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# Comparison of Wireless Routing Protocols in Sensor Network Using NS2 Tool

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*Abstract*— **Wireless Sensor Networks are collection of hundred or thousand sensor nodes connected to wireless radio link. In this work we compared our proposed protocol MAODV with the existing protocols such as AODV, AOMDV and DSDV using the simulator NS2. The performance of the protocols are measured based on metrics such as Packet Delivery Ratio, End to End Delay, Throughput and Node Left Energy.**

*Keywords*— **Wireless Sensor Networks, NS2.34, Routing and Frequency.**

## I. INTRODUCTION

A Network is defined as the group of system or people, or organizations who tend to share their information collectively for their business purpose. Definition of network is similar as a group of computers logically connected for the sharing of information or services. An organization has two options when it comes to setting up in networks. They can use a completely wired network, which use networking cable to connect computers, or they can use a wireless networks which uses Radio frequency to connect computer. [1].

## II. WIRELESS SENSOR NETWORKS

A Wireless Sensor Networks [WSNs] are a collection of sensor nodes connect to wireless Radio frequency Link. Wireless Sensor Nodes are used to monitor physical or real world environmental conditions, such as traffic monitoring, forest fire detection, sounds and smart phone applications. In wireless sensor networks where there is no infrastructure support as in the case of wired network.

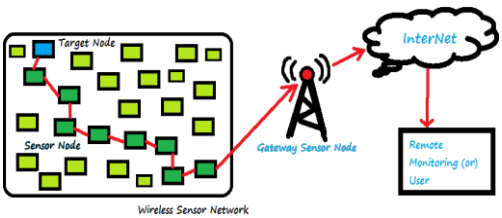



Fig. 2.1: Wireless Sensor Networks

A routing method is always needed to find a path so as to forward the packets between the source and the destination nodes. A wireless network uses high frequency Radio waves rather than wires to communicate between nodes.

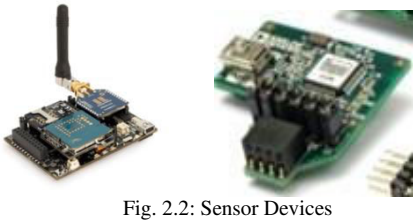


Fig. 2.2: Sensor Devices

*Routing Protocols for Proactive & Reactive*

*A). Proactive- DSDV (Table Driven)*

Proactive routing protocols can also be seen as table driven protocols. Table driven means every node or a device continuously updates the table containing routing information about every other node of the network. If due to sensor of nodes topology changes, then nodes of the network send a message to update routing table [9]. In proactive routing protocol, routing information of all the nodes is continuously updating and modify routing table. The routing table has all the current routes of every node to link with any other node. S o if any node wishes to send the packet of data to its intended node, then source node checks the current routing table information and finds the path to the destination node.

Here latency delay is very less as the route from source to destination is updated immediately and readily available in routing table before the actual communication requirement. When any source terminal wants to transmit packet of information to intended node, it has to just check for particular route and pass from source to destination in routing table [10]

*B).Reactive (On Demand) Routing Protocol*

Reactive routing protocols can also be seen as on demand protocols. In this type of routing algorithm, all sensor nodes contain the information of only active paths to the destination nodes. If any source terminal wants to send packet

of information to its intended node or terminal, reactive routing will try to settle a route based on the request from the source. It indicates that here latency delay is high as the route discovery process is only on demand, as the route from source to destination is settled after the request from the source terminal. It performs better in highly dynamic movement of nodes of the network [11]. Reactive routing protocols include Ad-hoc on Demand Distance Vector (AODV), Ad-hoc on Demand Multipath Distance Vector (AOMDV).

## III. NETWORK SIMULATOR TOOL

NS2 provides a large number of built-in C++ objects. It is advisable to use these C++ objects to set up a simulation using a TCL Simulation script. If these objects are insufficient then we have to develop our own C++ objects and use a OTcl configuration interface to put together these objects. After simulation, either text-based or animation based simulation results. To interpret these results graphically and interactively, then the user has to use we will get tools such as NAM and Xgraph. [4]

## IV. PROPOSED MODIFICATION OF [MAODV] ROUTING PROTOCOL

The Existing Protocol AODV modified in our work by adding information to control packets for all routes. After exploring all possible paths, one with the shortest path hop count is first selected as required by the user. i.e. RREQ and RREP is controlled. To controlled packets Route Request [RREQ] and Route Reply [RREP] are routed in broadcast way. When the source wishes to transmit, it checks its routing table for any valid route to the desired destination. If this is not the case, it starts Detection Phase (discovery route process) by broadcasting control packet Route Request [RREQ].

