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"Performance Comparison of AODV and OLSR in urban VANET scenarios"

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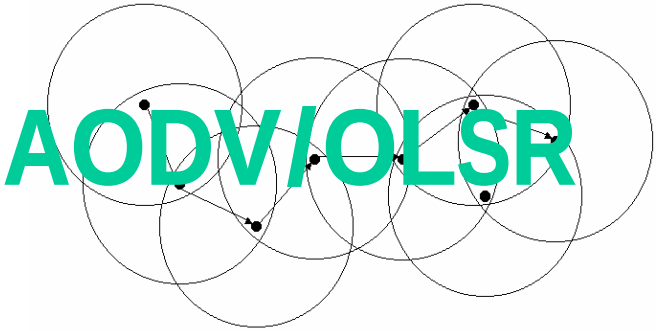

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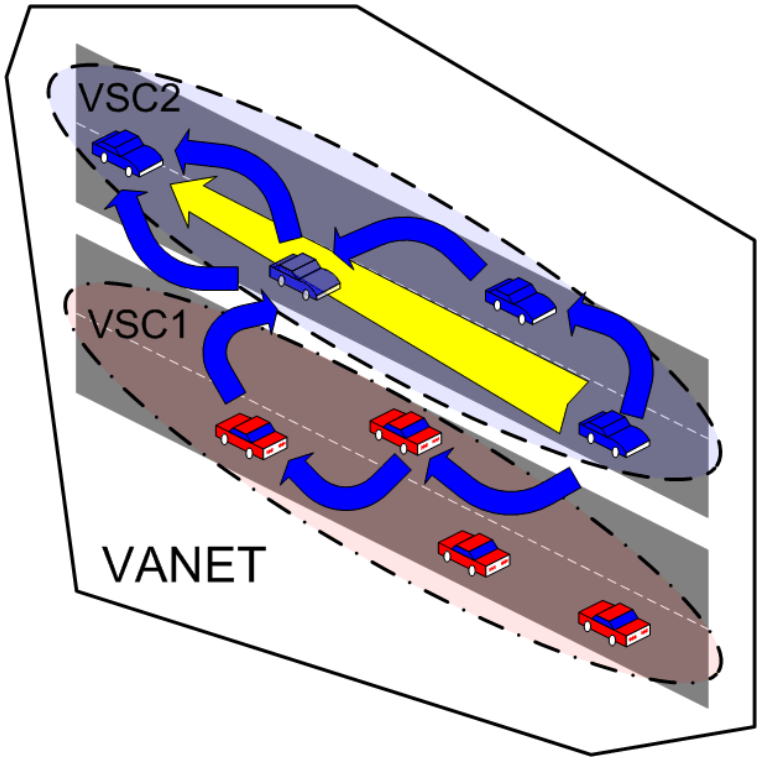
Introduction

- The guideline concept in COM2REACT is the Virtual Sub-Centre (VSC).



- The VANET (Vehicular Ad-hoc Network) is the communication layer that supports all VSC functions. This network is composed of different vehicles communicating between themselves, using the V2V communication system.

VANETs

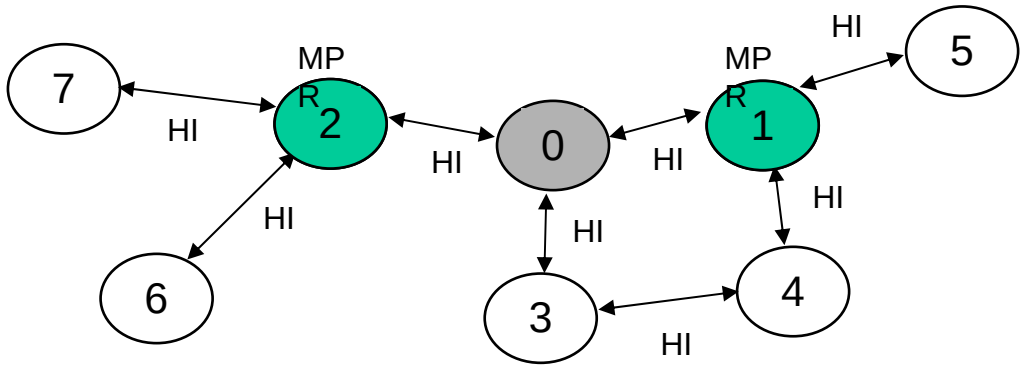
- Specialisation of mobile ad-hoc networks (MANETs).
- Common characteristics of MANETs are present in VANETs too.
  - Multihop communication, dynamic topology, lack of a central entity, auto-configuration and self-healing are the principal issues of these networks.
- However, automotive ad-hoc networks behave in different ways than MANETs.
  - Constraints on mobility and high speeds.
  - Rapid but somewhat predictable topology changes.
  - Small effective network diameter.
  - Driver behaviour.

