An Adaptive Distance Vector Routing Algorithm for Mobile, Ad Hoc Networks

Rajendra V. Boppana
Computer Science Division
The Univ. of Texas at San Antonio
San Antonio, TX 78249-0667

Satyadeva P Konduru
Nexsi Corp.
1959 Concourse Dr
San Jose CA 94086

IEEE INFOCOM 2001
Outline

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- PERFORMANCE ANALYSIS
- CONCLUSIONS
INTRODUCTION

- **Proactive routing protocol:**
  - DSDV, need large memory to maintain table.

- **On-demand routing protocol:**
  - AODV, pure on-demand.
  - DSR, pure on-demand.

- We believe that the combination of them will be better.
INTRODUCTION

- Combination routing protocol:
  - ZRP, proactive routing in certain region.
  - ADV, Adaptive Distance Vector in this paper.
ADAPTIVE DISTANCE VECTOR

- We maintain routes to only active receivers to reduce the number of entries advertised.
  - Each routing table entry has a receiver flag to log active receiver.

- We adaptively trigger partial and full updates such that periodic full updates are obviated.
  - Each routing table has a trigger threshold.
ADAPTIVE DISTANCE VECTOR

Varying the number of active routes maintained

- At the beginning of a new connection.

1. Broadcast *init-connection*.

2. Nodes turn on the corresponding *receiver flag*.

3. If receiver receive a update that it is not a active receiver then it broadcast *receiver-alert*.

1. *init-connection*  
2. Turn on the Receiver flag
3. *receiver-alert*
ADAPTIVE DISTANCE VECTOR

Varying the number of active routes maintained

- A node should trigger an update when:
  - If it has some buffered data packets due to lack of routes.
  - If one of its neighbors make a request for fresh routes.
  - It is a forwarding node that intends to advertise any fresh valid/invalid route to the destination so as to keep the route fresh.
- We use Trigger meter variables to maintain above trigger matter.
ADAPTIVE DISTANCE VECTOR

Varying the number of active routes maintained

- Trigger meter is associated with constants:
  - TRGMETER_FULL
  - TRGMETER_HIGH
  - TRGMETER_MED
    - When the number of packets already exceeds Buffer threshold do \( (\text{trigger meter} + \text{TRGMETER\_MED}) \)
  - TRGMETER_LOW

- Trigger threshold
  - If trigger meter exceeds TRGMETER\_FULL, a full update is triggered.
  - If trigger meter exceeds Trigger threshold but less than TRGMETER\_FULL, a partial update is triggered.
ADAPTIVE DISTANCE VECTOR

Varying the number of active routes maintained (cont’)

- Sending routing update:

  Fields in a routing update entry transmitted in ADV.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination IP address (32 bits)</td>
<td>32</td>
</tr>
<tr>
<td>Next hop IP address (32)</td>
<td>32</td>
</tr>
<tr>
<td>Sequence number (16)</td>
<td>16</td>
</tr>
<tr>
<td>Metric (8)</td>
<td>8</td>
</tr>
<tr>
<td>Is_receiver (1)</td>
<td>1</td>
</tr>
<tr>
<td>Expected_response (2)</td>
<td>2</td>
</tr>
<tr>
<td>Unused (5)</td>
<td>5</td>
</tr>
</tbody>
</table>

- \textit{Expected_response(2)}:
  - \textit{HIGH}, if there are packets waiting for this route in node buffer.
  - \textit{MEDIUM}, in \textit{HIGH_SPEED} network if this node is a forwarding node.
ADAPTIVE DISTANCE VECTOR

Varying the number of active routes maintained (cont’)

- **Expected_response(2):**
  - *Low*, in *low_speed* network, if this node is a forwarding node.
  - *ZERO*, if none of the above criteria.

- **Is_receiver(1):**
  - Propagate an active receiver information, even if the flag control packets are lost.

- When node receive a update entry, the trigger meter is incremented by *TRGMETER_HIGH*, *TRGMETER_MED* or *TRGMETER_LOW* for an expected response of *HIGH*, *MEDIUM* or *LOW* respectively.
ADAPTIVE DISTANCE VECTOR

Trigger threshold computation

- The trigger threshold on active receivers and forwarding node is constant value.

- The trigger threshold on other node is dynamic value.
Define of dynamic threshold:

- $tn = \text{sum of trigger counter value since the last full update/number of update}$
  - if no updates are done since last full update, it set to TRGMETER_HIGHT.

- $th = (th + tn)/2$
  - In order to adapt the mobility change in the network quickly.

- If the number of updates done are much less than maximum number since the last full update then the threshold is set to a fraction of $th$. 
PERFORMANCE ANALYSIS
steady-state behavior

- Because of adv maintain route to all the active receiver all the time. So it’s the better.
With more data packets using the channel, collisions increase, and route discoveries in AODV and DSR take more time.
PERFORMANCE ANALYSIS
steady-state behavior (cont’)

- Adv is the best, because 500ms must be elapsed between consecutive update.
- Adv uses only 1-hop broadcast for routing update.
PERFORMANCE ANALYSIS

Transient state behavior

[Graphs showing performance metrics such as Average Packet Latency, Packets Delivery %, and Throughput over simulation time for different protocols (e.g., adv, aodv, dsr) with 10-50 connections and 20 m/s speed.]
ADV transmits the least number of routing packets.
CONCLUSIONS

- Control the timing of update is more efficient than the periodic full update.

- Only update the active entry of routing table is more efficient than update full table.
END