NETWORK SIMULATOR ANALYSIS OF ENERGY EFFICIENCY OF DSDV (DESTINATION SEQUENCE DISTANCE VECTOR)

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ABSTRACT

Many protocol which can give the best performance in wireless Ad-hoc network in all conditions. AODV (Ad-hoc On-Demand Distance Vector) protocol uses an on-demand approach and established the route only when it is required by a source node for transmitting data packet to the destination. WBAODV (Weight Based Ad-hoc On-Demand Distance Vector) protocol is also an on-demand protocol and used to enhance the stability of a network. DSDV (Destination Sequence Distance Vector) is a table-driven protocol and complete path must be traversed before sending the packets. Every protocol has its own advantages and disadvantages in the network. In this current research work paper Hybrid Scheme comprising WBAODV and DSDV protocol is proposed to minimize the delay, increase the throughput, increase the packet delivery Fraction (PDF) and decrease the energy as compared to AODV, WBAODV and DSDV protocol.

Keywords: Wireless Ad-hoc Network, Routing, MANET, AODV, Wireless Sensor Network, Packet Delivery Fraction

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1.0 INTRODUCTION

The wireless ad-hoc network does not require central administration and does not fail when a node leaves the range of other mobile nodes' transmitters. Due to the limited range of mobile nodes in a wireless ad-hoc network, data packets travel through multiple hosts to reach their destination, and each host has the ability to enter and exit the network. In a wireless ad hoc network, the nodes must be participating to forward the data packet to the next node under routing. Each node is composed of a router and a mobile host. A router is a device that intercepts data and forwards it to the next node, while a mobile host is merely a host's IP address. Ad-hoc networks are required to manage topology changes and node failures. As mobile nodes leave the network, the link is severed. This issue is resolved by requesting affected nodes to generate new routes. It requires time, but the issue is resolved. This technique is easily implementable on wireless ad-hoc networks, whereas other networks require a wired connection *[S. Mueller et al. (2003), T. Larson & N. H. Lulea (1998)*].

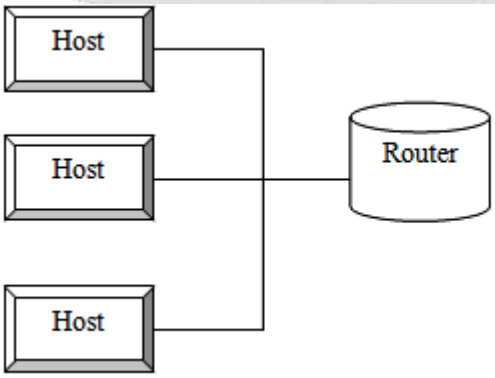

Figure 1: Mobile node acting both as hosts and as router

It is desired to choose each hop individually to deliver the message to its destination, and each hop is responsible for calculating the entire path to forward the packet to the next hop in routing. In a wireless ad hoc network, consistency must be maintained across all hops, which prevents loop formation. This may be accomplished manually by a network administrator, which is known as static routing, or automatically by machines using a routing protocol to communicate with one another, which is known as dynamic routing [*Abdual Hadi Abd Rahman and Zuriati Ahmad Zukarnain (2009), J.Haerri & C. Bonner (2004)*]. Positives and Negatives of Static Routing. To connect to other routers, it requires static routing, but it cannot connect directly. The entire procedure begins with naming a router, followed by defining its IP address and subnet mask for each of its interfaces. In a small domain with three routers and five network segments, static routing has the advantage over dynamic routing when selecting the path. If 250 network segments are to be interconnected by more than 12 routers, it is impossible to compute the optimal route and predict redundant network links.