Routing protocols

- A **routing protocol** specifies how different nodes in a network communicate with each other to spread information that allows them to select routes between them.
- MANETs routing protocols Classification:
  - Attending at the moment when the table route is calculated: Reactives, proactives, hybrids.
  - Attending on route selection strategies or routing metrics: Shortest path, multipath, link-reversal, link stability, distance-vector, geographical…
  - Attending on network structure: Uniform, flat, hierarchical, clustering…
- AODV and OLSR are well-know MANET protocols, but could they be used for VANETs?

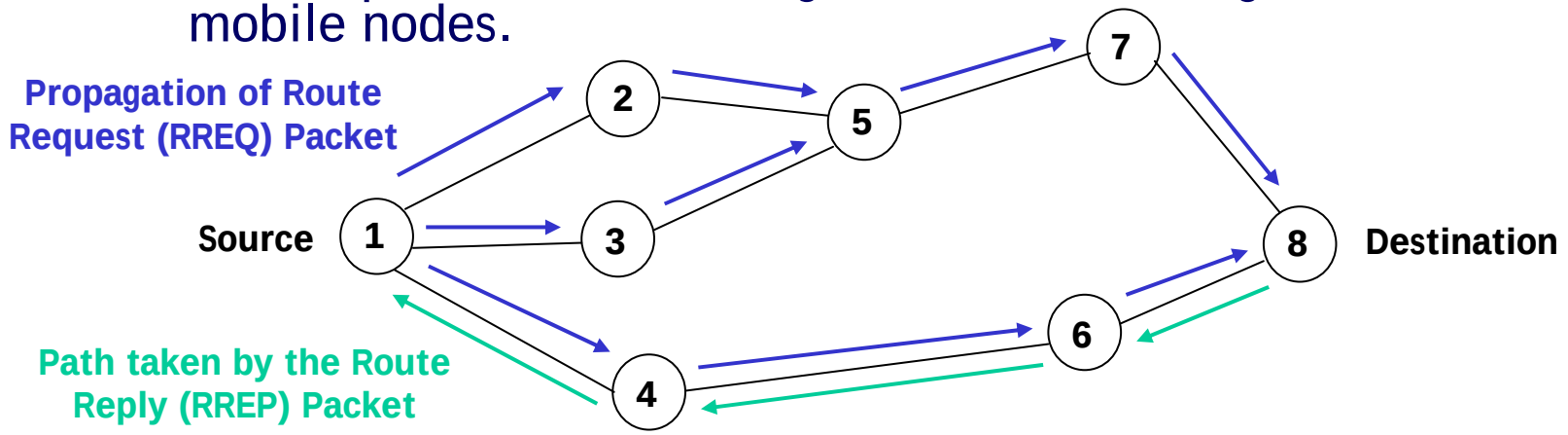
OLSR

- OLSR: Optimized Link State Routing.
  - Proactive Protocol.
  - Works in a completely distributed manner.
  - Hello messages are used to establish links and select MPRs.
  - Multipoint relays (MPRs) allow efficient flooding of Topology Control (TC) messages to all nodes.
  - Only MPR nodes are responsible for forwarding control traffic.



