

## DYMO Implementation in OPNET Simulator

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## DYMO Implementation in OPNET

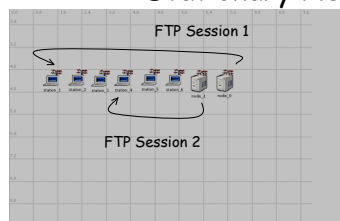
- OPNET 11.0
- draft-ietf-manet-dymo-01
  - was implemented except
    - Sec 4.8 - Internet Attachment
    - Sec 4.9 - Multiple Interfaces
  - Hello Messages (As explained in AODV)
  - IPv4 & IPv6
- Testing
  - IPv4
    - Stationary Networks - up to 50 nodes
    - Mobile Networks - in a small network of 5 nodes
- Overview to the results of stationary network

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## Scenario 1: FTP Downloads in a Stationary Network



➤ Performance, when using

- AODV
- DYMO
- DSR

(All are configured to use default routing parameters as defined)

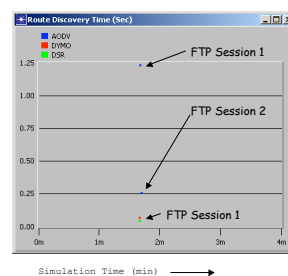
- Simulation Duration 220 sec
- Session 1 starts at 100 sec, Session 2 starts at 102 sec
- Both sessions download a file of 1500 bytes at each 3 seconds

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## Route Discovery Latency



➤ Only AODV has 2 separate route discoveries for session 1 & 2

➤ DYMO & DSR → Similar, Session 2 can use routes found during the route discovery of Session 1 (know the path between each other)

➤ AODV route discovery latency is more since it uses Expanding Ring Search during flooding of RREQ

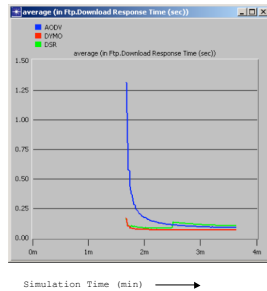
➤ AODV Route Discovery Latency is also equal to DYMO when using TTL\_START as the Net-Diameter, but still has 2 discoveries

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## FTP Download Response Time (Sec)



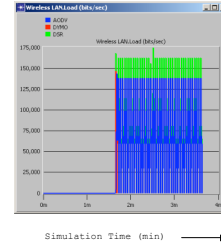
- At the beginning AODV has higher Response time
- After the routes are made, DSR has higher response time than AODV & DYMO (due to source routing)
- In general, DYMO has the lowest response time

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## Total Load in bps (Link Layer)



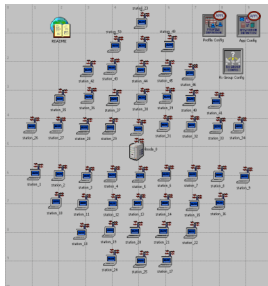
- AODV & DYMO have Routing overhead at the beginning (Hello Messages are not used in this scenario)- Dymo routing overhead is higher than AODV
- DSR has the overhead even after the routes are made

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## Scenario 2: 50-node Stationary Network



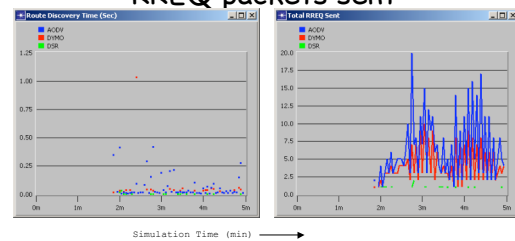
- Simulation Duration 300 sec
- Each node starts downloading files (@6 sec) from the server in the middle
- FTP Download
  - Starts at each node between (100-300) in an uniformly distributed manner
  - Lasts abt 40 sec

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## Route Discovery (Sec) & Num. of RREQ packets sent



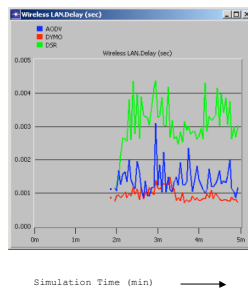
- Number of Route Discoveries (AODV > DYMO > DSR)
- AODV flooding is controlled by ERS
- Each DYMO flooding is up to 10 hops, but no route discoveries if the paths are known

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## Delay in WLAN

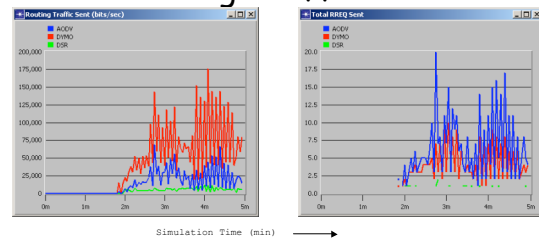


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## Routing Traffic Sent



➤DYMO has sent more routing traffic (due to path accumulation)

➤Higher route discoveries than DSR and message sizes are bigger since REBlock attachments

➤Flooding in AODV uses ERS. Total RREQ message propagation is controlled

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## Observations

- Path Accumulation in DYMO (Attachment of ReBlocks)
  - Improve the performance by reducing the route discoveries when intermediate nodes want to send data (Scenario 1)
  - This performance is no longer valid, if intermediate nodes start the route discoveries after the lifetime of the route discovery, i.e 3 sec (Scenario 2)
  - Solution?
    - Send a separate RE message to extend the path lifetime (10 sec, 100Sec, ?) after the successful route discovery or Lifetime of routes during the route discovery could be increased

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## Observations

- Flooding to Net-Diameter (TTL=10) in DYMO
  - Performance is better in smaller networks (Scenario1)
  - For larger networks, this will increase more routing traffic overhead. (Scenario 3)
  - Solution?
    - Adapting a mechanism like ERS

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