2.0 LITERATURE REVIEW

David Espes et al. (2006), Quality of Service (QoS) in mobile Ad hoc networks (MANETs) is a very difficult task due to their dynamic topology, limited resources, and wireless link characteristics. Routing algorithm is a crucial mechanism for ensuring quality of service in networks. The Ad hoc On-demand Distance Vector (AODV) protocol selects a path with low bandwidth usage. The QoS routing algorithm, which is an extension of the AODV protocol, is presented in this article. The resulting protocol disperses traffic across the global topology. Therefore, it improves the throughput and reduces the number of collisions on the paths. The introduction of additional metrics beyond the number of hops used by the AODV protocol. Most routing algorithms compute paths based on a single or two metrics. In order to increase throughput, a weight function employing multiple parameters is provided in this paper. *David B. Johnson, David A. Maltz, and Josh Broch (2002)* presented a directional routing approach for multihop ad-hoc networks, which was applied to two on-demand routing protocols: dynamic source routing (DSR) and ad-hoc on-demand distance vector routing (AODV). Both DSR-based and AODV-based directional routing protocols are intended to strike a balance between co-channel interferences from distant nodes and the total power consumed by all the nodes. Three metrics are considered during the route discovery process in order to select the optimal route. They include hop count, power budget, and overlap between adjacent beams. By taking advantage of the orientation of directional antennas, both routing protocols are able to reduce overlaps between the beams of the nodes along the route, thereby eliminating interference. The simulations take into account both arbitrary and random networks. Real-time traffic transmission over ad hoc networks exhibits significant performance gains as a result of these findings. *I. Akyildiz, W. Su, Y. Sankara subramaniam, and E. Cayirci (2002)* examine the energy aspect of wireless sensor networks. In this paper, a novel technique based on system identification is used to extend the lifetime of sensor nodes dispersed within a closed space container to measure environmental variables such as temperature and relative humidity. The collected data can be used to make decisions regarding freights or containers as components of an expansive transportation network. *V. Kanakaris, D. Ndzi, and D. Azzi (2010)* demonstrate that energy conservation has been deemed a significant topic in wireless sensor networks (WSNs). Network lifetime with cost-effective management is the most important factor in the design of power-saving mechanisms for wireless sensor networks. Two location tracking algorithms are proposed in the distributed WSNs to track a mobile station that is not synchronised with its corresponding sensor nodes (SNs). *D.P.S. Edvinoe Christina et al. (2011)* reached the conclusion that wireless sensor networks can offer low-cost solutions to a variety of real-world problems. As sensors have limited power, any security mechanism for a network of sensors must be energy-efficient. Based on dynamic key cryptography, this paper proposes an energy-efficient secure routing for wireless sensor networks. They proposed a Weight Based AODV protocol for the routing process in which a route's weight is determined by four factors: node speed, battery power, hop count, and bandwidth. *B. C. Mohan and R. Baskaran (2011)* have suggested a bumble bee calculation for specially appointed steering. The bumble bee calculation is a type of SI method utilised for streamlining issues. The calculation reconstructed the honey bee state calculation from the period of introduction to the period of execution and yielded results that were superior to the current ABC approach. In terms of reaction time and output, the new framework provides optimal characteristics due to the honey bee region's lower operating costs. Consequently, this leads to decreased vitality and traffic, enhancing battery life and organisation efficiency. The authors *[M. I. Fahmy, L. Nassef, and A. H. Hefny (2014)*] proposed the anticipated vitality proficient honey bee roused directing (PEEBR) formula. The calculation was inspired by honey bees' searching behaviours and compared to two cutting-edge specially appointed steering conventions, namely the objective sequenced separation vector (DSDV) and AODV, for various organisation MANET sizes. They also compared the energy

consumption of PEEBR, measured in mJ/KB, to that of BeeAdHoc, an additional honey bee-inspired steering convention. The simulation outcomes demonstrate that PEEBR is a highly energy-efficient guiding algorithm.

3.0 METHODOLOGY

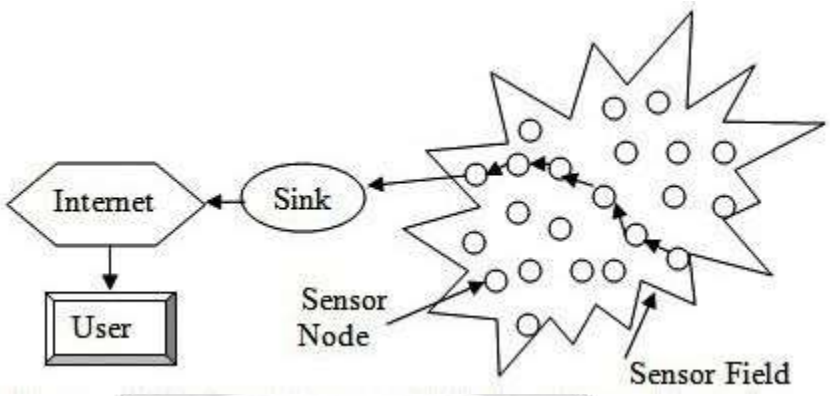

Figure 2 Basic architecture of wireless sensor network

3.1 PROTOCOL APPLICABLE TO WIRELESS AD-HOC NETWORK

In wireless d-hoc networks, these three protocols are predominantly used: On Demand (Reactive), Table Driven (Proactive), and Hybrid (Mixture of Reactive & Proactive). The brief details of these protocols are discussed in the following section.