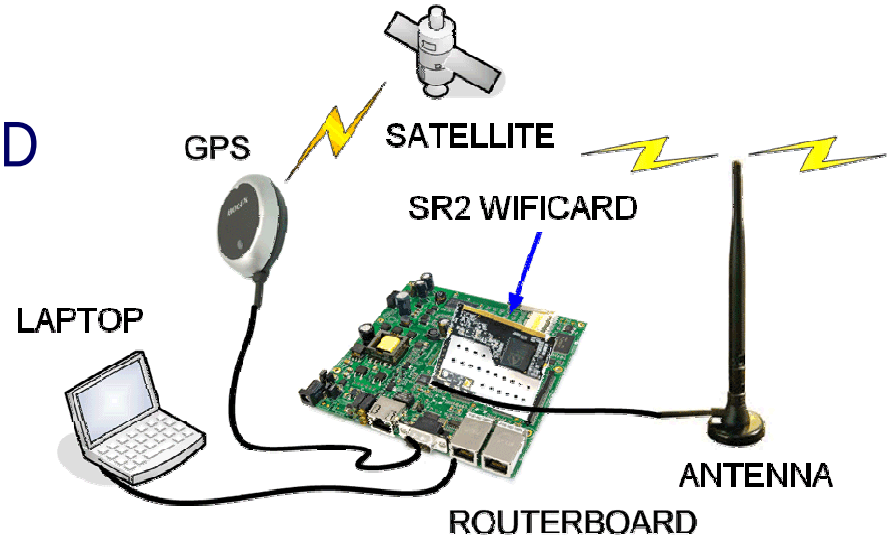
AODV

- AODV: Ad-hoc On-demand Distance Vector
  - Reactive protocol, it is an on demand algorithm.
  - It maintains the routes as long as they are needed by the sources.
  - Additionally, AODV forms trees which connect multicast group members. The trees are composed of the group members and the nodes needed to connect the members.
  - Its main advantage is that it uses bandwidth efficiently, minimizing the network load for control and data traffic.
  - It is loop-free, self-starting, and scales to large numbers of mobile nodes.



802.11b based V2V communication module

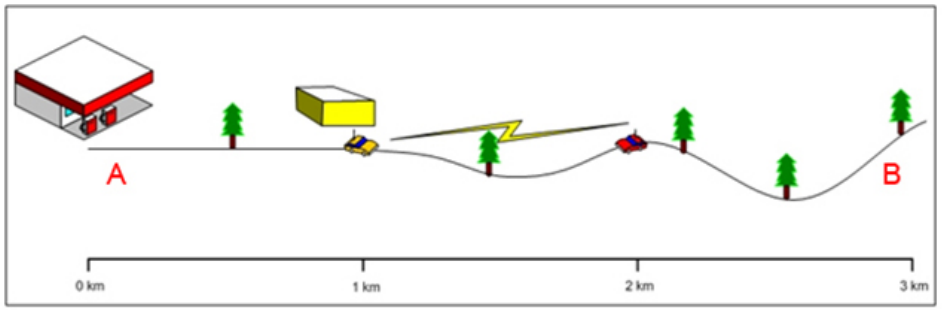
- Components:
  - Ubiquiti SR2 WIFICARD (máx. 400 mW)
  - 9 dBi ANTENNA
  - ROUTERBOARD 532A
  - SERIAL GPS

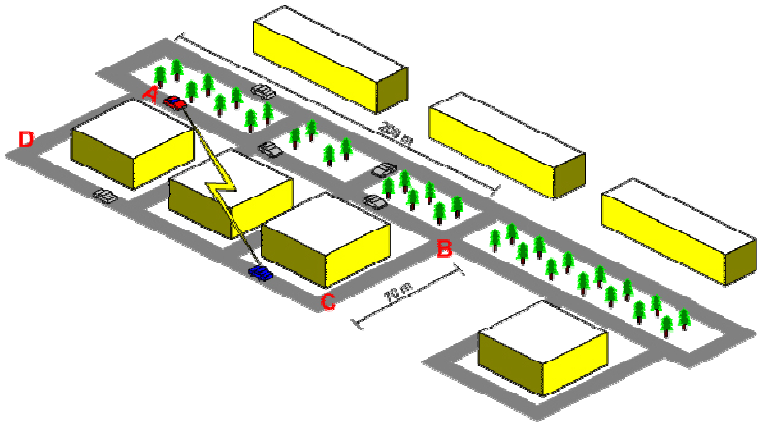


- Software:
  - Debian MIPS distribution (2.6 Kernel)
  - Madwifi driver
  - Iperf

