International Conference on Automation, Control, Engineering and Computer Science (ACECS'14)
Proceedings - Copyright IPCO-2014, pp.171-176
ISSN 2356-5608

Adapting the AODV Routing for Mobile Environment

EL OUKKAL Sanae,
Department of Informatics; GRMS2I / LIIAN
University Sidi Mohamed Ben Abdullah, FSDM- Fez
Fez, Morocco
sanae.eloukkal@usmba.ac.ma

EL BEQQALI Omar,
Department of Informatics; GRMS2I / LIIAN
University Sidi Mohamed Ben Abdullah, FSDM- Fez
Fez, Morocco
omar.elbeqqali@usmba.ac.ma

Abstract— **Wireless communication has become a ubiquitous communication in modern life.**
Mobile ad hoc networks (MANET) are self-creating, self-organizing, self-administrating and do not require deployment of any kind of fixed infrastructure. They used the multi-hop routing from a source to a destination node or nodes to route data.
We suggest a novel approach of AODV protocol to constrain route request broadcast based on mobility of nodes.
We adapt the known protocol to three mobility conditions i.e. random position, random direction and speed. In this approach we select the neighborhood nodes for broadcasting route requests based on their mobility.
The routing protocols would be evaluated in the forms of metrics like User Datagram Protocol (UDP) traffic by utilizing the Network Simulator (NS2).

Keywords— Wireless communication;routing protocol; AODV; mobility; WSN; MANET.

I. INTRODUCTION

Those last years were remembered by the passion of technologies of information and communication (TIC), especially in networking. The Wireless Sensor Network (WSN) is consist of a large number of autonomous nodes equipped with sensing capabilities, wireless communication interfaces, and limited processing and energy resources.
WSNs are used for distributed and cooperative sensing of physical phenomena and events of interests [1].

WSNs can be employed in a wide spectrum of applications in both civilian and military scenarios, including environmental monitoring, surveillance for safety and security, automated health care, intelligent building control, traffic control, object tracking, etc.

A mobile environment is a system made up of several variable components which have possibility of reaching the information independently of their geographical positions.
The mobile networks or wireless network can be classified in two classes which are on the one hand the mobile networks with infrastructure including two distinct sets of entity: the "wired network" or traditional telegraphic communication network and the "wireless network", and in the other hand mobile network without infrastructure.
They use a direct communication by using their interfaces of communications. It should be known that the absence of the infrastructure obliges the elements of the network to behave as routers who take part of their share in the research and maintain the ways.

II. WIRELESS SENSOR NETWORK

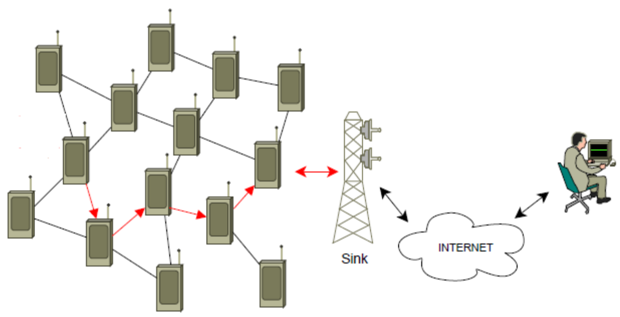

Figure 1: WSN Architecture

A Wireless Sensor Network (Figure 1) [2] (WSN) is an ad hoc network with a great number of nodes which are micro-sensors and able to collect and to transmit environmental data in an autonomous way. The position of these nodes is not obligatorily predetermined. They can be dispersed in a geographical area.

A. *WSNs Applications*

WSN have found application in a vast range of different domains, scenarios and disciplines [3]:

International Conference on Automation, Control, Engineering and Computer Science (ACECS'14)
Proceedings - Copyright IPCO-2014, pp.171-176
ISSN 2356-5608

1) Environmental/Earth monitoring: The term Environmental Sensor Networks, has evolved to cover many applications of WSNs to earth science research. This includes sensing volcanoes, oceans, glaciers, forests, etc.