Demand-based (Reactive) Protocol

On demand routing protocols include Ad-Hoc on-demand distance vector (AODV) and Weighted AODV. WBAODV is an upgrade to the AODV protocol. AODV is a routing protocol for mobile ad-hoc networks. AODV is compatible with both Unicast and Multicast routing. It is a demand-driven algorithm that maintains a route whenever the source wishes to send data to the destination. The routes are maintained for as long as the source requires them. AODV is a self-starting and loop-free technique. It uses sequence numbers to ensure that routes in a wireless ad-hoc network are current.

It uses a route request / route reply query cycle to establish the route when a route between the Source and Destination Nodes has not been established. When a route is desired, it broadcasts a route request (RREQ) packet to all network nodes. Nodes receive this RREQ packet and update their routing information in the routing table. It also configures the routing table's backward pointers to the source node. The RREQ includes the IP address of the source node, the current sequence number, the broadcast ID, and the destination's updated sequence number. If the node is the destination or has a route to the destination, it sends the RREP packet. In this instance, an RREP is unicast back to the source node; otherwise, the RREQ is rebroadcast in the network. Nodes establish the route by returning the RREP packet to the source node via all intermediate nodes. As soon as the source node receives the RREP packet, it begins sending data packets to the destination. As long as the packet is being transmitted from source to destination, the route remains active; otherwise, the nodes will delete the route. Therefore, nodes spread the error message (RERR) throughout the entire network. If the source node still desires the route for packet transmission, the entire network process begins again.

Weight-Based AODV (WBAODV) is an efficient routing protocol that is superior to the standard AODV routing protocol. It is also resistant to the most common types of routing attacks.

Table-Driven Protocol (Proactive)

In wireless ad hoc mobile networks, the table-driven routing scheme is Destination Sequenced Distance Vector Routing. It is based on the Bellman–Ford algorithm and was created in 1994 by C. Perkins and P. Bhagwat. Priority was given to resolving the routing loop issue in the wireless ad-hoc network, and the sequence number in the routing table is used to determine whether the link is present or not in the network's routing. If a link is present, an even sequence number is used; otherwise, an odd sequence number is used; this sequence number is generated by the destination, and nodes transmit the next update with this number. The Destination Sequence Distance Routing Protocol sends full dumps infrequently and incremental updates more frequently to maintain an up-to-date routing table.

Hybrid Protocol

Weight Based Ad-Hoc on demand Distance Vector (WBAODV) and Destination Sequence Distance Vector (DSDV) protocols have been implemented using On Demand and Table Driven Protocols. Due to the fact that On Demand and Table Driven protocols are optimal for different scenarios, hybrid employs both. Table Driven is limited to small domains, while On Demand is utilised for larger domains.