Field tests

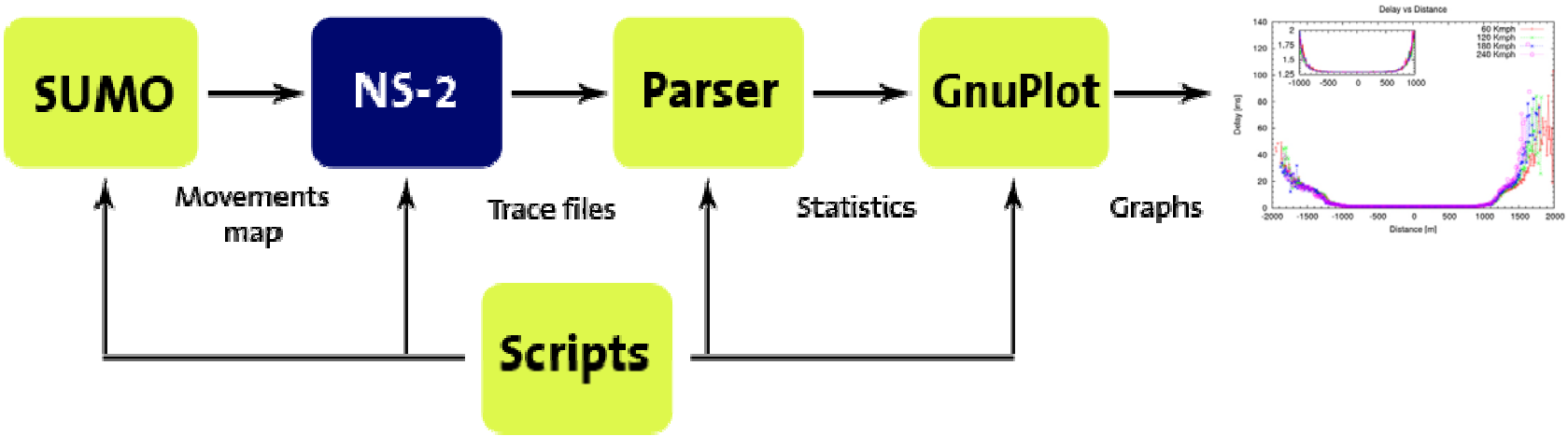
- Together with the simulations, numerous field tests have been done in different scenarios.
- The simulations have complemented the tests performed. Some scenarios couldn't be tested due to logistic and physical problems.





