

A Complete Study on Energy Efficient Routing Protocols DSR, ZRP and DSDV in Mobile Ad Hoc Networks

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Abstract: In wireless network will classified during a combine of how that in that one is infrastructure network and another is infrastructure less. Infrastructure less wireless network is believed as Ad-hoc network. Rather than trying forward to a base station to coordinate the flow of messages to every node among the network, the individual network nodes forward packets to and from one another. In portable computer networking, Associate in Nursing ad-hoc networks all nodes unit of measuring mobile and will be connected dynamically in Associate in Nursing capricious manner. All nodes of those networks behave as routers and participate in discovery and maintenance of routes to fully totally different nodes among the network. Throughout this paper, the 3 routing protocols unit of measuring studied i.e. DSR, ZRP, and DSDV.

Keywords—Mobile ad hoc network, DSR, ZRP and DSDV

1. Introduction

A mobile ad-hoc network (MANET) cluster has been fashioned among IETF. The first focus of this unit is to develop and evolve Edouard Manet specifications and introduce them to the net commonplace track. The goal is to support mobile ad-hoc networks with many routers and solve challenges during this reasonably network. Some challenges that ad-hoc networking faces square measure restricted wireless transmission vary, hidden terminal issues, packet losses owing to transmission errors, quality evoked route changes, and battery constraints. Mobile ad-hoc networks might enhance the place of access networks and supply wireless property into areas with poor or antecedently no coverage property to wired infrastructure can be provided through multiple gateways with presumably completely different

capabilities and utilization. To boost performance, the mobile host ought to have the power to adapt to variation in performance and coverage and to modify gateways once helpful. To reinforce the prediction of the most effective overall performance, a network layer metric includes a higher summary of the network. Ad-hoc networking brings options like simple affiliation to access networks, dynamic multihop network structures, and direct peer-to-peer communication. The multihop property of associate ad-hoc network must be bridged by a entranceway to the wired backbone. The entranceway should have a network interface on each sorts of networks and be a regionality of each the world routing and therefore the local ad-hoc routing. Users may benefit from present networks in many ways in which. User quality permits users to modify between devices, migrate sessions, and still get identical customized services. Host quality permits the users' devices to maneuver round the networks and maintain property and reachability. Wireless networks are often classified in 2 types: 1st, infrastructure network that consists of a network with fastened and wired gateways. A mobile host communicates with a bridge within the network (called base station) among its communication radius. Once it goes out of the vary of 1 base station, it connects with a brand new fastened base station and starts act through it. Second, infrastructure less (ad-hoc) networks fig. 1: In ad-hoc networks all nodes square measure mobile and may be connected dynamically in associate absolute manner.

All nodes of those networks behave as routers and participate in discovery and maintenance of routes to different nodes within the network. In spontaneous network for a few time for connecting to every different through this mobile spontaneous network. They are doing not use any base station and router during this network. There square measure range of routing protocols for spontaneous

networks, they're classified into two: Proactive Routing and Reactive routing.

A. Classification Of Routing Protocols:

The routing protocols is classified into 2 parts: one. Proactive (Table driven), 2. Reactive (Source or Demand driven) and three. Hybrid Routing Protocols whereas betting on the network structure these area unit classified as flat routing, graded routing and geographic position motor-assisted routing. Flat routing covers each routing protocols supported routing strategy. The 3 impromptu routing protocols area unit used, DSR, ZRP and DSDV. ZRP is Hybrid Routing Protocols DSR is Reactive Protocol (Source driven) and DSDV is Proactive (Table driven) Routing protocol.

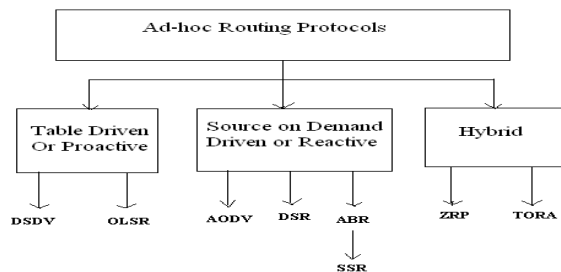


Fig 1. Adhoc Networking Protocols

A.1 Pro-active vs. reactive

The IETF painter social unit has researched and developed variety of protocols for mobile ad- hoc networks, that are delineate. These protocols will usually be classified into 2 groups: pro- active and reactive protocols. Pro-active protocols follow associate approach kind of like the one utilized in wired routing protocols. By incessantly evaluating the far-famed and trying to find new routes, they struggle to take care of the foremost up-to-date map of the network. this permits them to expeditiously forward packets, because the route is understood at the time once the packet arrives at the node. Pro-active or table-driven protocols, so as to take care of the perpetually dynamic network graph attributable to new, moving or failing nodes, need continuous updates, which can consume giant amounts of information measure – clearly an obstacle within the wireless world, wherever information measure is usually distributed. Even worse thus, abundant of the accumulated routing info is rarely used, since routes could exist just for terribly restricted periods of your time.

