files and put the whole source code into Eclipse as a C++ project
- 4. Modify tcl files to deploy nodes, set environment, set protocols and set trace file.
- 5. Use nam to visualize the process of the experiment.
- 6. Analyze the generated trace files and extract useful data from them.



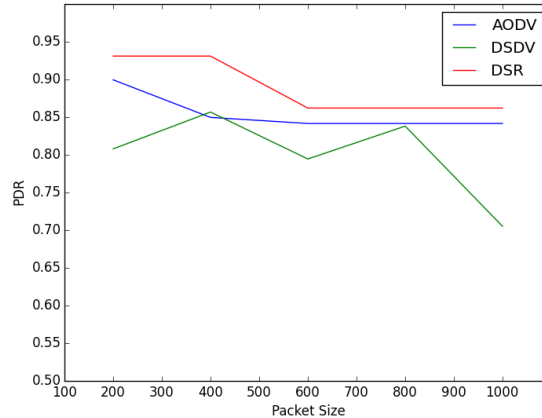
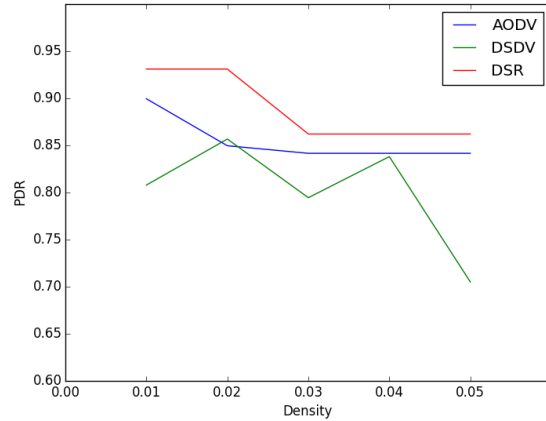


# Main Results - Delay



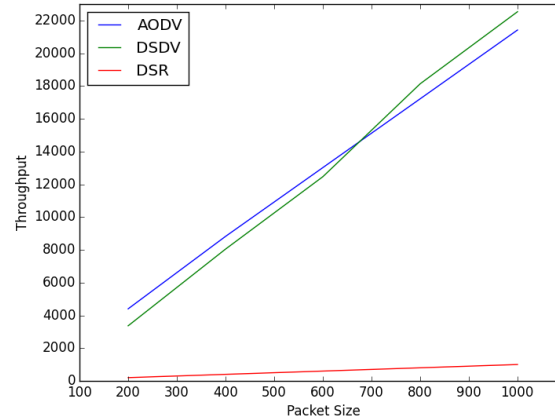
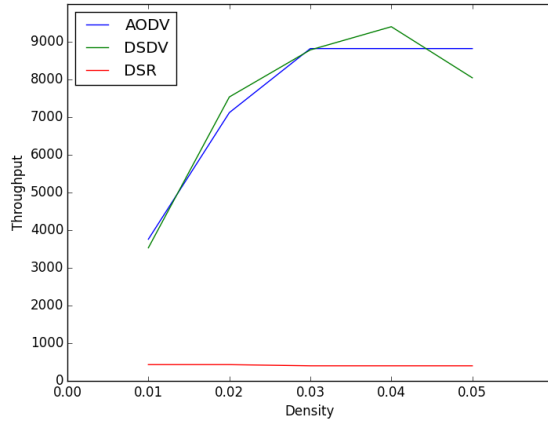
- AODV performance is the best considering its ability to maintain connection by periodic exchange of data's.

# Main Results - Packets Delivery Rate



- As it can be seen from the above results, Table driven routing protocol(DSDV) has lower pdr than reactive protocols(AODV,DSR). Among these three protocols DSR is better pdr than AODV and DSDV.

# Main Results - Throughput



- DSDV is huge control overhead because its periodic routing table updates in the network. Then AODV is slightly lower than the DSDV and DSR have lower control overhead than two other routing protocols.

# Analysis and Conclusion - AODV

## Advantage:

- The main advantage of this protocol is that routes are established on demand and destination sequence numbers are used to find the latest route to destination. The connection setup delay is less.

## Disadvantage:

- One disadvantage is that intermediate nodes can lead to inconsistent routes if the source sequence number is very old and the intermediate nodes have a higher but not the latest destination sequence number, thereby having stale entries. Also multiple Route Request packets in response to a single Route Request packet can lead to heavy control overhead.

# Analysis and Conclusion - DSR

## Advantage:

- This protocol used a reactive approach which eliminates the need to periodically flood the network with table update messages which are in table-driven approach. The intermediate nodes also utilize the route cache information efficiently to reduce the control overhead.

## Disadvantage:

- The route maintenance mechanism does not locally repair a broken link. Stale route cache information could also result in inconsistencies during the route reconstruction phase.

# Analysis and Conclusion - DSDV

## Advantages:

- Simple (almost like Distance Vector)
- Loop free through destination seq. numbers
- No latency caused by route discovery

## Disadvantages:

- No sleeping nodes
- Overhead: most routing information never used

# References

- Mohapatra, S., and P. Kanungo. "Performance analysis of AODV, DSR, OLSR and DSDV routing protocols using NS2 Simulator." Procedia Engineering 30 (2012): 69-76.
- [http://www.ijarcce.com/upload/2013/december/IJARCCE2C-rajesh\\_COMPARATIVE-FINAL.pdf](http://www.ijarcce.com/upload/2013/december/IJARCCE2C-rajesh_COMPARATIVE-FINAL.pdf)
- [http://www.cse.wustl.edu/~jain/cis788-99/ftp/adhoc\\_routing/](http://www.cse.wustl.edu/~jain/cis788-99/ftp/adhoc_routing/)
- <http://ghost.lesiuuk.org/AdHoc/adhoc/>

That's all :D  
Thank you~