Journal of Advances in Science and Technology
Vol. 14, Issue No. 2, September-2017, ISSN 2230-9659

Versatile Directing Methodology for Mobile Ad Hoc Networks

Vinod S. Wadne[1]* Dr. Y. P. Singh[2]

[1] Ph.D., Research Student, Department of Computer Science and Engineering, Kalinga University, Raipur, Chhattisgarh, India

[2] Research Guide, Department of Computer Science and Engineering, Kalinga University, Raipur, Chhattisgarh, India

Abstract – The ad hoc system is nothing but the collection of wireless devices communicating with each other in cooperative ways without using any physical infrastructure. There are number challenges while dealing with such ad hoc system such as routing efficiency, load balancing, security, QoS etc. The communication is performed by using the directing methodologies called as routing protocols. The ad hoc systems like Mobile Ad Hoc Network (MANET) is common research domain in which number of researchers shows their interest on designing different types of directing methodologies. For Ad hoc systems, the designing versatile directing methodologies and protocols is main research problem. The versatility of such routing methods is based on the QoS performance under the different network conditions such as traffic, mobility and scalability factors. Therefore directing methodologies are strong component for QoS improvement in MANET. There are two main types of routing schemes single path and multi path routing protocols. In this, research work, our goal is to presenting the experimental study and analysis of different versatile directing methodologies and their protocols for ad hoc systems (e.g. MANET) by considering the different network considerations. We contributed the novel multi-path based directive methodology to optimize the QoS performance against the state-of-art directive methodologies such as single path and multi path based routing protocols for MANET using the improved source based node disjoint algorithm in terms of throughput, delay, packet delivery rate etc. The proposed method is based on mobility and QoS aware multi-path selecting for efficient data transmission. The simulation results show the effectiveness of proposed directive algorithm for wireless networks against state-of-art methods.

----------♦----------

1. INTRODUCTION

In ad hoc network, portable node communicates with each other utilizing multi-node wireless network. There is no stationary framework, for instance, base stations. Every node in the system likewise goes about as a switch, sending information packet for different nodes. Focal test in the outline of ad hoc systems is the improvement of element routing protocols that can effectively discover route between two conveying nodes. The routing protocols must have the capacity to stay aware of the high level of hub portability that regularly changes the system topology definitely and capriciously (Toh, 2001). Wireless Ad hoc network consists of self-organizing devices and can be deployed without infrastructure. Mobile Ad hoc Networks (MANETs) are defined as self- control system of mobile nodes interconnected via wireless links without using existing network (Toh, 2001). Every node working like a host node and a route, further other packet to authorize the communication among nodes not straight joins by the wireless links. The main difficulty in the system of ad hoc network is the making that can conveniently discover among the interacting to other nodes.

A Network encourages the distributed of files and data between various PCs. Computer network systems can be interconnected through either Ethernet links or utilizing remote cards that forward and receive data or wireless medium like air. Ad hoc network, create the link among different nodes without any base node. Mobile Ad Hoc Networks (MANETs) are quickly becoming a common mode in telecommunication because of simply deployment and administration. They are utilizing in natural accident situation like flooding, military, earthquake and flooding. These networks use broadcasting as a method for communication, for updating the topology, maintaining the network, giving warning messages. They comprise of a gathering of hubs that speak with each other over a wireless medium are air without any existing structure (Lee and Gerla, 2001).

All the nodes are working as source, router or destination. The topology of the network can change dynamically because the nodes proceed in different directions, leave or connect it. Such change creates problems in maintaining the routing process through energy loss, delay and instability in linking. So, the routing protocol must be designed to provide energy maintenance, avoid delay and make the link stable (Wang, et. al., 2001).

Routing algorithm is shown in Figure 1.1. It mainly focuses on the area of this research work. Basic attributes like wired and wireless network is made in vet of sets wire and air. Wireless networks correspondence faces challenges like data transmission compels, robustness, flexibility, node energy, Macintosh layer planning at standard. The remote systems are ordered into two parts. (i) Foundation organizes which requires a base station to work (ii) Infrastructure-independent network where all the nodes work without base station (Mauve, et. al., 2001).