The family of Distance-Vector protocols, as well as Destination-Sequenced Distance-Vector Routing, constitute the class of pro-active protocols. In distinction, reactive protocols confirm

the correct route only if needed, that is, once a packet has to be forwarded. during this instance, the node floods the network with a route request and builds the route on demand from the responses it receives. this system doesn't need constant broadcasts and discovery, however on the opposite hand causes delays since the routes don't seem to be already out there. to boot, the flooding of the network could cause extra management traffic, once more golf shot strain on the restricted information measure. These reactive (or on-demand) protocols embrace Dynamic supply Routing (DSR) and Ad- hoc On demand Distance Vector Routing (AODV), similarly because the classical flooding algorithms.

A.2. Hybrid Routing Protocol

Hybrid protocols ar the mixtures of reactive and proactive protocols and takes blessings of these 2 protocols and as a result, routes ar found quickly within the routing zone. Example Protocol: ZRP (Zone Routing Protocol), TORA (Temporally-Ordered Routing Algorithm).

2. Related Work

The problem of routing in MANETs has received attention among researchers, and plenty of routing protocols dedicated to MANETs are projected. In keeping with their approaches for making and maintaining routes, these protocols will be divided into 2 main categories; proactive protocols and reactive ones. The proactive protocols, additionally known as table driven, establish routes before, and for good maintain them, basing on the periodic routing table exchange.

Table 1: Comparison of Reactive and Proactive routing protocols

Reactive protocols	Proactive
A route is built only when	Attempt to maintain consistent, up- to-date Routing information
No periodic updates. Control information is not propagated	Constant propagation of routing information periodically even
First-packet latency is more when compared with	First packet latency is less when compared with on-demand
Not available	A route to every other

Table 2: Comparison of different routing protocols

Protocol	Route	Route selection	Beacon	Maintenance	Route discovery
DSR	Multiple	Shortest path	No	Global, notify source	Global
ABR	Single	Link stability	Yes	Local, bypass	Global
SSA	Single	Signal strength	Yes	Global, notify source	Global
AODV	Single	Shortest path	Yes	Global, notify source	Global
LAR	Multiple	Shortest path	No	Global, notify	localized

3. Description Of Selected Routing Protocols

A. Dynamic Source Routing (DSR)

Dynamic supply Routing (DSR) may be a routing protocol for wireless mesh networks and is predicated on a way called supply routing. It's just like AODV in this it forms a route on-demand once a sending laptop requests one. Except that every intermediate node that broadcasts a route request packet adds its own address symbol to an inventory carried within the packet. The destination node generates a route reply message that features the list of addresses received within the route request and transmits it back on this path to the supply. Route maintenance in DSR is accomplished through the confirmations that nodes generate after they will verify that ensuing node with success received a packet. These confirmations is link-layer acknowledgements, passive acknowledgements or network-layer acknowledgements such by the DSR protocol. However, it uses supply routing rather than counting on the routing table at every intermediate device. Once a node isn't ready to verify the eminent reception of a packet it tries to transmit it. Once a finite range of retransmissions fail, the node generates a route error message that specifies the problematic link, sending it to the supply node. Once a node needs a route to a destination that it doesn't have in its route cache it broadcasts a Route Request (RREQ) message that is flooded throughout the network. The primary RREQ message may be a broadcast question on neighbors while not flooding. Every RREQ packet is unambiguously known by the initiator's address and therefore the request id. A node processes a route request packet on condition that it's not already seen the packet and its address isn't gift within the route record of the packet. This minimizes the quantity of route requests propagated within the network. RREQ is replied by the destination node or associate intermediate node

that is aware of the route, exploitation the Route Reply (RREP) message. The comeback route for the RREP message could also be one in every of the routes that exist within the route cache (if it exists) or an inventory reversal of the nodes within the RREQ packet if symmetrical routing is supported. In alternative cases the node could initiate it owns route discovery mechanism and piggyback the RREP packet onto it. Therefore the route could also be thought of unifaceal or bidirectional. DSR doesn't enforce any use of periodic messages from the mobile hosts for maintenance of routes. Instead it uses 2 styles of packets for route maintenance: Route Error (RERR) packets and ACKs. Whenever a node encounters fatal transmission errors in order that the route becomes invalid, the supply receives a RERR message.