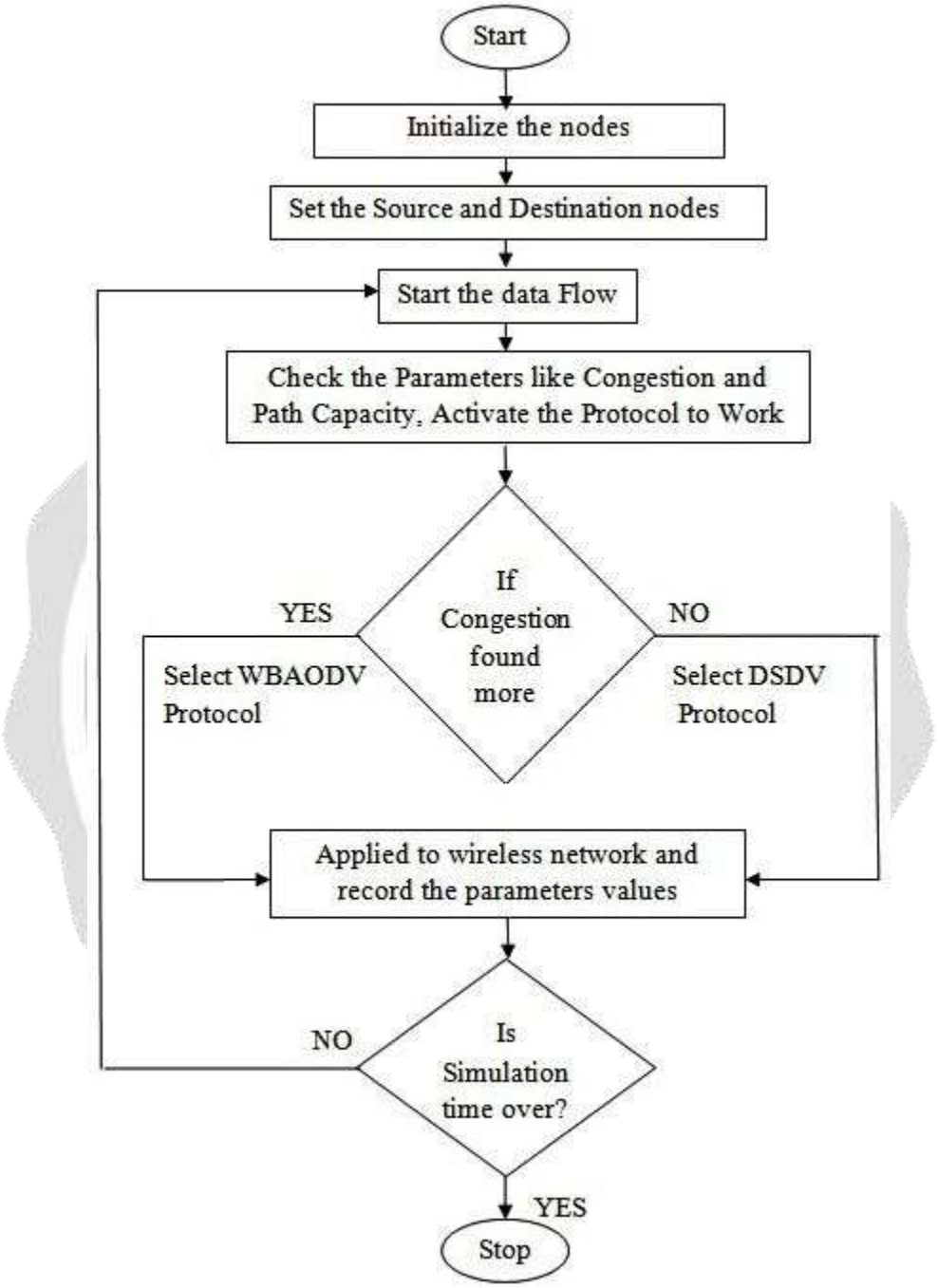

Figure 3 Routing Mechanism of Hybrid Protocol

3.2 SOLUTION METHODOLOGY

The AODV Routing protocol utilises an on-demand method for route discovery. A route is only initiated, established, and terminated when it is required by a source node for data packet transmission towards the destination. DSDV employs source routing, in which a data packet contains the entire path to be traversed prior to data transmission. WBAODV is a weight-based AODV protocol used to improve network stability. Weight Based Ad-Hoc On Demand Distance Vector (WBAODV) and Destination Sequence Distance Vector (DSDV) are combined in this work to create a hybrid distance vector (WBAODVDSDV). In a wireless sensor Ad-hoc

network, it is the hybrid Mechanism that functions more efficiently. Then, it records the values using a lookup table that specifies which protocol may be more effective.

4.0 RESULTS AND DISCUSSIONS

Network Simulator 2 (NS2) is used to simulate the various parameters and compare them with two on demand (reactive) routing protocols, AODV and WBAODV, and one table driven (proactive) routing protocol, DSDV. The primary objective of our simulations is to demonstrate that the hybrid protocol is vastly superior to the individual Reactive and Proactive Protocols.

4.1 Simulation Environment

Table: 1 Simulation Parameters of different Protocol

Simulator	Network Simulator 2.34
Network Size	1000m x 1000m
No. of nodes	50
Simulation Time	50Sec
MAC Type	802.11
Bandwidth	4Mz
Traffic Sources	CBR, FTP
Traffic Agents	UDP, TCP
Interface Queue Length	50
Packet Size	512 Byte data
Max speed	10
Interval time b/w Packets	0.05
Max. Packets to be send	10000

The performance analysis of the proposed Hybrid Protocol, which consists of WBAODV and DSDV, is conducted by comparing it is the existing two on-demand protocols, AODV and WBAODV, and the table-driven protocol, DSDV.

1. Delay between ends

2. Throughput

3. Parcel Delivery Percentage (PDF)

4. Energy

4.2 Comparison of End to End Delay Performance

End-to-end delay is the average time it takes the network to transmit data packets from the source to the destination. It also includes the delay caused by the route discovery process and the transmission queue.