2) Data logging: Wireless sensor networks are also used for the collection of data for monitoring of environmental information; this can be as simple as the monitoring of the temperature in a fridge to the level of water in overflow tanks in nuclear power plants. The statistical information can then be used to show how systems have been working. The advantage of WSNs over conventional loggers is the "live" data feed that is possible.

3) Agriculture: Using wireless sensor networks within the agricultural industry are increasingly common; using a wireless network frees the farmer from the maintenance of wiring in a difficult environment. Gravity feed water systems can be monitored using pressure transmitters to monitor water tank levels, pumps can be controlled using wireless I/O devices and water use can be measured and wirelessly transmitted back to a central control for billing.

III. Routing in WSN

Routing in a MANET [11] [12] is fundamentally different from traditional routing found on infrastructure networks. Routing in a MANET depends on many factors including topology, selection of routers, and initiation of request and specific underlying characteristic that could serve as a heuristic in finding the path quickly and efficiently.

One of the major challenges in designing a routing protocol for Ad Hoc networks system from the fact that, on one hand, a node needs to know at least the reach ability information to its neighbors for determining a packet route and, on other hand, the network topology can change quite often in an Ad Hoc network. Some ad hoc network routing protocols: DSR [4], DSDV [5], AODV [5] [10].

Ad Hoc routing protocols can be broadly classified as being Proactive (Table-Driven) or Reactive (On- Demand).

a) ***Proactive and Reactive Routing Protocols [Table 1]:*** In a **Proactive routing protocol**, all the routes to each destination are kept in an up-to-date table. Changes in the network topology are continually updated as they occur.

b) ***Reactive routing protocol [Table 1]:*** In the **Reactive routing protocol**, a connection between two nodes is only created when it is asked for by a source. When a route is found, it is kept by a route maintenance procedure until the destination no longer exists or is indeed.

The following Table1 presents a comparison between proactive and reactive routing protocols.

Table1. Comparison between proactive and reactive routing protocols

Protocol	Proactive	Reactive
Advantages	A route can be selected immediately without delay	Lower bandwidth is used for maintaining routing tables. More energy-efficient Effective route maintenance
Disadvantages	Produces more control traffic Takes a lot more bandwidth Produces network congestion	Have higher latencies when it comes to route discovery

IV. Contribution

We project following [6] to propose a more general *prefetching* [13] architecture.
Prefetching data is transferring data from main memory to temporary storage in readiness for later use.

This architecture must take into account all the hierarchical proxies caches or collaborative distributed in the area covered by the system. That's why we are using WSNs architecture. For our work, we can replace our problem in the Network Layer from WSN OSI Layer, because the major function of this layer is routing. This layer has a lot of challenges depending on the application but apparently, the major challenges are in the power saving, limited memory and buffers, sensor have to be self organized.

In this paper, we focus on on-demand reactive routing protocol AODV and propose a new approach:
This approach permit to select a neighbor node for forwarding the route request based on its recent usage and mobility.
The approach of communication when we adapt mobility for AODV Routing can be divided in two scenarios: *client/server.*

International Conference on Automation, Control, Engineering and Computer Science (ACECS'14)
Proceedings - Copyright IPCO-2014, pp.171-176
ISSN 2356-5608

Client side:

- The client sends his request in broadcast mode in network, and waits an ACK from the close node following its routing table.
- If after time the client does not receive an ACK, it returns its request.
- The client receives the ACK from his neighbors and waits the response to his request.
- The client receives the response; and register in its memory for a possible use.
- The client updates (MAJ) his routing's table

Server side:

- The close nodes intercept the received message and determine the client node.
- They send in their turn an ACK with the customer's node and treat the request.
- If the answer of the request is in only one node, it MAJ its routing's table, try to find the nodes close with the client node, and allow to transfer information within an optimal time.
- If the answer of the request is on several nodes, we make a cluster, and we will indicate Cluster-Head.