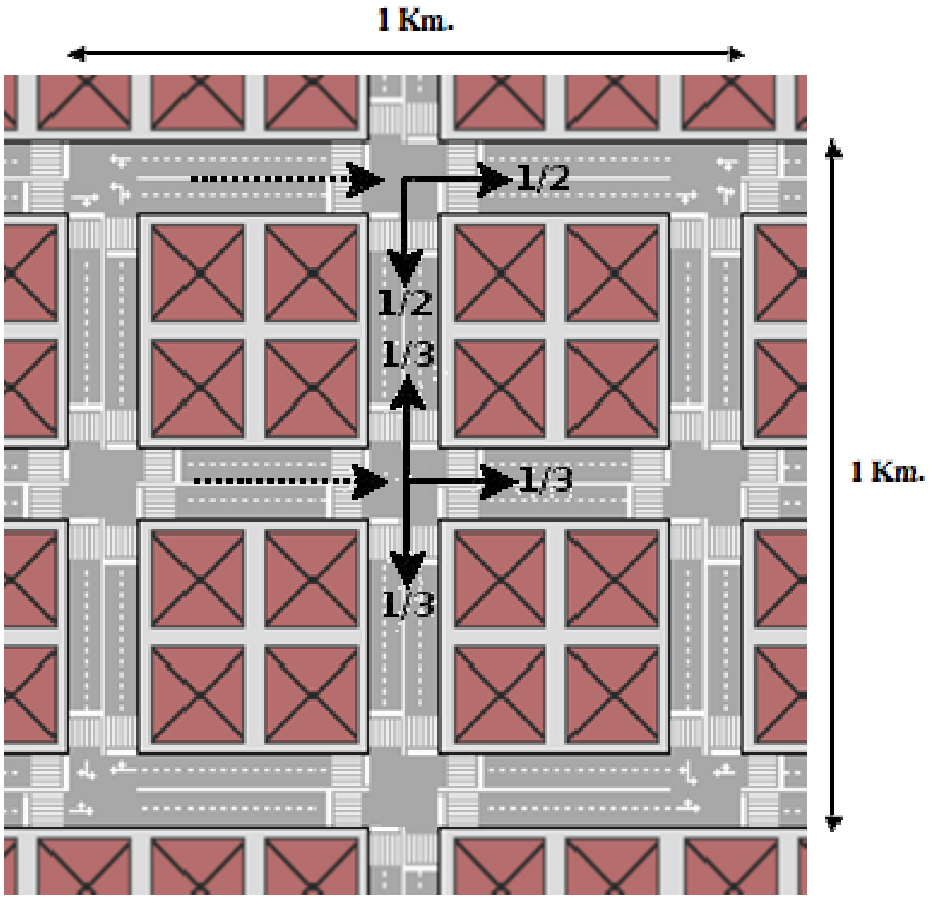
Simulations platform

- Different software was connected:
  - NS2: Network Simulator 2.
  - SUMO: Simulation of Urban Mobility.
  - Parser
  - Gnuplot



Manhattan Scenario

- Characteristics:
  - 1 Km x 1Km area
  - 2 lanes per street (one per way)
  - 5 traffic lights
  - Vehicles Speed: 0 to 60 Km/h
  - Crossroads
    - The same turning probability for each direction
    - Closed Circuit