Figure 1: Sample Mobile Ad hoc network

There are different factors based on which the selection of versatile directing method is done for MANETs: “Multi-pathing” is a method which is equipped for exchanging the parcels to a gathering of hubs on the double. The multi-pat is a bundle sending system and furthermore a sort of communicating. In transmission, a source base node trades the packet to each one of the centres in the framework. The favoured preferred standpoint of this procedure is to set aside least measure of scope to cast various nodes. The all the versatile directing protocols are distributed and also these are reactive protocols (Toh, et. al., 2002).

Directing Methodologies/Routing methods are broadly categorized as Link state routing (LSR) method and Distance vector routing (DSR) method. These help us to investigate the best route from source to destination. Unlike small networks, huge networks can pose problems because of the presence of a huge amount of nodes as well as destinations. Routing is started by the source. The source steering procedure can route the packet over the system, yet every bundle contains finish course data. Every one of the select the route is taken just by source. This maintains a strategic distance from the looping roots (Wu, et. al., 2002).

Classification of routing protocols consists of the several numbers of the routing protocols these are, centralize routing, distributed routing, static routing, dynamic routing, proactive routing, and reactive routing. These routing protocol are used to transforming the data packet form one host to another host (Hong, et. al., 2002). Multiple numbers of real time applications by using ad hoc system. These applications are Tactical Networks are used in Communication in Military and Battlefields Environment, Emergency services application are used in Recover from disaster and police and fire services, Civilian and commercial Environments, vehicle services, sensor networks, education (Sankararajan, et. al., 2003).

In this research work, we are presenting the examining of single path and multi-path routing methods. To overcome the difficulty in existing routing protocols, multipath routing protocols are innovated in this exploration work. These steering protocols have less postponement, oversee energy capacity, keep up quality connection and locate the best way with quality parameters. Likewise their outcomes are contrasted and those of other routing protocols like AODV and Ad Hoc On-demand Multipath Distance Vector routing. The directing methodologies in ad hoc system are Destination Sequenced Distance Vector Routing (DSDV), AODV, Zone routing protocol (ZPR and AODV) (Seet, et. al., 2003).

The important objectives of this research work is to organize the analysis of different versatile directing methodologies for ad hoc systems and present novel QoS efficient directing methodology for ad hoc system. In rest of postulation, the coordinating strategies is dealt with as routing protocols and ad hoc system is treated as mobile ad hoc networks (MANETs).

2. LITERATURE SURVEY

C.K.Toh et al. (2002) evaluate the reasonableness of understanding a specially appointed remote system and examine execution issues. A few portable PCs were upgraded with specially appointed steering capacity and were sent in an outside situation. Furthermore, correspondence exhibitions related with specially appointed interchanges were assessed. These PCs intermittently sent guides to their neighbours’ to proclaim their quality. They inspected the effect of differing parcel measure, beaconing interim, and course bounce depend on course disclosure time and they produced more throughputs, less end-to-end delay, and less packet loss.

Kui .Wu et al. (2002) investigated two on-request techniques to adequately look for different hub disjoint ways and present the way determination criteria. Contrasted and Dynamic Source Routing (DSR), the proposed strategies can discover more hub disjoint ways and in this way furnish source hubs with more decisions to choose great quality different ways. This directing protocol correlation result demonstrates that multipath steering strategies which can diminish the quantity of course disclosures and keep up the heap adjust.

R.Beraldi et al. (2003) investigates that problem of arranging a proactive store plot that does not depends upon any clock based instrument. This arrangement guarantees that honest to goodness held courses are never cleared while stale courses are removed powerfully. This proactive store plot has been embedded in the Zone Routing Protocol (ZRP) structure and assessed by a broad recreation contemplate. The execution of this steering calculation is contemplated for different portability models and throughput, control overhead, the normal end-to-end postponement, and level of bundle dropped are contrasted and the current directing protocols. This calculation indicates worthy execution under all portability conditions. The outcome demonstrates that this calculation augments the transmission capacity usage amid substantial activity with lesser overhead.

