Dynamic Source Routing Protocol

Speaker:
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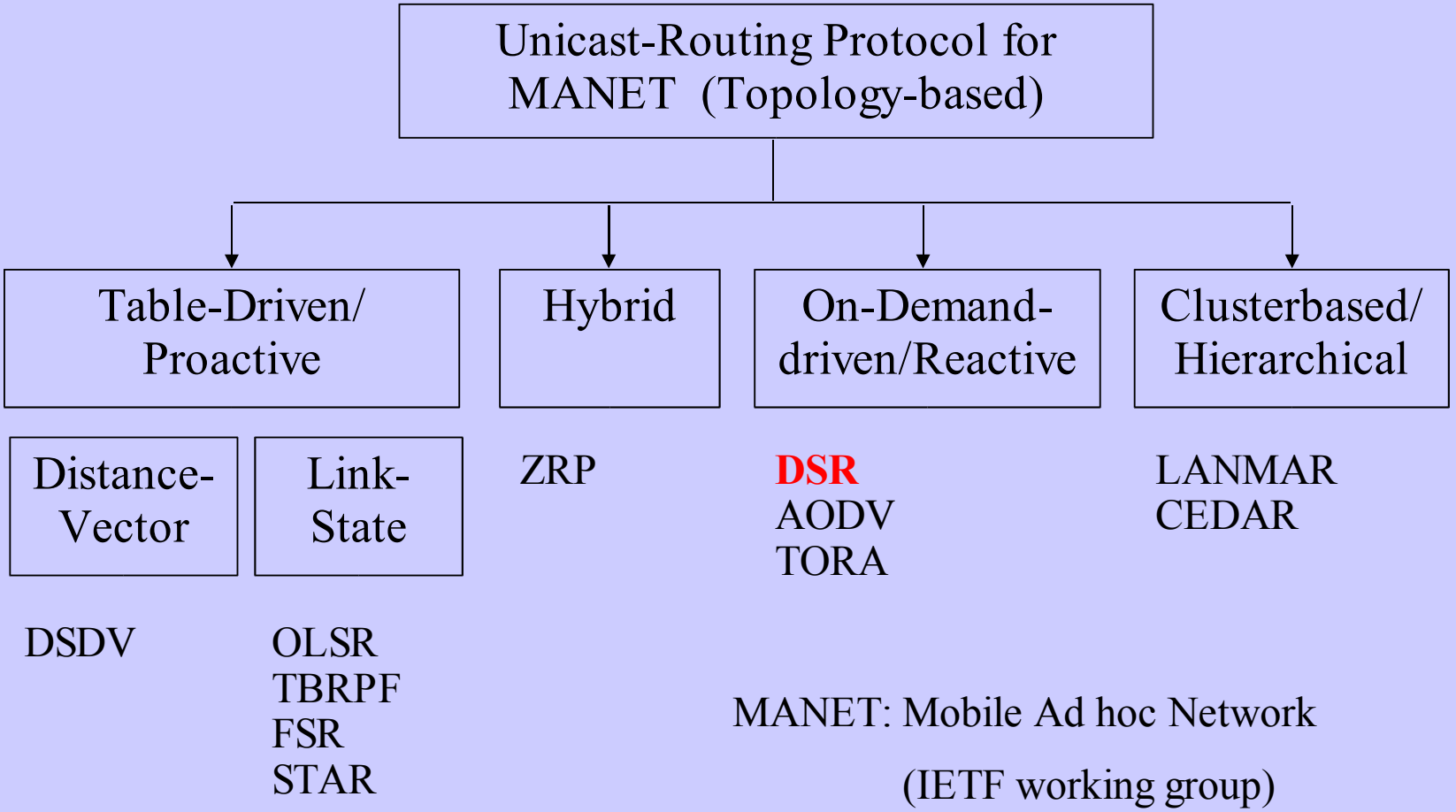
Overview:



MANET: Mobile Ad hoc Network

(IETF working group)

Overview:

- DSR is a reactive routing protocol for ad hoc networks (no periodic route updates)
- Source obtains information of all nodes along a path to the destination
- DSR does not assume bi-directional links (IEEE 802.11b does)
- The protocol is able to adapt quickly to dynamic network topology
- Loop freedom is guaranteed

Network assumptions

- All nodes willing to participate the protocol
- Diameter of network often small (5 – 10 hops), but often greater > 1
- Node movement speed small w.r.t transmission rate
- Nodes capable of promiscuous mode

Route Discovery

Route Discovery:

Route discovery allows any node in the ad hoc network to dynamically discover a route to any other node
in the ad hoc network, whether directly reachable within wireless transmission range or reachable through
one or more intermediate network hops through other nodes.