Those explanation of client and server side, conclude the following algorithm:

Algorithm1: Routing data in mobile environment
Require: Nodes in mobile environment
Ensure: Data routed to the client

1- The nodes update their routing's table
2- Client sends its request in multicast to neighbor's node, and waits ACK

- **If** NO ACK **then**

3- Client updates its routing's table and resent the request again
4- Go to 2

- **Else**

5- Answer the request

- **End if**

- **If** one node has answer **then**

6- It inform client's node
7- Check the path to sent answer following the routing's table

- **Else**

8- Create a cluster including nodes having the answer
9- Identify the cluster head
10- Send answer

- **End if**

11- Update routing's table to all node

A. Simulation

The goal of this simulation is to optimize the number of transmission following the requests in the network.
In our simulation, 10 nodes were allowed to move in a 1200x800 meter rectangular region for few seconds simulation time. Initial locations of the nodes were obtained using a uniform distribution. We have assumed that each node moves independently with a random speed in a random direction later.
Initially, we suppose that the sensors can transmit without collisions and error. When a node transmits a package, it is sure that the package will arrive at destination. The goal is to have a simulation which makes it possible to represent a WSN on very broad scale.
They are many simulators for the WSN: NS2[7], GloMoSim[8], OMNeT++[9].
Our simulation was carried out in the following software environment:

- Operating system UNIX: Ubuntu
- The simulator: NS2 [7]

We have analyzed the performance of the proposed algorithm with the following parameters.

Table2. The simulation's Parameters.

Number of Nodes	10
Network Type	Mobile
Connection Type	UDP/CBR
Packet Size	1000 bytes
Routing Protocol	AODV(adaptative)
Radio-Propagation Model	TwoRayGround
Interface Queue Type	DropTail
MAC Type	Mac/802_11
Antenna Model	Antenna/OmniAntenna
Link Layer Type	LL
Chanel Type	WirelessChannel
Max Packet in ifq	50
Zone of Deployment	1200/800

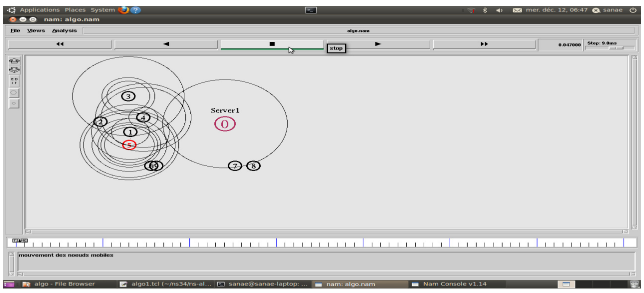

Figure2: The simulation (mobile case)

International Conference on Automation, Control, Engineering and Computer Science (ACECS'14)
Proceedings - Copyright IPCO-2014, pp.171-176
ISSN 2356-5608

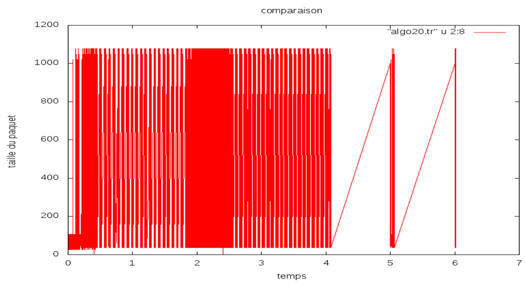

Figure3: Graphical Representation

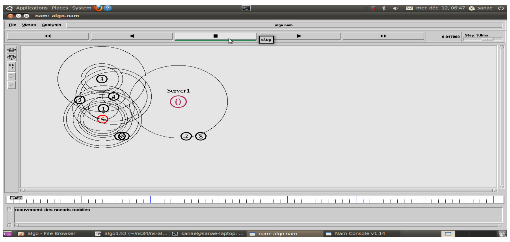

Figure 4: the simulation (static case)

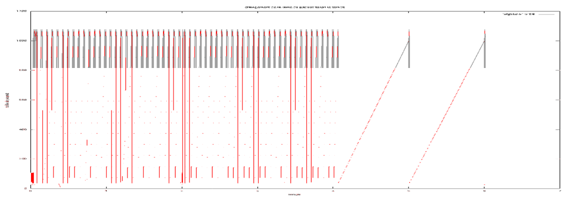

Figure 5 : Graphical Representation

This scenario helps us in knowing whether the algorithm supports dynamic traffic conditions in the network without any affect on packet size, even if we use a big data.
Fig 2 shows the simulated network. Figure 3 shows that the data packet delivered in the time of the simulation. This graph shows that the performance of the adapting AODV is effectively works without losing data. Routing in this environment is not necessary a problem when the nodes are moving at this speed as the topology of the network does not change very rapidly, and the number of node is not exceeded. As we can see, there is no problem comparing the result in those cases (mobile and static node), we can conclude that our proposed model proof the possibility of adapting the AODV protocol with mobile environment.