Boon-Chong Seet et al. (2003) study the viability of UNIQUE by applying it to the course revelation of the Dynamic Source routing (DSR) protocol. What's more, a similar report is made with a DSR protocol improved with just LAR. The outcomes demonstrate that one of a kind could additionally lessen the general directing overhead by as much as 58% under profoundly portable conditions.

Aristotelis Tsirigos et al (2004) build up a scientific structure for assessing multipath steering in versatile specially appointed systems. The flightiness of the topology change viz. disappointment of connections because of moving of hubs in different directions. To activity the natural instability of these networks, they utilized a routing method with multiple paths that divided concurrently the data among huge amount of paths. As a result there was a delay in the destination receiving the essential portion of the packets. Despite the delay causing overhead, since the packets were fragmented into smaller blocks and disseminated over the available paths, the packet dropping possibility was reduced in numbers Some Mobile ad hoc network nodes are in a position to communicate with another node in another network with the help of internet. These nodes may use the gateway nodes. And neighbour nodes also used to reach the gateway over multiple paths. On-demand routing methods are best suitable for the gateway communication because of their lesser routing overhead in lower bandwidth. However, their routing control overhead raises exponentially with node density.

Joo-Han Song et al. (2004) present a novel extension of the ad hoc on-demand distance vector (AODV) routing protocol, called load-balancing ad hoc on demand distance vector (LB-AODV), which incorporates the concept of load-balancing (LB). The LB-AODV routing protocol has a noteworthy higher bundle conveyance portion, a lower end-to-end defer and a diminished steering overhead when contrasted and both AODV.

A.Tsirigos et al. (2004) developed a diagnostic structure for assessing multipath directing in portable specially appointed systems. The unsteadiness of the topology in this sort of framework due to nodal convey ability and changes in remote causing conditions makes transmission of time-fragile information a testing issue. What's more, besides they proposed a coordinating arrangement that exploits numerous ways at the same time by part the data between large numbers of ways in order to expand the likelihood that the basic segment of the data is gotten at the goal immediately.

Georgios Parissidis et al. (2006) assess the execution of multipath steering protocols. These protocols showed they accomplished lesser controlling overhead, lesser end-to-end concede and low blockage in the evaluation analyze with a singular way coordinating protocols. As of late, a few multi-way steering protocols have been improved for MANETs. In any case, a quantitative correlation of multi-way steering protocols has not yet been led. The simulation results of three multi-path routing protocols like Split multipath routing (SMR), Ad hoc On-Demand Multipath Distance Vector (AOMDV) Routing and Ad hoc On-Demand Distance Vector Multipath (AODVM) were acquired with the NS-2 test system. The reproduction comes about show that the AOMDV protocol accomplishes most noteworthy execution in a high portability condition, while AODVM Multipath performs better with low versatility and high hub thickness.

D.A. Tran et al. (2006) contend that steering ought know about, as well as be versatile to, arrange blockage. Henceforth, they proposed a directing protocol (CRP) with such properties. They created ns-2 recreation comes about which affirm that CRP enhances the bundle misfortune rate and end-to-end defer while getting a charge out of fundamentally littler protocol overhead and higher proficiency when contrasted with AODV and DSR.

Rui Teng et al. (2006) consider proficient steering activities between any two hubs in a specially

appointed system that is connected to wire arranges by an entrance point. To manufacture courses with low directing overhead effectively, they built up another region-based routing (RBR), which uses jump tallies between versatile hubs and the entrance point to confine a course disclosure inside a constrained topological district. Constraining the locale of course disclosure brings about less steering messages and along these lines lessens directing overhead.

Lei Chen et al. (2007) broadly and only concentrated the issues required with QoS-mindful steering and exhibited an outline and examination of existing QoS-mindful directing protocols. What's more, the open issues that must be routed to completely bolster QoS-mindful steering were describing. MM-DSR (Multipath Multimedia Dynamic Source Routing) is a multipath routing protocol DSR-based merged with a cross-layer algorithm was proposed by Victor Carrascal Friaset al. (2007). This provided QoS for numerous wellsprings of video over IEEE 802.11b Impromptu systems. The shortcomings of the framework with plain DSR and IEEE 802.11b have been dissected and work has been done keeping in mind the end goal to enhance the throughput and the last client quality.