- When route is not in the cache table, initiate a route request.
  (By sending a Route Request Packet)

Route Discovery

Route Request Package consists of:

Initiator Address:	The address of the source node
Request ID:	A unique message ID given by the source node
Target Address:	The target address a route is requested for
Route Record:	A list of hops the packet went through

To detect duplicated route requests, each host maintains a list of the <initiator address, request id> pairs that it has recently received on any route request.

Route Discovery

When any node receives a route request packet, it processes the request according to the following steps:

1. If the pair <initiator address, request id> for this route request is found in this nodes list of recently seen requests, then discard the route request packet and do not process it further.

2. Otherwise, if this node address is already listed in the route record in the request, then discard the route request packet and do not process it further.

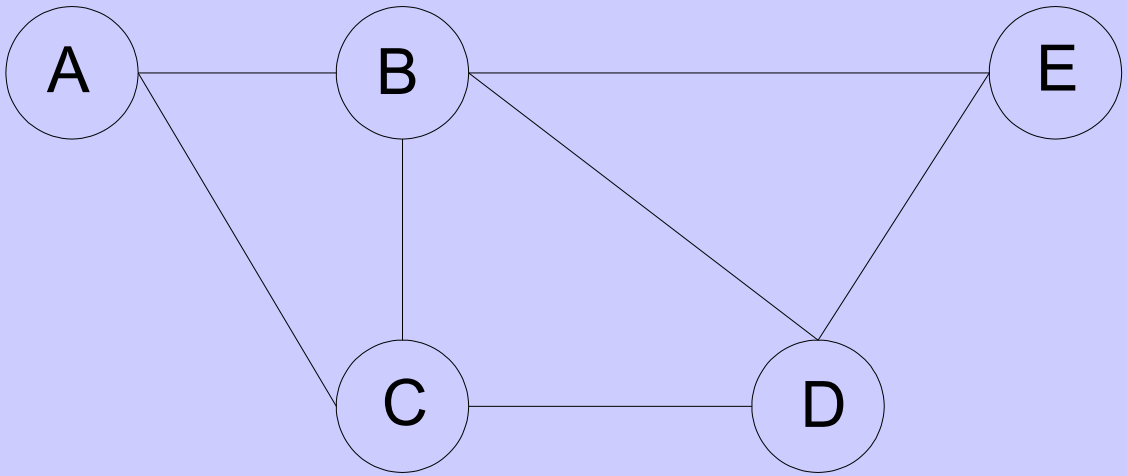
3. Otherwise, if the target of the request matches this host's own address, then the route record in the packet contains the route by which the request reached this host from the initiator of the route request.
   Return a copy of this route in a *route reply* packet to the initiator.

Route Discovery

4. Otherwise, append this nodes own address to the route record in the route request packet, and re-broadcast the request.

Example:

Initiator Address: A
Request ID: 1
Target Address: E



Route Discovery

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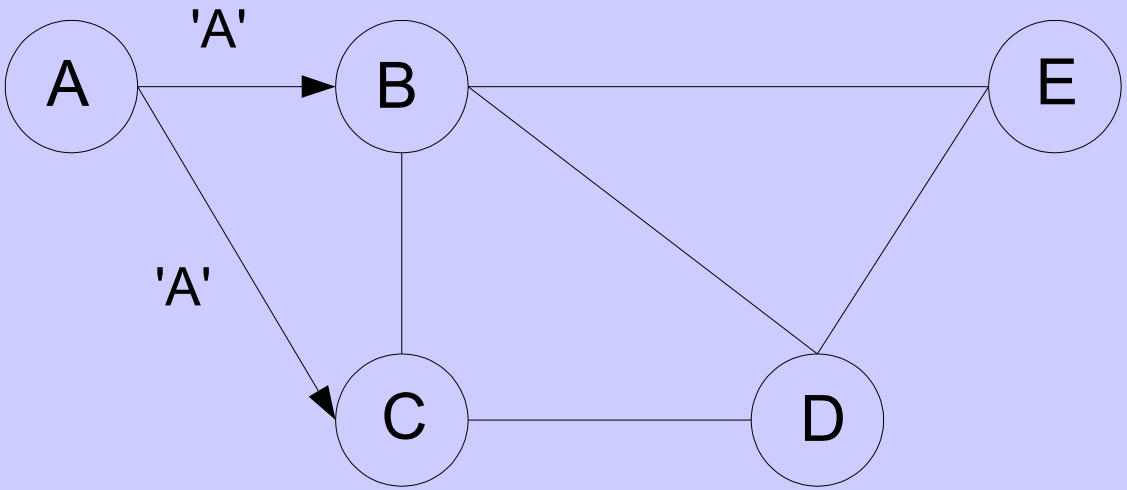

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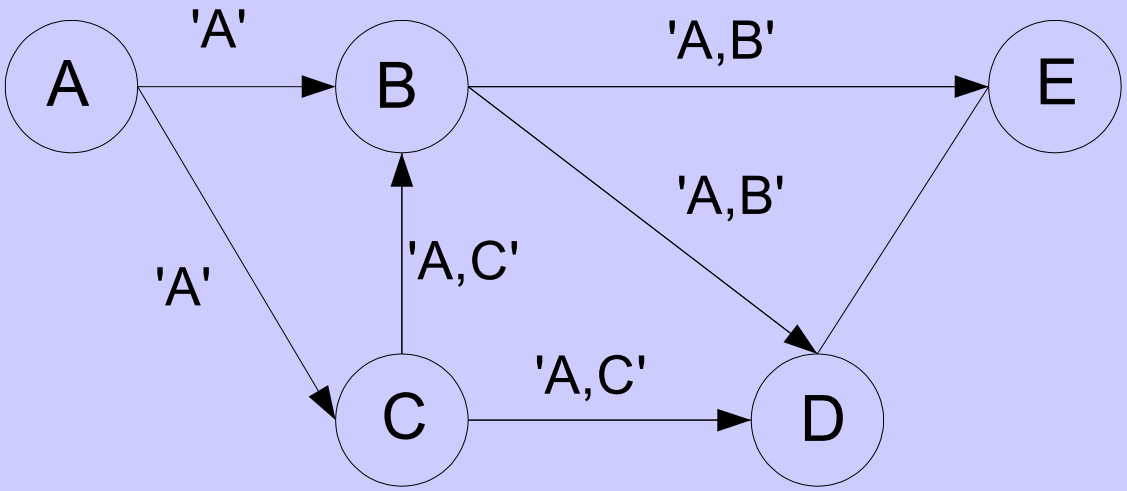

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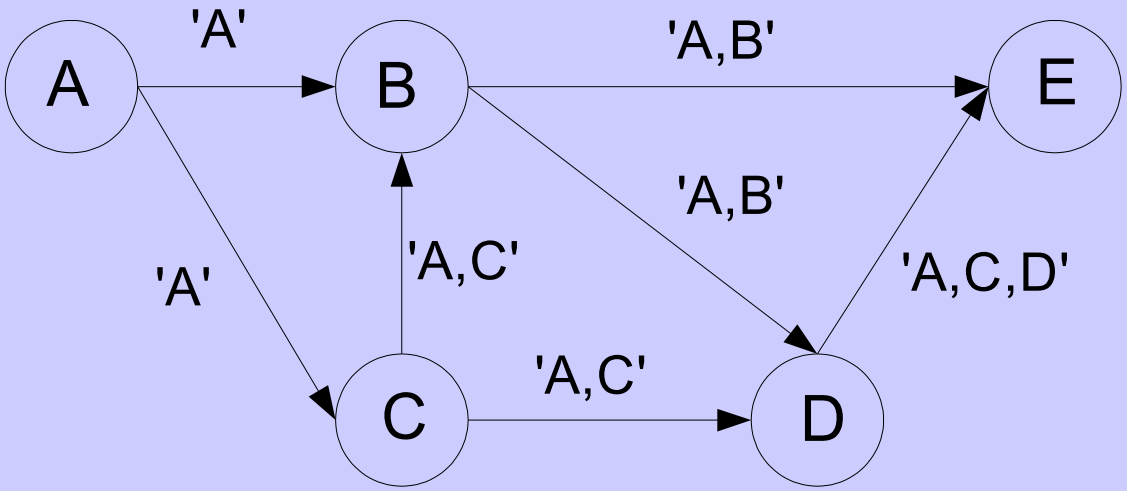

