COMPARATIVE STUDY BETWEEN A SET OF PROACTIVE PROTOCOLS FOR WIRELESS SENSOR NETWORKS

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Abstract -
In recent years, wireless sensor networks (WSN)have found their way into a wide variety of applications and systems with vastly varying requirements and characteris-tics. Wireless networks are self-configurable, multihopnetworksformed by nodes having continuous mobility. This is an areain which close collaboration between users, application domainexperts, hardware designers, and software developers is neededto implement efficient systems. The foremost challenge of WSN isin finding routes between source and destination with minimumpower consumption, and this requirement has led to manyrouting protocols. In this paper,we compare some proactiveprotocols with Collection criterion's.

Keywords - WSN, Proactive Routing Protocols, Power Efficiency, Comparative, Sensors

I. INTRODUCTION

As we have already seen, an ad hoc network is a set of mobile nodes that are dynamically and arbitrarily scattered in a manner where the interconnection between the nodes can change at any time. In most cases, the destination unit is not necessarily within the scope of the source unit which implies that the exchange of data between any two nodes, must be performed by intermediate stations. The management of this routing of data involves the establishment of a certain global architecture that must take into account the mobility of the units and the versatility of the physical medium.

The routing strategy (or protocol) is used to discover the paths that exist between the nodes. The main goal of such a strategy is the establishment of roads that are correct and efficient between a pair any units, which ensures the exchange of messages in a continuous manner. Given the limitations of adhoc networks, road construction must be done with minimal control and bandwidth consumption. Depending on how you create and maintain routes when routing data, routing protocols can be separated into two categories, pro-active protocols and reactive protocols. Proactive protocols establish routes in advance based on the periodic exchange of routing tables, while reactive protocols look for routes on demand. Some search work considers the location factor in the protocol classification, so protocols that use location information (such as LAR and DREAM protocols) are classified into an in-dependent class. In what follows, we will present the best-known protocols proposed for routing in ad-hoc networks.

We describe their main features and features that ensure the routing of data between different mobile units. Note that most of these protocols are being evaluated by working groups specializing in mobile environments.

II. PROACTIVE ROUTING PROTOCOLS

Proactive or table-driven routing protocols aim to keepup-to-date routing information flowingthroughout a networkbetween all nodes. As a means of preserving a consistent network connection, proactive routing protocols require every node to support at least one table which contains routinginformation. These nodes then react to the variations in thetopology of the network by distributing the most currentinformation through the network. This type of protocols isunique compared to others in term of the manner which thealterations to the networks structure are transmitted and alsothe amount of routing-related tables that are required. Thebenefit of proactive routing protocols is the median delay timeper packet that can be decreased. In these protocols, routeinformation is present and accessible in the table wheneverit is required. Nevertheless, in maintaining up-to-date rout-ing information, proactive protocols uninterruptedly employa significant share of network capacity. This makes suchrouting protocols unsuitable for re-configurable mobile ad-hocnetworks [1]. Additionally, further network capacity wastageoccurs as the majority of stored routing information actuallymay never be used, and the node activity is fast and thevariations in topology are more regular than the actual requestsfor route information.

2.1. Optimized Link State Routing Protocol (OLSR)

The OLSR is an optimized pure link state algorithm withproactive nature which allows it to ensure the availability ofthe routes when required. Hop-by-hop mechanism is utilizedto forward packets, which is one of the main characteristicsof any MANET routing protocol [6] [7]. Being a link-staterouting algorithm, OLSR needs to keep up-to-date informationabout the nodes in the network and the route to each ofthese nodes. This is done by having

the nodes to periodicallybroadcast link-state update messages. These updates maycause a large amount of traffic to be generated [2].

The advantages and disadvantages: From the presentation of the OLSR routing protocol, we notice that it has theadvantages and disadvantages following:

1) Advantages

- Optimization of control messages broadcast throughtechnical multi point relay.
- The HNA messages that allow communication between a MANET network and a wired network.
- It offers interesting features while looking for optimal routes in terms of the number of jumps.
- It correctly manages the network topology, sendingregular messages TC.
- It can control the multiple use of interfaces (MID
- messages).

2) Disadvantages

- It poses a security problem, it remains vulnerabledespite the research done to improve its protectionagainst attacks.

2.2. Destination-Sequenced Distance-Vector (DSDV)

Perkins and Bhagwat introduced Destination-SequencedDistance-Vector (DSDV) , which is regarded as the premier adhoc routing protocols, similar to many distance-vector routingprotocols. It was expanded from the classical Bellman-Fordrouting mechanism, with the inclusion of destination address,sequence number and the number of hops rendering which itsuitable for MANET operations. Each node possesses a routingtable equipped with one route entrance to each goal, where theshortest path route (based on the number of hops) is recorded below for more information [3].

The advantages and disadvantages: From the presentation of the DSDV routing protocol, we notice that it has theadvantages and disadvantages following:

1) Advantages

- It eliminates the two problems of routing looprouting, and that of counting to infinity.
- Uses a periodic update and event-based

2) Disadvantages

- In this protocol, a mobile unit must wait until what itreceives the next update initiated by the destination,in order to update the entry associated with thisdestination, in the distance table. This makes DSDV slow.
- It causes excessive control in communication.