S.M.Das et al. (2007) propose and assess two unicast steering protocols custom fitted for use in specially appointed systems shaped by versatile multi-robot groups: Portable robot remove vector (MRDV) and portable robot source directing (MRSR). The two protocols misuse the extraordinary portability qualities of versatile robot systems to perform proficient routing.

Sunho Lim et al. (2009) investigated another correspondence framework, called RandomCast, through which a sender can decide the pined for level of discovering, making a reasonable congruity among imperativeness and coordinating execution. Likewise, it diminishes abundance rebroadcasts for an impart package, and along these lines, saves more energy.

B.Tavli et al. (2011) present architecture such as Multicasting through Time Reservation using Adaptive Control for Energy efficiency (MC-TRACE), a proficient constant information multicasting engineering for versatile ad hoc network. MC-Follow is a cross-layer layout, where the medium access control layer handiness and the framework layer convenience are performed by a lone facilitated layer. The MC-Take after multicast spine is a combined idle work woven around an exceedingly pruned tree. Essentialness capability is refined by enabling the centres to change to rest mode frequently and by wiping out a huge bit of the abundance data gatherings.

Chee-Wah Tan et al. (2012) investigates an on-demand routing protocol for choice a routes in view of bigger the littler hub battery control and limiting the aggregate transmission control required to accomplish the objective. Likewise, the proposed guiding issue can limit control bundle flooding amid course revelation and pre-empt connect breakages on account of hub portability. A power and portability mindful improvement issue is first detailed. For a genuine viable usage, they introduce a heuristic plan, Power and Portability Mindful Directing or PMAR protocol. PMAR performs nearly and also the proposed streamlining approach in static systems.

D.C.Karia et al. (2013) proposed a biology-inspired ant routing protocol based on ant colony optimization called as optimized antnet global positioning system, which depends on GPS and versatile programming operators demonstrated on ants for steering in specially appointed systems. They are look at the execution of the creator's protocol with Antnet, specially appointed on-request remove vector, Dynamic DSR AOMDV protocols concerning end-to-end delay, normal throughput, parcel conveyance proportion and route cost.

3. PROPOSED METHODOLOGY

In research work, we proposed the multipath directing methodology to improve the QoS performance by suppressing the challenges of mobility, scalability, high dynamics, and load balancing for wireless communications. This section presents the design of proposed routing protocol.

In this paper, we investigated and novel method directing methodology for improving the QoS performance of wireless communications using the novel source initiated multipath path disjoint to address to high dynamics and mobility issues of wireless networks. These are contributed the first one is, basic objective of this contribution is to evaluate the performance of existing single path directing methods such as AODV and DSR with respect to different types of wireless scenarios. Second, In second phase, we focused on evaluating the multi path directives against the single path directing in order to show the benefits of using multipath directing for wireless communications. Last, novel algorithms are designed to optimize the performance of multipath routing in order to achieve the load balancing, congestion prevention, network dynamics, mobility management and QoS efficiency for wireless communications. This proposed multipath directing is called as SMAMRP.

The proposed Source Initiated Mobility Aware Multipath Routing protocol (SMAMRP) is an on request source directing protocol which allows numerous ways between the source and the goal utilizing the routes demand and route solution packet. Another proposed mechanisms is route maintenance mechanisms, these mechanisms utilized the route error (REER) protocol for the data packet transmission one node to another node. The ns-2 simulation are proposed in this research paper.