Route Discovery

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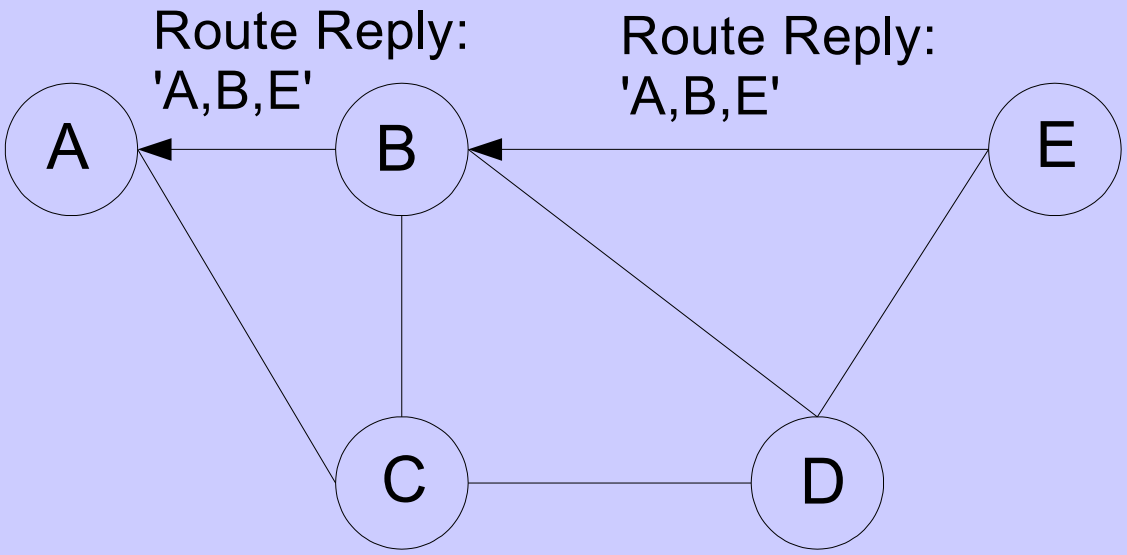


Route Maintenance

Route Maintenance:

- Each Node responsible for confirming the receivement of the packets
- Receipt confirmation given by link level acknowledgment in IEEE 802.11b
- If Node detects a broken Route, it sends a Route Error packet
- Retransmission of packet is a function of upper-layer protocols such as TCP

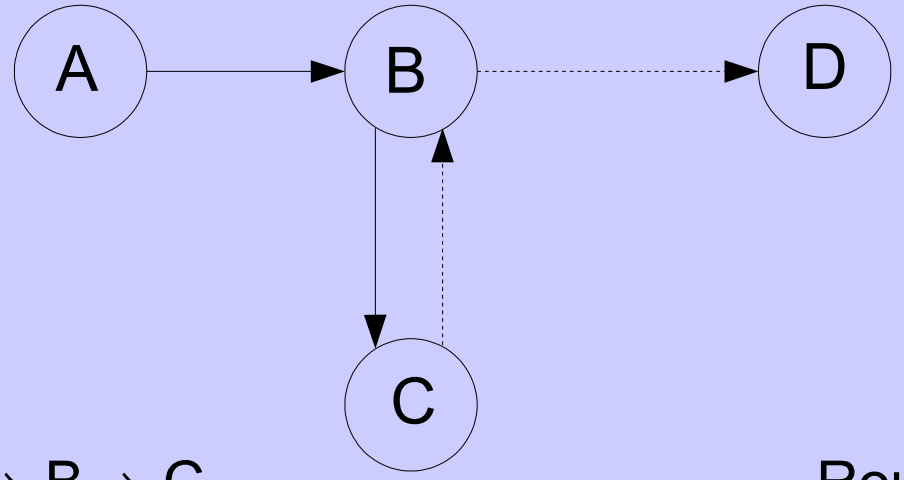
Optimizations:

Replying to Route Requests using chached routes:

- When node receives a Route Request for witch node is not target, search own cache for route.
- Concatenate cached route and Route Request Hop list.
- Before transmitting Route check Route for duplicate nodes.