2.3. Wireless Routing Protocol (WRP)

WRP is regarded as a part of the general class of pathfinding algorithms, and defined as a collection of distributedshortest path algorithms that determines the paths via information on the length and second to-last hop of the shortestpath to every destination. WRP decreases the number ofcases whereby a temporary routing loop might occur. WirelessRouting Protocol is a table-based protocol with the intention ofkeeping routing information secured between the nodes of thenetwork. Every node is tasked with maintaining four tables:

- Distance table
- Routing table
- Link-cost table
- Message retransmission list (MRL) table

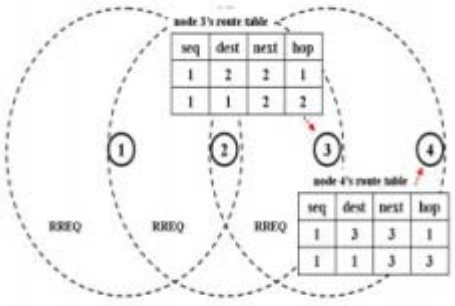


Fig. 1. **DSDV ROUTING**

WRP utilizes periodic update message transmissions adjacentto a node. The nodes in the response list of new messages(which is formed using MRL) should in turn acknowledge it[1].

1) Advantages

- A problem of the Bellman-Ford protocol is thecount-to-infinity problem. This is a problem that issolved by WRP.

2) Disadvantages

- Four tables requires a large amount of memory.
- Periodic hello message consumes power and band-width.

2.4. FISH-EYE STATE ROUTING (FSR)

Fisheye State Routing (FSR) is based on proactive routing.Klein and Stevens proposed Fisheye technology to reducegraphics and image data. The characteristic of Fisheye isthat the information across the focal length can be clearlycaught, while the information beyond the focal length isvague. FSR routing protocol makes use of this feature offisheye vision to broadcast routing update information withdifferent frequencies thereby reducing the routing overheadand decreasing the flood cost of updating information. FSRrouting protocol distributes information using the Fisheyetechnology, and does not broadcast routing update informationin the whole network, thus reducing the controlling overheadcaused by the router updating of information; while linkstaterouting protocol will cause flooding of the routers updatinginformation in the whole network [4].

1) Advantages

- Major scalability benefit: link state overhead de-creases significantly.
- Usage of most up to date shortest routes

2) Disadvantages
- Route table size still grows linearly with networksize.
- Out of date routes to remote destinations.

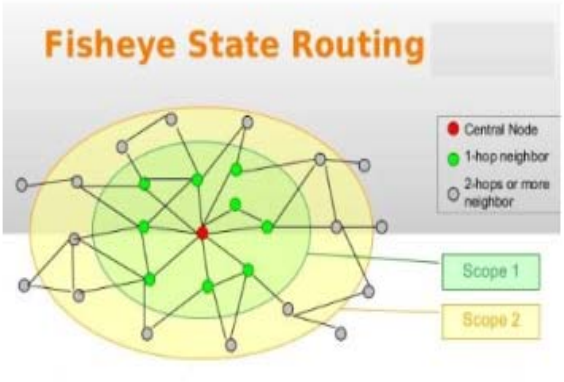


Fig. 2. **FSR Protocol Overview**

2.5. Hierarchical State Routing (HSR)

The characteristic feature of Hierarchical State Routing(HSR) is multilevel clustering and logical partitioning ofmobile nodes. The network is partitioned into clusters and acluster-head elected as in a cluster-based algorithm. In HSR,the cluster-heads again organize themselves into clusters andso on. The nodes of a physical cluster broadcast their linkinformation to each other. The cluster-head summarizes itscluster's information and sends it to neighboring cluster-headsvia gateway [5].

2.6. Cluster-Head Gateway Switch Routing (CGSR)

CGSR is also a proactive protocol. In this protocol thenodes are separated into interrelated group of nodes. In thesegroups, one of the nodes elected as cluster head to achievedistributed mechanism. This protocol is differing from DSDVby hierarchical cluster-head-to-gateway routing approach. The
node that is in the range of two or more cluster heads calledas gateway node. Gateway node switches the packets betweenone cluster head to another cluster head. Finally From theirown cluster head to node are receiving their packets [6].

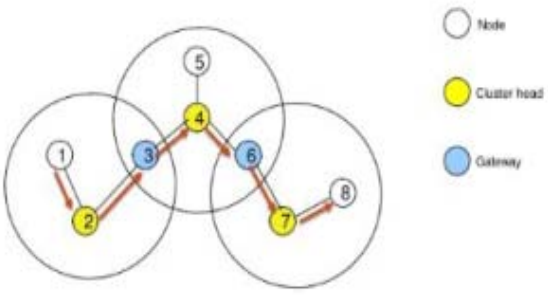


Fig. 3. **CGSR routing**

1) Advantages
- Better bandwidth utilization.
- Reduce the size of distance vector table because the routing is performed only over cluster head.
- More time is spend in selection of cluster heads an gateways.
- Changes in the cluster-head, may result in multiplepath breaks.
- Reduces routing table size storage required.