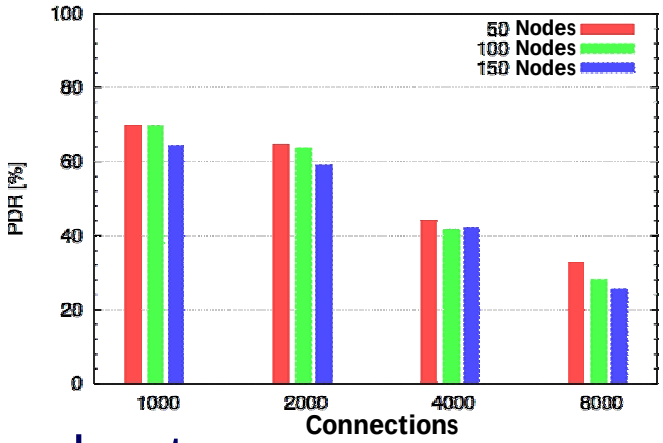


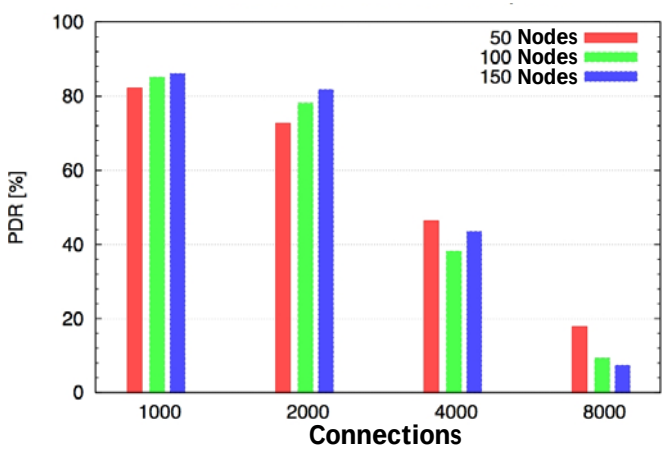
Simulations set up

- Random Movement patterns (SUMO) and Random Traffic Network.
- Shadowing-vis propagation model used in NS2. It allows the definition of obstacles in the scenario, where NLOS situations are presented.
- The hardware parameters configuration in NS2 is similar to the one provided in the data sheets (wificard power emission and sensitivity, antennae gain…)
- Each connection is a 10KB UDP burst sent at the maximum IEEE802.11b rate (11Mb/s). Packet size is 1460 Bytes at application layer.
- HI value in OLSR is set to 1 second.
- Objective: OLSR and AODV performance comparison
  - Vehicles density: 50, 100 and 150 vehicles/km^2
  - Connections number: 1000, 2000, 4000 and 8000 UDP connections.
  - Evaluated parameters: PDR, Average Throughput, Average Hop Number and Overhead.

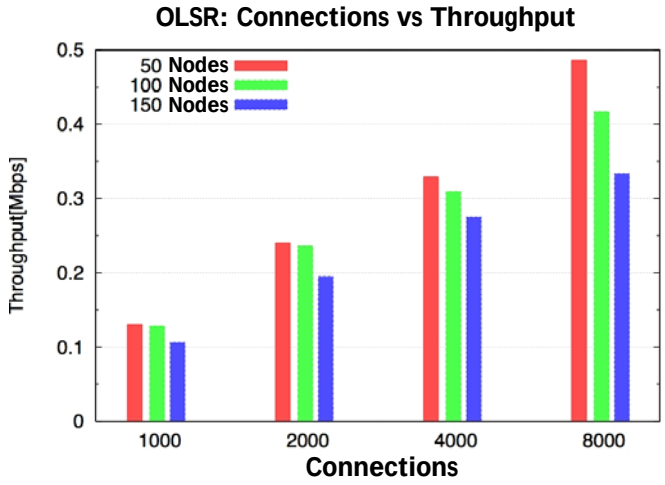
OLSR vs AODV (I)