4. MATHAMATICAL MODULE

A. Packet delivery rate

PDR (%) = (P_{rcev} / P_{gen}) * 100

B. End to End Delay (Processing Time)

$d_{end-end}$= N[d_{trans}+d_{prop}+d_{proc}+d_{queue}]

Where,

dend-end= end-to-end delay

dtrans= transmission delay

dprop= propagation delay

dproc= processing delay

dqueue= Queuing delay

N= number of links (Number of routers - 1)

C. Throughput:

KBPS: ((total_recieved_pkts)/(stopTime-startTime))*(8/1000)

Where,

Total_recieved_pkts: complete received packets at all destination nodes

Stoptime= simulation end time

startTime= simulation start time

8/1000 = using to converted MPBS into KBPS

D. Packet drops:

P_{drop} = P_{gen} - P_{rcev}

❖ Proposed Multipath Directing Method

Input

S; source node

D; destination node

RR; reporting rate

P: packet

1. Find all available disjoint paths from *S* to *D* through routing protocol.

2. Consider hop count *HC* of all nodes from sink.

3. *S* calculates its upstream nodes (say n) and keeps only one path from each node towards destination.

4. Calculate *RR* by dividing current *RR* by neighboring nodes of *S* and then assign new *RR* to each path.

5. If (*P*) // if packet received

i. from higher Hop count node and

ii. from the path of which the current node is member

Then accept and forward the packet.