ACK packets area unit won't to verify the proper operation of the route links. This additionally is a passive acknowledgement for the mobile node. DSR allows multiple routes to be learnt for a specific destination. DSR doesn't need any periodic update messages, therefore avoiding wastage of information measure.

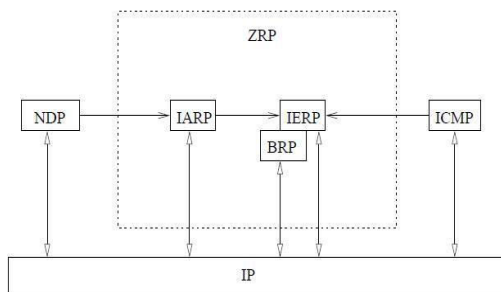
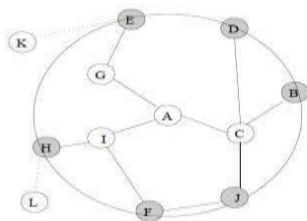
A. Advantages and Disadvantages

DSR uses a reactive approach that eliminates the necessity to sporadically flood the network with table update messages that are needed during a table-driven approach. The intermediate nodes additionally utilize the route cache info with efficiency to cut back the management overhead. The disadvantage of DSR is that the route maintenance mechanism doesn't regionally repair a countermined link. The affiliation setup delay is on top of in table-driven protocols. Although the protocol performs well in static and low-mobility environments, the performance degrades quickly with increasing quality. Also, goodly routing overhead is concerned thanks to the source-routing mechanism utilized in DSR. This routing overhead is directly proportional to the trail length.

B. Zone Routing Protocol (ZRP)

The Zone Routing Protocol, or ZRP, as delineated during this document combines the benefits of each into a hybrid theme, taking advantage of pro-active discovery inside a node's native neighborhood, and employing a reactive protocol for communication between these neighborhoods. As mentioned earlier, the ZRP isn't most a definite protocol because it provides a framework for alternative protocols. The separation of a nodes native neighborhood from the world topology of the whole network permits for applying completely different

approaches – and therefore taking advantage of every technique’s options for a given scenario. These native neighborhoods are referred to as zones (hence the name); every node is also inside multiple overlapping zones, and every zone is also of a special size. The size of a zone isn't determined by geographical activity, collectively would possibly expect, however is given by a radius of length, wherever is that the variety of hops to the perimeter of the zone.



By dividing the network into overlapping, variable-size zones, ZRP avoids a gradable map of the network and also the overhead concerned in maintaining this map. Instead, the network could also be considered flat, and route improvement is feasible if overlapping zones are detected. Whereas the concept of zones usually appears to imply similarities with cell phone services, it's vital to denote that every node has its own zone, and doesn't admit mounted nodes (which would be not possible in MANETs).

C. Destination-Sequenced Distance-Vector Routing (DSDV)

Destination-Sequenced Distance-Vector Routing (DSDV) could be a table-driven routing theme for unintentional mobile networks supported the Bellman-Ford rule. It eliminates route process, will increase convergence speed, and reduces management message overhead.

$$\text{if } \{d_{jk}(X)\} = \min \{d_{ji}(X)\}$$

Parameter	DSDV	DSR	ZRP
Source routing	No	Yes	No
Periodic message	Yes	No	Yes(Locally)
Functioning proactively	Yes	No	Yes(Locally)
Functioning Reactively	No	Yes	Yes (Globally)

Table 3: Parameter comparison for DSR, DSDV, and ZRP

Table 4: Property comparison for DSR, DSDV, and ZRP

Protocol property	DSDV	DSR	ZRP
Loop free	Yes	Yes	Yes
Multicast routes	No	Yes	No
Distributed	Yes	Yes	Yes
Unidirectional link support	No	Yes	No
Multicast	No	No	Yes
Periodic broadcast	Yes	No	Yes
QoS support	No	No	No
Routes maintained in	Route Tabl	Rout e	Route Tabl
Route cache / table timer	Yes	No	Yes
Reactive	No	Yes	Yes