Optimizations:

- A sends Route Request for target node D
- C has cached route to D
- C concatenates Route Request route with cached Route
- New Route A→ B→ C → B→ D
- Discard Route !

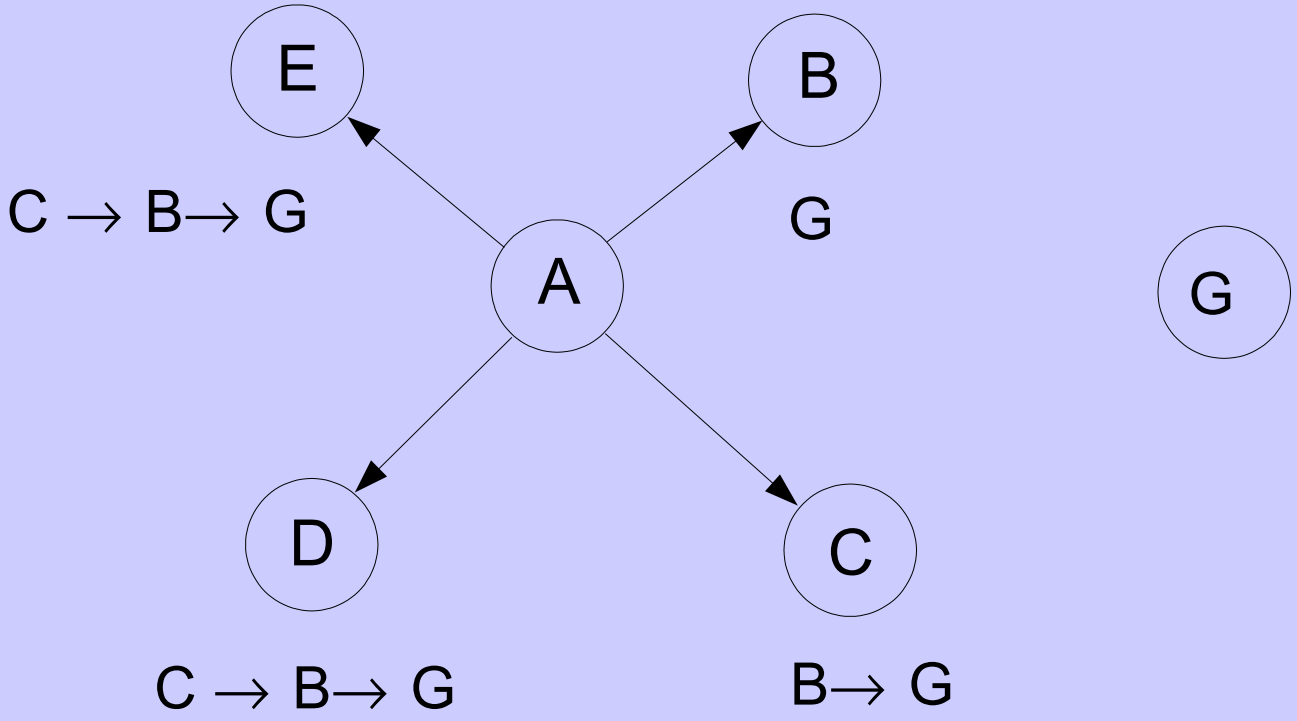


Route: A→ B→ C

Route: C→ B→ D

Optimizations - Preventing Route Reply Storms:

- A sends Route Request for node G
- All neighbours reply immediately



Optimizations - Preventing Route Reply Storms:

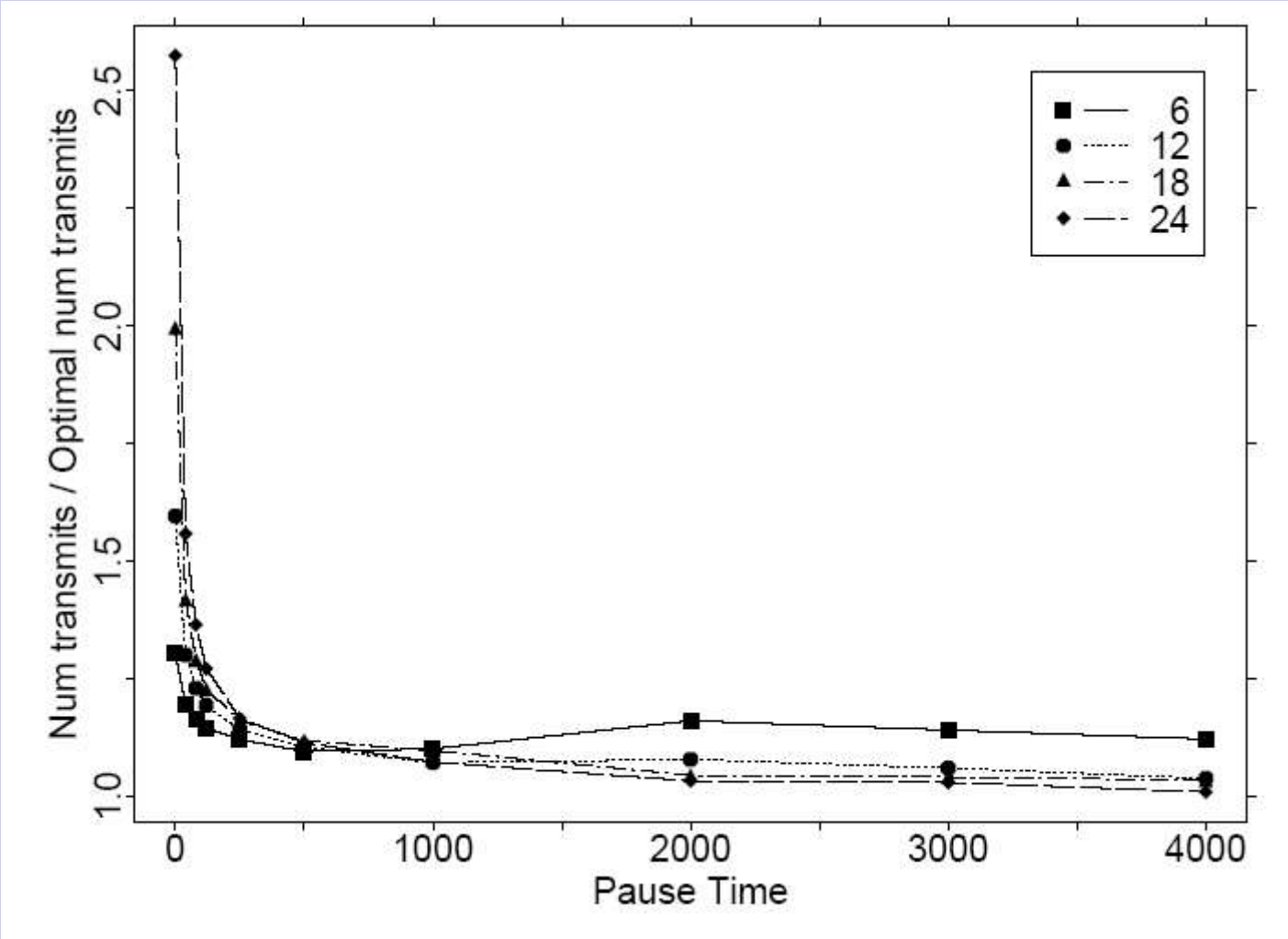
- Delay Route Reply by $d = H \times (h - 1 + r)$

  H = small constant delay
  h = length of route to return in number of network hops
  r = random number $\in [0..1]$

- The shorter the Route Reply Hop List, the sooner the node replies

- All nodes in promiscuous mode , looking for Route Reply for same Route. If shorter Route is returned, discard own Route Reply

Efficiency:


Num transmits / Optimal num transmits
1.0
1.5
2.0
2.5
0
1000
2000
3000
4000
Pause Time
6
12
18
24

End:

Literature:

- **The Dynamic Source Routing Protocol for Multihop Wireless Ad Hoc Networks**
- **Dynamic Source Routing in Ad Hoc Wireless Networks**

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