6. Else drop (*P*)

7. End if

8. Repeat step 5 and 6 till packet reaches the destination.

9. Start data transmission

5. RESULT

1. PDR vs. Number of wireless nodes

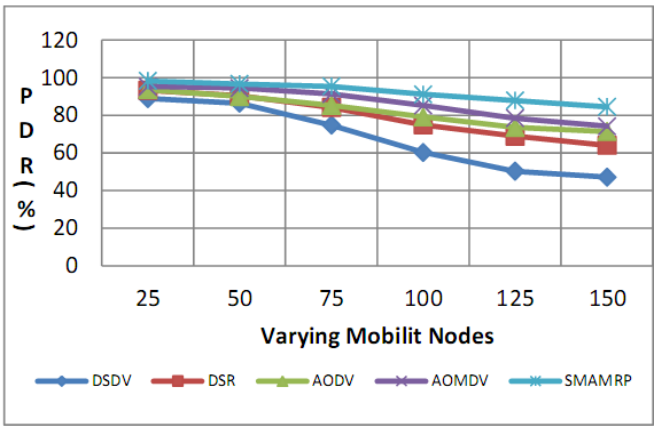

Figure 3 PDR vs. Number of wireless nodes

2. Average Throughput vs. Number of wireless nodes

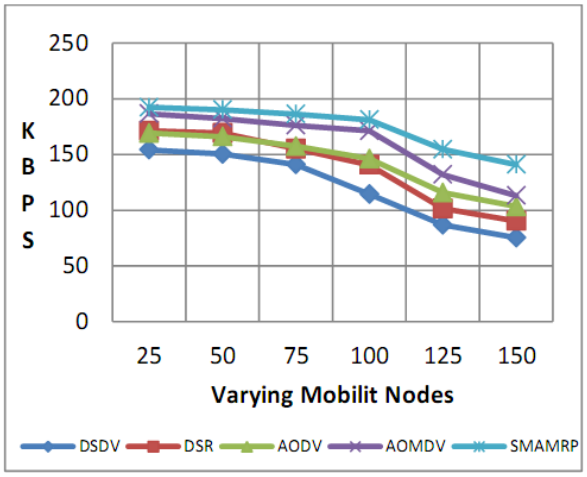

Figure 4. Average Throughput vs. Number of wireless nodes

3. Average End to End Delay vs. Number of wireless nodes

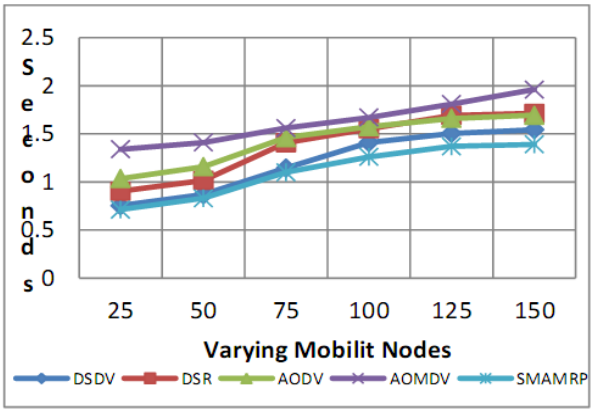

Figure 5: Average End to End Delay vs. Number of wireless nodes

4. Control Overhead vs. Number of wireless nodes

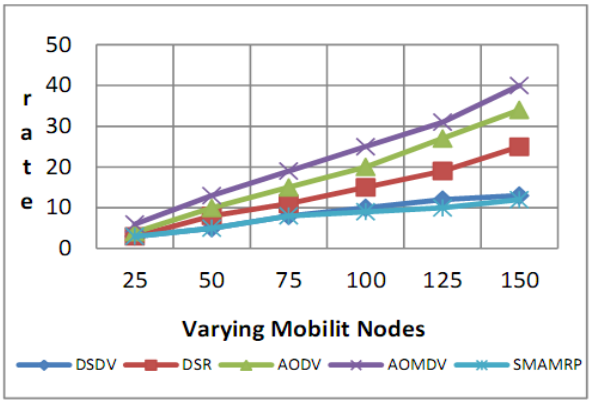

Figure 6. Control Overhead vs. Number of wireless nodes

5. Packet Dropped Rate vs. Number of wireless nodes (Single path vs. multipath evaluation)

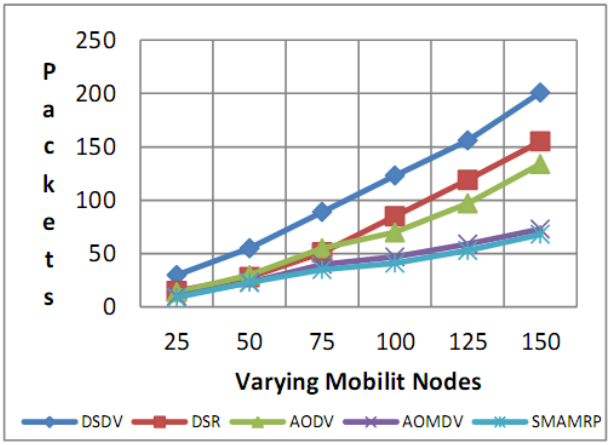

Figure 7. Packet Dropped Rate vs. Number of wireless nodes (Single path vs. multipath evaluation)