In DSDV, every node maintains a next-hop table that it exchanges with its neighbors. There are 2 forms of next-hop table exchanges: periodic full-table broadcast and event-driven progressive change. The ratio of the full-table broadcast and also the progressive change is decided by the node quality. In every knowledge packet sent throughout a next-hop table broadcast or progressive change, the supply node appends a sequence variety. This sequence variety is propagated by all nodes receiving the corresponding distance-vector updates, and is hold on within the next-hop table entry of those nodes. A node, when receiving a replacement next-hop table from its neighbor, updates its route to a destination given that the new sequence variety is larger than the

recorded one, or if the new sequence variety is that the same because the recorded one, however the new route is shorter. So as to additional scale back the management message overhead, a subsidence time is calculable for every route. A node updates to its neighbors with a replacement route given that the subsidence time of the route has invalid and also the route remains optimum.

4. IV.SIMULATION BASED ANALYSIS USING NETWORK SIMULATOR (NS-2.34)

A. Simulation Tool

The simulation tool used for analysis is NS-2.34 that is very most popular by analysis communities. NS could be a separate event machine targeted at networking analysis. NS provides substantial support for simulation of communications protocol, routing, and multicast protocols over wired and wireless (local and satellite) networks. NS2 is AN object orienting machine, written in C++, with AN OTcl interpreter as a frontend. This implies that almost all of the simulation scripts area unit created in Tcl (Tool Command Language). If the elements got to be developed for ns2, then each Tcl and C++ got to be used.

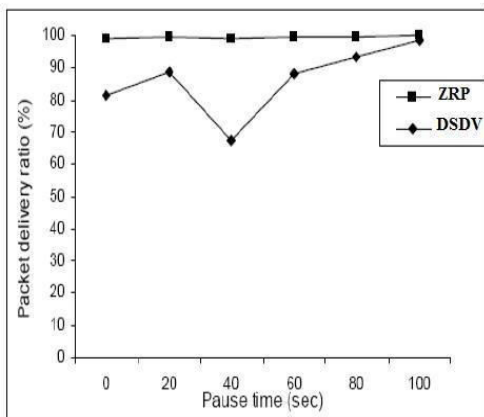


Fig 4. Packet delivery fraction vs. Pause time for 50- node model with 15 sources.

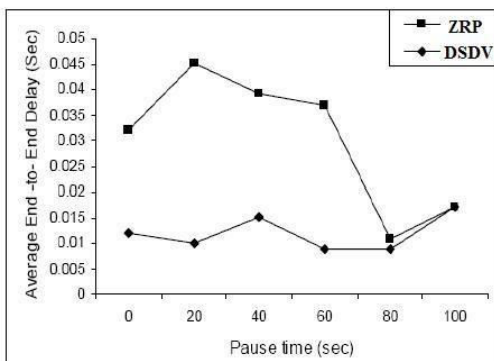


Fig 5. Average End-to-End Delay vs. Pause time

for the 50-node model with 15 sources.

5. Conclusion

It is troublesome for the quantitative comparison of the foremost of the unintended routing protocols as a result of the very fact that simulations are done freelance of 1 another mistreatment totally different metrics and mistreatment different simulators. This paper will the realistic comparison of 3 routing protocols AODV, TORA and DSDV. The numerous observation is, simulation results accept as true with expected results supported theoretical analysis. Needless to say, reactive routing protocol DSR performance is that the best considering its ability to take care of affiliation by periodic exchange of knowledge, that is needed for ZRP and DSDV based mostly traffic. DSDV performs predictably. In the meantime DSDV was superb in the least quality rates and movement speeds. Compared the On- Demand (DSR) , Table-Driven (DSDV) routing protocols and hybrid routing protocol (ZRP) by variable the quantity of nodes and measured the metrics like end-end delay, born packets, As so much as packet delay and born packets magnitude relation are involved, DSR performs higher than DSDV and ZRP with sizable amount of nodes. Thence for real time traffic DSR is most popular over ZRP and DSDV. For fewer range of nodes and fewer quality, DSDV and ZRP's performance is superior.

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