### NS2.34: AODV MODIFICATION PROTOCOL

- **ns-allinone-2.34/ns- 2.34/Aodv/Aodv.cc**
- **ns-allinone-2.34/ns-2.34/Aodv.h**
- **ns-allinone-2.34/ns-2.34/tcl/lib/ nsmobilenode.tcl.**
- **ns-allione-2.34/ns-2.34/tcl/ex/simple-wireless.tcl**
- **ns-allinone-2.34/ns-2.34/MAC- 802.11/802.15.4**

## V. PERFORMANCE EVALUATION OF WIRELESS ROUTING PROTOCOLS

In order to analyse our proposed method with the existing protocols, we have used NS2 simulator with two ray ground models. In this experiment, the MAC type of 802_11 & 802_15_4 is used to simulate the Wireless Sensor Network and the table 5.1 shows the other parameters considered for our simulation study.

TABLE 5.1 :

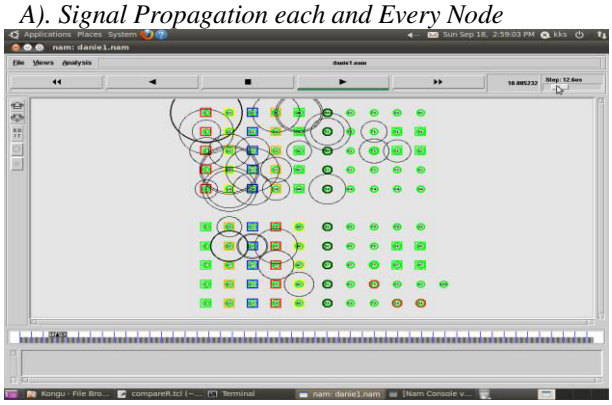
SIMULATION & VALUES

| Parameter | Value |
|---|---|
| Simulator | NS2.34 |
| Channel Type | Channel/Wireless Channel |
| Radio-Propagation Model | Two Ray Ground |
| Network Interface type | 802_11/802_15_4 |
| Antenna | Omni Antenna |
| Number of Nodes | 101 |
| Traffic | CBR/FTP |
| Simulation Time | 150.0 (Ms) |
| Initial Energy | 100 (%) |
| Rx Power | 0.355 (J) |
| Tx Power | 0.255 (J) |
| Communication Type | Bi Directional |
| Routing Protocols | AODV, AOMDV, DSDV and Proposed MAODV |

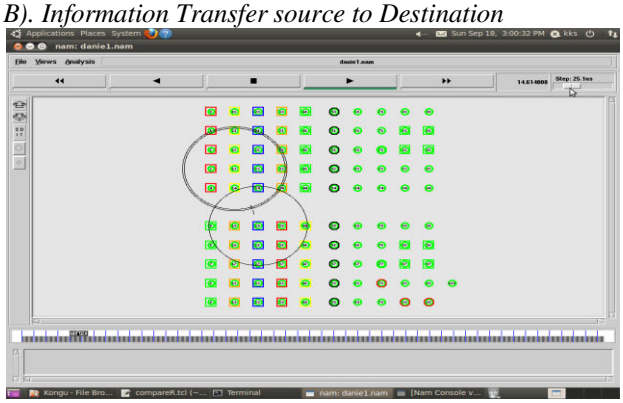
The following metrics are used to measure the performance of protocols.

- ✓ Packet Delivery Ratio
- ✓ End to End Delay
- ✓ Throughput
- ✓ Node Left Energy

*A). Signal Propagation each and Every Node*



*B). Information Transfer source to Destination*



*C). Comparison of Routing Protocols*

Table 5.2
Comparison of Routing Protocols

| Protocols/ Parameter | AODV | AOMDV | D SDV | Proposed MAODV |
|---|---|---|---|---|
| Packet Delivery Ratio | 90.9852 | 91.3634 | 13.8261 | 91.7676 |
| End to End Delay | 0.19763 | 0.19154 | 0.31860 | 0.19038 |
| Throughput | 69.32 | 94.47 | 89.77 | 111.60 |

From the figure 5.1 it is observed that the proposed protocol MAODV gives improved result in terms of Packet Delivery Ratio when compared to existing protocols such as AODV, AOMDV and DSDV.

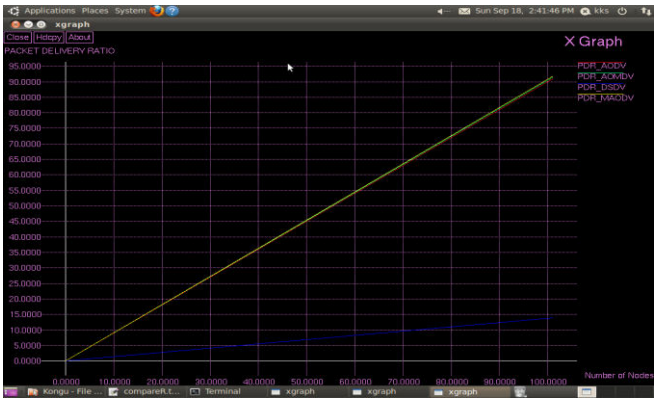



**Fig 5.1: Packet Delivery Ratio**

From the figure 5.2 shows that the proposed method MAODV gives better result in terms of End to End Delay when compared to existing protocols such as AODV, AOMDV and DSDV.