2) Disadvantages
- The leader election in each cluster, the process ofexchanging information concerned makes it criticalfor adhoc networks.
- More time is spend in selection of cluster heads an gateways.

III. CHALLENGES IN WSN

Some hurdles and challenges are there which includes limited functional capabilities, including problem of size, powerfactors related to environmental factors, transmission channelfactors, topology management complexity, node distribution, scalability issues and standard versus proprietary solutions [7].

IV. PARAMETERS USED FOR COMPARISON

4.1. Energy Consumption

As sensor nodes have limited power supply, energy becomesa major constraint to sensor networks. Thus, routing protocolsshould be designed such that sensor nodes consume leastamount of energy possible in transmitting data through thenetwork.

4.2. Control Overheads

Network control mechanisms are used to regulate the flowof traffic and ensure effective data transport in communicationnetworks.

4.3. Scalability

Sensor networks are utilized in various kinds of application ranging from defense services to environment monitoring tohealth monitoring. Now, some of these applications requiresmall scale deployment of sensor nodes while some requirelarge scale deployment. Thus, routing protocols should beflexible enough to operate in every kind of environment,irrespective of whether it is a small scale deployment or alarge scale application deployment.

4.4. Quality of Service (QOS)

Most of the routing protocols used in WSNs do not paymuch attention to Quality of Service. Normally, they aredesigned keeping in mind only one thing, reducing the networkresource utilization. Although there is nothing wrong in thatapproach, but it is advisable to give a little more importance tothe quality of network services provided; and design protocolswhich offer high Quality of Service (QOS).

4.5. Complexity

The complexity of a routing protocol may affect the performance of the entire wireless network. The reason behind isthat we have inadequate hardware competences and we alsoface extreme energy limitations in wireless sensor networks.

4.6. Routing overhead

Routing overhead is approximately constant regardless ofnode movements and traffic load,or sum of all types of controlpackets sent during route discovery and route maintenanceduring data transfer.

4.7. Mobility

Whereas mobility is a fundamental aspect of all nodes in anad hoc networks, mobility in WSN pertains mostly to a subsetof the network elements, and it is more specifically applicationdependent.

	OLSR	DSDV	WRP	FSR	CGSR	HSR
Energy Consumption	High	Medium	High	High	High	Low
Control Overheads	Less	High	High	Less	Less	High
Scalability	Good	Low	Low		Medium	Low
Quality of Service	Yes	No	No	Yes	No	No
Complexity	High	High	_	Low	Low	Low
Routing overhead	Low	High	High	Low	Less	Low
Mobility	Poor	Good	Medium		Medium	Medium

Table 1. Comparison of the various Proactive Routing Protocols

V. SYNTHESIS

Throughout this work, we have focused on tmain routing protocols ProactiveProtocols for Wireless Sensor Networksby studying their characteristics and operating principles. According to the comparison between these protocols (Table.1) we note significant differences between them in terms of efficiency and scalability OLSR

VI. CONCLUSION

Through our exhaustive study, it has been found that some routing protocols ProactiveProtocols for Wireless Sensor Networks. The analysis of these protocols allowed us to highlight the advantages and the disadvantages of the routing techniques adopted by each one of them. Thus, we made a comparative study between these protocols to be able to deduce which one is the least consuming in term of energy or which has the best performance compared to its counterparts.

REFERENCES

[1] M.Abdulleh, S.Yussof, H.Shaker, “Comparative Study of Proactive,Reactive and Geographical MANET Routing Protocols”theCreativeCommons Attribution International License,pp.11, 6 May 2015.

[2] K.Adoni,R.Joshi, “Optimization of Energy Consumption for OLSRRouting Protocol in MANET”,International Journal of Wireless and Mobile Networks (IJWMN),pp.252-252, February 2012.

[3] C.E.Perkins, P.Bhagwat,” Highly dynamic destination sequenceddistance-vector routing (DSDV) for mobile computers”, Proceedings of the ACM Special Interest Group on Data Communication,pp.234-244,September, 1994.

[4] S.Thaseen, K. Santhi, “Performance Analysis of FSR, LAR and ZRPRouting Protocols in MANET”,International Journal of Computer Ap-plications,pp.20-25,March 2012.

[5] J.Hemagowri ,C.Baranikumari ,B.Brindha, “A Study on Proactive Routing Protocol in Ad-hoc network”,International Journal of Modern Engi-neering Research (IJMER),pp.1-2,unpublished.

[6] I.OUAFAA, KS.DDNE , L.JALAL, EH.SAD, “Recent Advances of Hierarchical Routing Protocols for AdHoc and Wireless Sensor Networks: A Literature Survey”,BLM TEKNOLOJLER DERGS,PP.75-75,MAY2016.

[7] SK.Singh,” Routing Protocols in Wireless Sensor Networks A Survey”,International Journal of Computer Science and Engineering Survey(IJCSES),Vol.1, PP.63-83,2010.

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