6. PDR vs. Varying Mobility

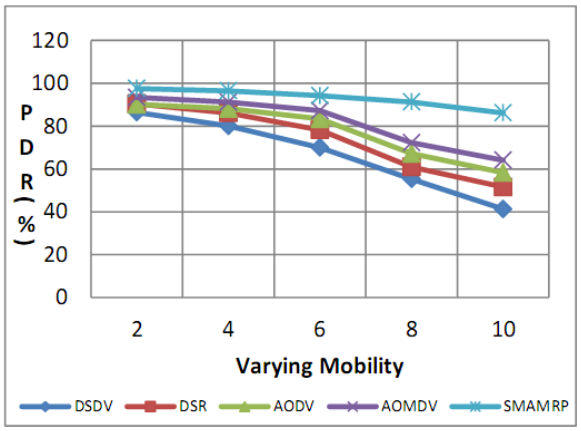

Figure 8. PDR vs. Varying Mobility

7. Average Throughput vs. Varying Mobility

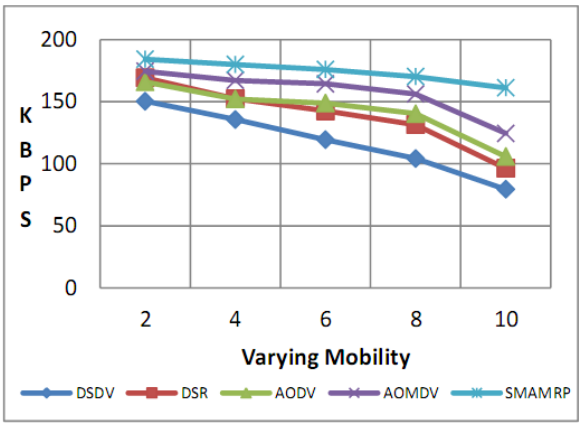

Figure 9. Average Throughput vs. Varying Mobility

8. Average End to End Delay vs. Varying Mobility

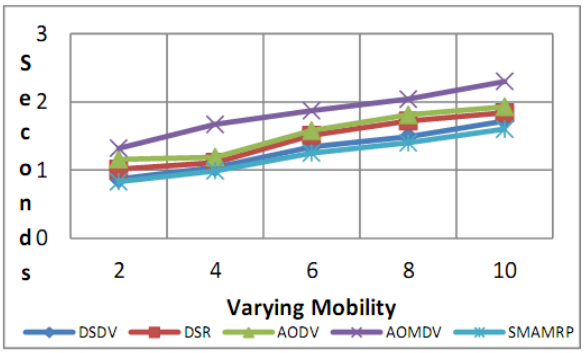

Figure 10. Average End to End Delay vs. Varying Mobility

9. Control Overhead vs. Varying Mobility

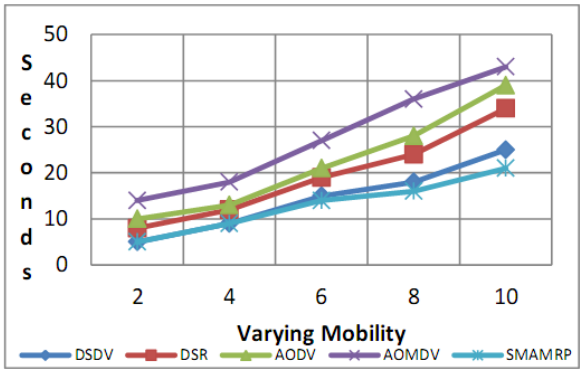

Figure 11. Control Overhead vs. Varying Mobility

10. Control Overhead vs. Varying Mobility

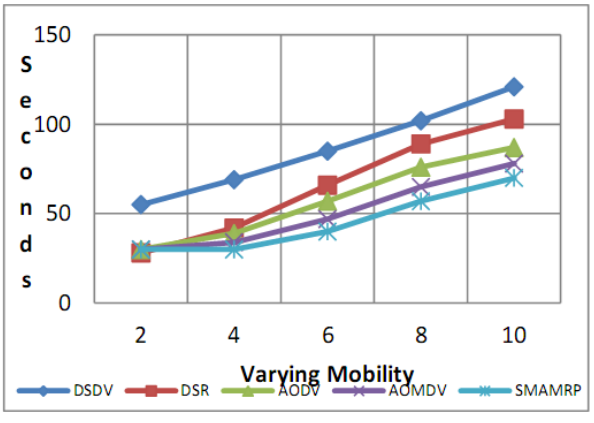

Figure 12. Control Overhead vs. Varying Mobility

The proposed SMAMRP protocol shows that it can address the problem of high mobility very effectively as compared to existing methods. The increased mobility harms fewer in SMAMRP protocol as compared to other state-of-art protocols due to the proposed algorithm of mobility aware data forwarding and load aware multipath selection process for wireless communications. The proposed protocol is truly the versatile directing method proposed in this research work based on all results presented in this chapter. The Throughput, PDR rates are show significant improvement for proposed method while keeping less overhead and end to end delay rate.

6. CONCLUSION AND FUTURE WORK

In this result paper we discuss and study on the, Investigation of single path directing methods, Investigation of multipath directing methods, comparative study of single and multipath directing methods, discussed the problems of single and multipath directing methods, presented the load aware multipath disjoint algorithm, presented the mobility aware QoS improvement algorithm, evaluated proposed multipath directing method against protocol directing methods.

In this research work, to address the challenges and problems of both proactive and reactive directing methods under single path and AOMDV under multipath methods, the novel source initiated disjoint multipath directing algorithm along with the mobility aware QoS improvement approach is designed. These protocols updates the routing information in the routing table dynamically and selects the disjoint paths and then equally distribute the traffic among them in order to prevent the congestion and control overhead. The simulation work was carried using the well know simulator tool called NS2. The comparative study among AODV, DSDV, DSR, AOMDV and proposed SMAMRP protocol is conducted in this research work extensively. From the investigations we observed that the single path protocols showing the worst performance with increasing density and mobility. The multipath protocols AOMDV shows the better performance as compared to single path protocols, but having major problem control overhead and severs delay in communications. The proposed protocol improves all the QoS performance metrics significantly.