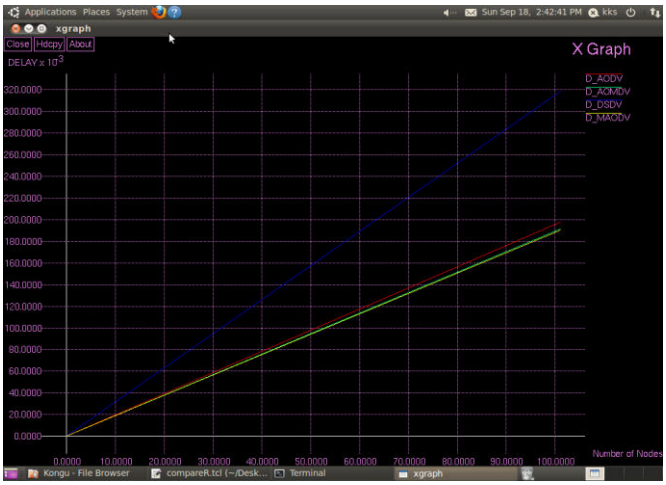



**Fig 5.2: End to End Delay**

Figure 5.3 it is observed that the proposed protocol MAODV gives better result in terms of Throughput when compared to existing protocols such as AODV, AOMDV and DSDV.

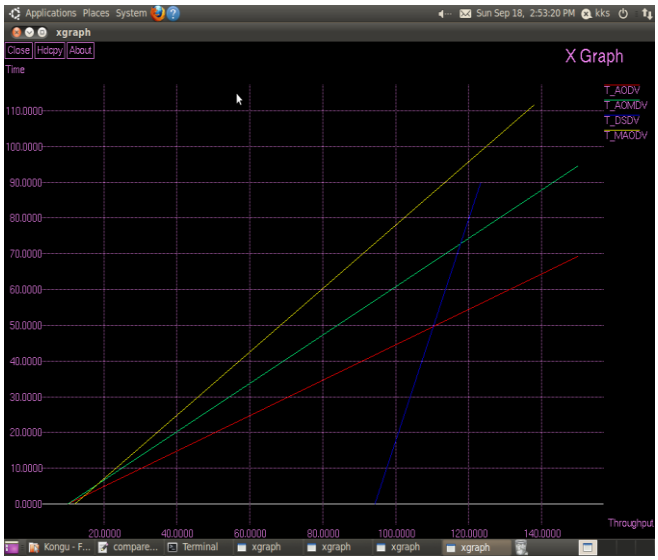



**Fig 5.3: Throughput for Wireless Routing**

Figure 5.4 demonstrates the Node Left Energy comparison of the proposed protocol MAODV with the existing protocols.

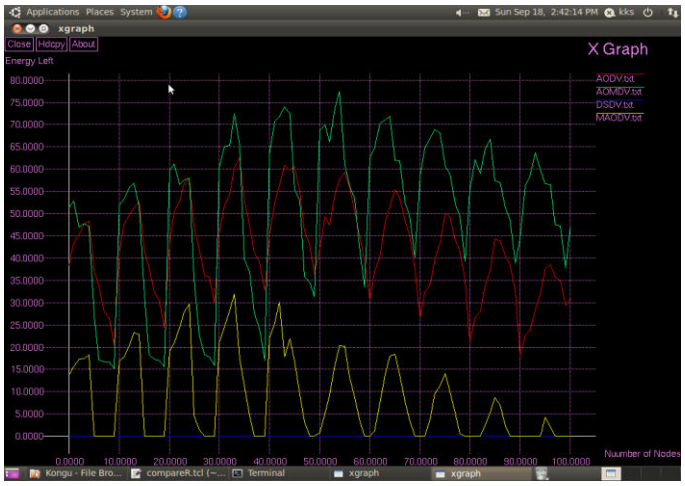



**Fig 5.4: Energy Consumption for Wireless Routing**

## VI. CONCLUSIONS

In this paper we compared the performance of AODV, AOMDV, DSDV and proposed MAODV routing protocols for Wireless Sensor Networks using NS2 Simulation. Both proactive and reactive routing protocols performed well in high sensor scenarios than sensor networks. Finally, the experimental result shows that the proposed MAODV protocol gives better result when compared to existing protocols.

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