Delay = Tr – Ts

While Tr is the arrival time and Ts is the send time

The lower value of the network's end-to-end delay indicates the superior performance of the protocol. The proposed work demonstrates a substantial improvement in end-to-end delay compared to individual reactive protocols and is comparable to proactive protocols. Figure 4 depicts a graph of delay versus pause time using the NS2 protocol.

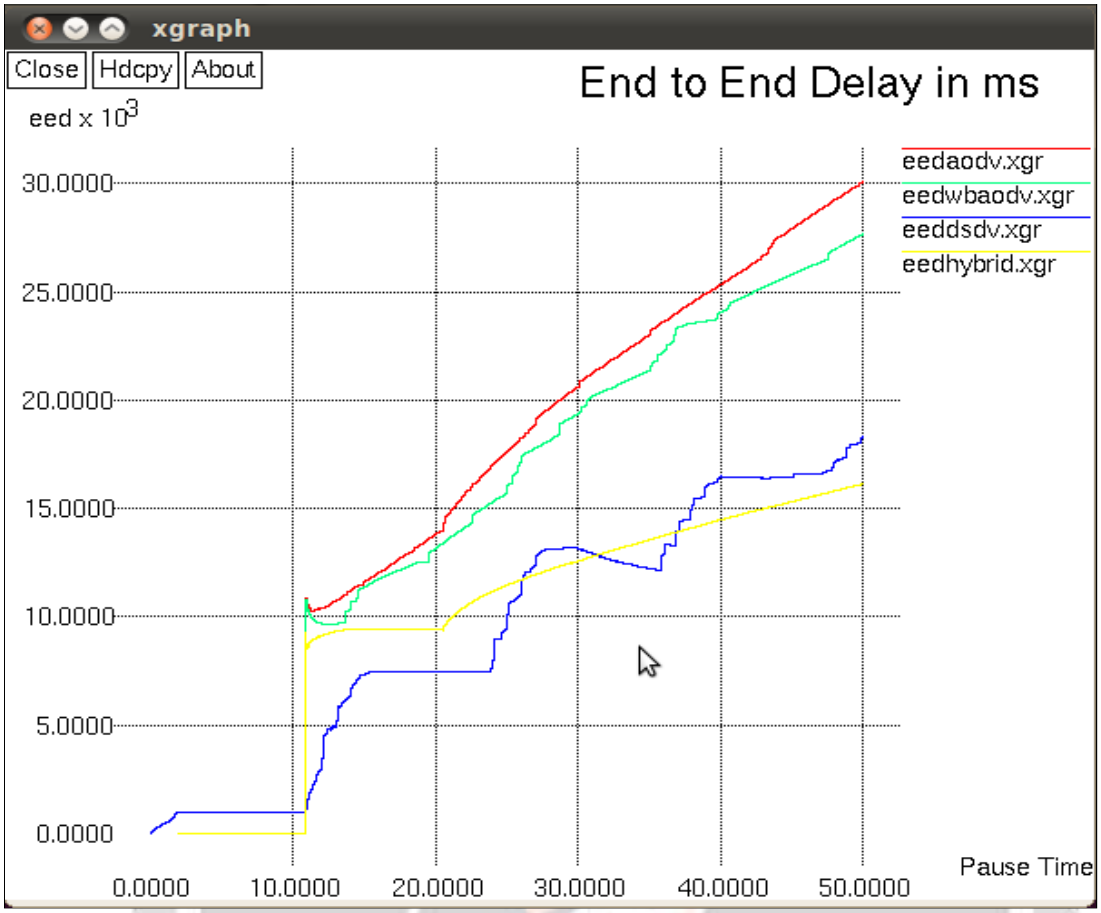

Figure: 4 End to End Delay Performance Comparison w.r.t Pause Time

4.3 Compared Throughput Performance

In a wireless ad-hoc network, throughput is the amount of data delivered per time unit from one node to another via a communication link. It should be increased to improve network performance.

Total Data Bits Received = Simulation Runtime

As depicted in Figure 5, the proposed work demonstrates a higher throughput in hybrid compared to other on-demand and table-driven protocols.