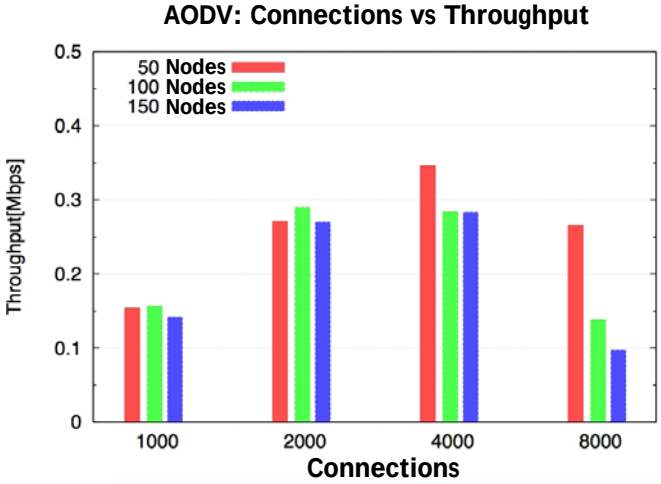
- PDR





- Throughput





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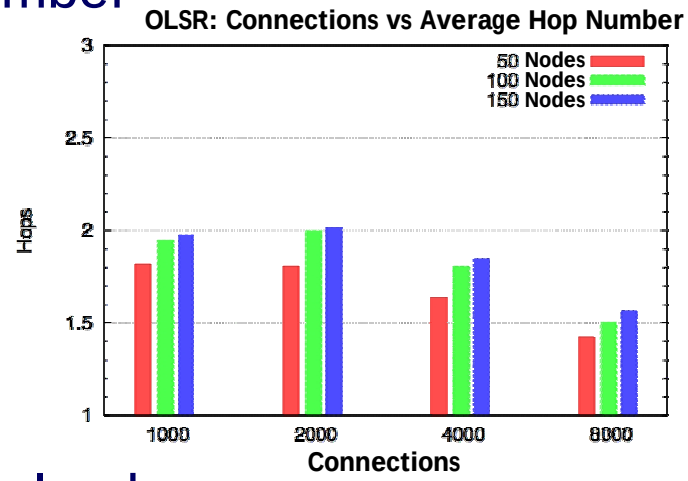
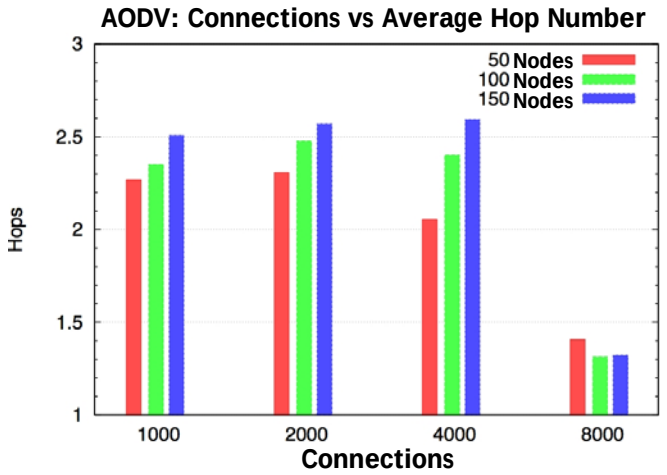
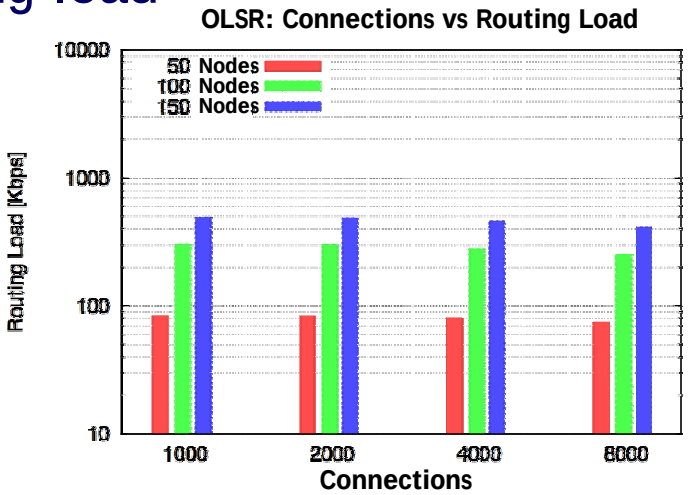
OLSR vs AODV (II)

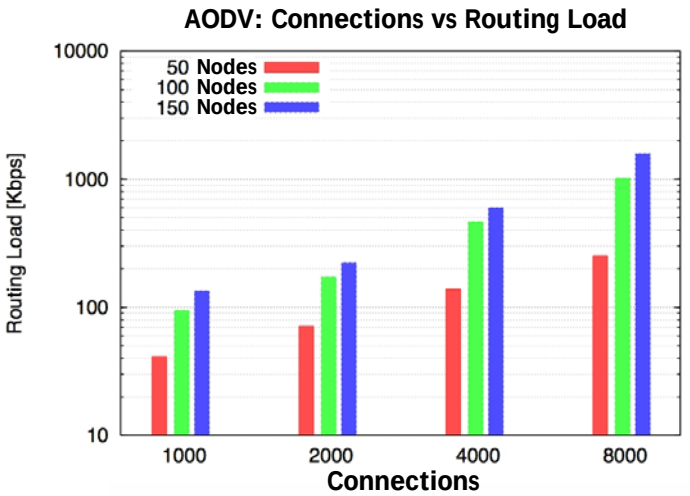
- Hop number





- Routing load





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Conclusions

- Simulations results:
  - Routing protocols performance depends on the vehicles density, and thus on the network load.
  - OLSR performance is better with higher load network, since its overhead is constant.
  - AODV has shown in our simulations that is a better option when the traffic is lower.
  - No one can be considered the best option for all the situations.
- Currently there are multitude of routing protocols, the future for VANETs could be protocols combining geographical information with traffic patterns. But:
  - OLSR which was initially designed for MANETs has demonstrated its correct performance in real field tests done in COM2REACT project. Information can be seen in **http://www.com2react-project.org/**.

More information

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