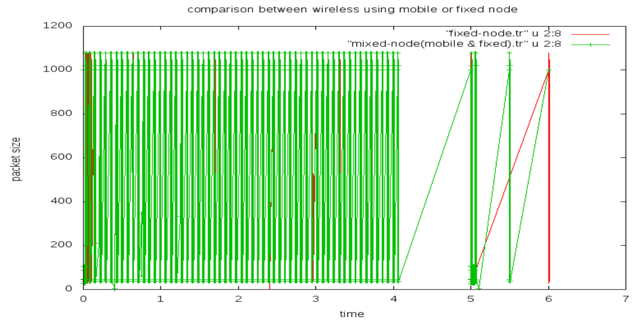

Figure6: Comparison between the two cases

In order to see the differences between the two simulations, we made comparison between them.
As shown in figure 6, we can see the similitude between the graphics.
We conclude that we had proposed a good approach, because even if we used mobility, we did not lose data (the packet size is the same).

V. CONCLUSION

In this article, we present an approach of routing data in a WSNs, this approach is carried out by using a routing algorithm for mobile networks. The experiments of our algorithm are carried out by an adequate simulator, to evaluate several criteria in a context.
To continue our work, we suggest treating the problems of the clustering by proposing a new clustering approach of the proposed algorithm to show the generic aspect of our study. The other problem that can be treated is the distributed answer because its need much energy from nodes, and reduce the lifetime node.

REFERENCES

[1] I.F.Akyildiz,W.Su, Y.Sankarasubramaniam, and E. Cayirci. 2002. Wireless sensor networks: A survey. IEEE Communications Magazine, 40(8):102–14.

[2] J. Yick, B. Mukherjee, and D. Ghosal, “Wireless sensor network survey,” Computer Networks, vol. 52, no. 12, pp. 2292-2330, 2008

[3] D. Bri, M. Garcia, J. Lloret, and P. Dini, “Real deployments of wireless sensor networks,” Proc. Of the 3rd int. conf. on Sensor Technologies and Applications, pp. 415-423, 2009

[4] David B. Johnson, David A. Maltz and Josh Broch “DSR: The DYNAMIC Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks”

[5] Adel.S.El ashheb “Performance Evaluation of AODV and DSDV Routing Protocol in wireless sensor network Environment” International conference on Computer Networks and Communication Systems (CNCS 2012), IPCSIT vol.35(2012), IACSIT Press, Singapore

[6] El Garouani Said, El Beqqali Omar and Laurini Robert : “Data Prefetching Algorithm in Mobile Environments” European Journal of Scientific Research Vol.28 No.3 having ISSN 1450-216X (2009), pp.478-491.

[7] Kevin Fall and Kannan Vardhan “The ns Manuel (formerly ns Notes and Documentation)”, The VINT Project

[8] Global Mobile Information Systems Simulation Library (GloMoSim).[Online].
Available : http://pcl.cs.ucla.edu/projectes/glomosim/

[9] OMNET++ discrete event simulator.[online]. Available:http//www.omnetpp/org

[10] C. E. Perkins and E. M. Royer. The Ad hoc On-Demand Distance Vector Protocol. In C. E. Perkins, editor, Ad hoc Networking, pages 173.219. Addison-Wesley, 2000.

[11] Asis Nasipuri, Mobile Adhoc Networks,Department of Electrical & Computer engineering, The University of North Carolina, http://www.ece.uncc.edu/~anasipur/pubs/adhoc.pdf.

[12] C. E. Perkins, Ad Hoc Networking, Addison-Wesley, 2001

[13] Sanae EL OUKKAL and Omar EL BEQQALI “Prefetching and indexing data in mobile environment: Using Wireless Sensor Network” iCEER’2013; Marrakesh – Morocco.