REFERENCES

Aristotelis Tsirigos and Zygmunt J. Haas (2004). "Analysis of Multipath Routing - Part I: The Effect on the Packet Delivery Ratio," IEEE Transactions on Wireless Communications, Vol. 3, Issue: 1, pp. 138-146.

Ass Aristotelis Tsirigos and Zygmunt J. Haas (2004). "Analysis of Multipath Routing - Part I: The Effect on the Packet Delivery Ratio," IEEE

Transactions on Wireless Communications, Vol. 3, Issue: 1, pp. 138-146.

Beraldi, R; Baldoni, R. (2003). "A caching scheme for routing in mobile ad hoc networks and its application to ZRP" IEEE Transactions on Computers, Volume: 52, Issue: 8, pp. 1051–1062.

C.K. Toh (2001). "Maximum battery life routing to support ubiquitous mobile computing in wireless ad hoc networks", IEEE Communications Magazine, Volume: 39, Issue: 6, pp. 138 - 147.

C.K. Toh,; Delwar, M. ; Allen, D. (2002). "Evaluating the communication performance of an ad hoc wireless network", IEEE Transactions on Wireless Communications, Volume: 1 , Issue: 3, pp. 402–414.

Chakrabarti S, Mishra A. (2001). "QoS issues in ad hoc wireless networks", IEEE Communications Magazine, Volume: 39, Issue: 2, pp. 142–148.

Joo Han Song, V.W.S. Wong, V.C.M. Leung (2004). "Efficient on-demand routing for mobile ad hoc wireless access networks," IEEE Journal on Selected Areas in Communications, Vol. 22, Issue : 7, pp. 1374–1383.

Kui.Wu, Harms and Janelle (2002). "Multipath routing for mobile ad hoc networks," Journal of Communications and Networks, Vol. 4, Issue: 1, pp. 48 – 58.

Lei Wang, Yantai Shu, Miao Dong and Lianfang Zhang (2001). "Adaptive multipath source routing in ad hoc networks," IEEE International Conference on Communications, Vol. 3, pp. 867-871.

Mauve, M. ; Widmer, J. ; Hartenstein, H. (2001). "A survey on position-based routing in mobile ad hoc networks", IEEE Network, Volume: 15 , Issue: 6, pp. 30–39.

Radha, Sankararajan, Shanmugavel and Sethu (2003). "Implementation of node transition probability based routing algorithm for MANET and performance analysis using different mobility models," Journal of Communications and Networks, Volume: 5, Issue: 3, pp. 202–214.

Seet, Boon-Chong; Lee, Bu-Sung; Lau, Chiew-Tong (2003). "On optimizing route discovery of topology-based on-demand routing protocols for ad hoc networks", Journal of Communications and Networks, Volume: 5, Issue: 3, pp. 266–274.

Sung Ju Lee and Mario Gerla (2001). "Split Multipath Routing with Maximally Disjoint Paths in Ad hoc Networks," IEEE International Conference on Communications, Vol.10, pp. 3201-3205.

Xiaoyan Hong, Kaixin Xu, Gerla M. (2002). "Scalable routing protocols for mobile ad hoc networks", IEEE Network, Volume: 16, Issue: 4, pp. 11 – 21.

Yu-Chee Tseng; Li, Yueh-Fen; Yu-Chia Chang (2003). "On route lifetime in multihop mobile ad hoc networks", IEEE Transactions on Mobile Computing, Volume: 2, Issue: 4 pp. 366–376.

Corresponding Author

Vinod S. Wadne*

Ph.D., Research Student, Department of Computer Science and Engineering, Kalinga University, Raipur, Chhattisgarh, India

E-Mail – vinods1111@gmail.com