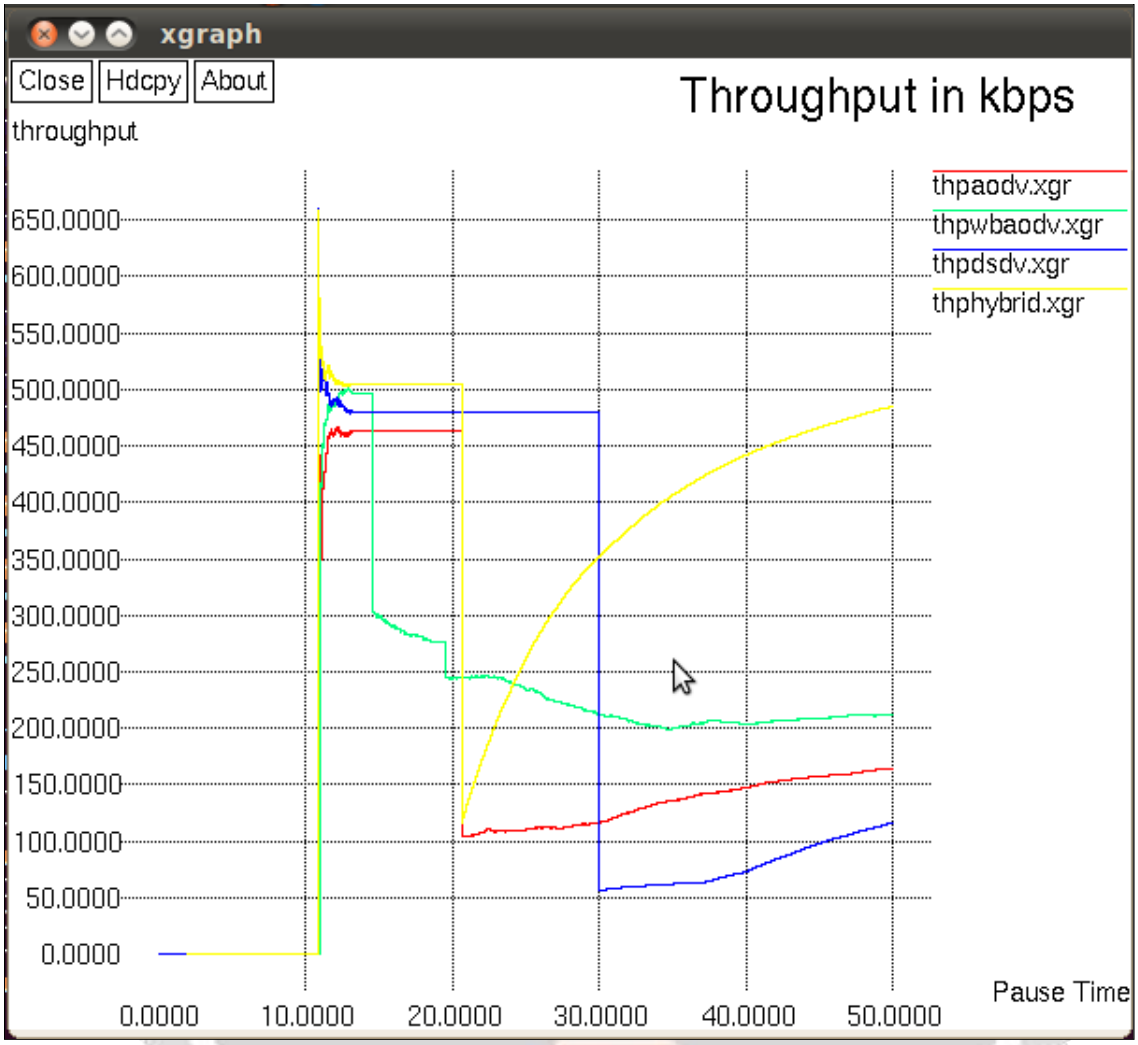

Figure: 5 Throughput Performance Comparison w.r.t Pause Time

5.0 CONCLUSIONS

In wireless communications, ad-hoc networking is a popular concept. There is an abundance of ongoing research and outstanding problems to be resolved. Due to time constraints, we have only concentrated on routing protocols. However, there are numerous issues that could benefit from additional research. The wireless ad-hoc network must be enhanced in order to resolve a number of critical issues. In a wireless sensor network, measuring computing complexity and ensuring network security are key concerns. The lack of centralised control makes routing protocols prime targets for impersonation attacks. The resolving of one issue at a time or making an effort to resolve multiple issues simultaneously, with the majority of the present work focusing on the network layer alone. The term "Hybrid" has been used in various contexts in relation to hybrid protocols. In general, hybrid routing protocol refers to the use of proactive & reactive routing mechanisms and clustered protocols. It is proposed to develop hybrid protocols not only at the level of combining Reactive and Proactive protocols, but also at the level of multicast hybrid protocol, in order to meet the diverse requirements of wireless ad hoc and sensor networks.

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