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# Performance Evaluation of OLSR and DSDV Protocols in Military Operations

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***Abstract:*** Mobile ad hoc network is an infrastructure less network**.** It has various applications in fields like the military. Sharing the information among the armed forces in the military operation is an essential issue for effective fighting and for the minimum causalities .The routing protocol is the key factor of MANET. For military operations selecting the proper routing protocol is important work**.** MANET has various types of properties like infrastructure less, flexible for changeable topology and data transfer effectively which makes it suitable for military operations. The property of MANET is that it can be easily configured, set up and build. Due to the infrastructure less network of MANET it depends on the cooperation of nodes for communication. Because of popularity and prospective among MANET protocols, OLSR and DSDV Routing Protocol are selected. For military operation environment OLSR and DSDV protocols has been simulated and analysed using Network Simulator 2(NS2) tool. After the simulation results it has been analysed that which routing protocol is suitable for military operation on the basis of simulation outcomes.

***Keywords:*** Mobile ad-hoc networks (MANET), Destination Sequenced Distance Vector (DSDV), Optimized Link State routing protocol (OLSR),Packet Delivery Ratio (PDR), Packet Loss, End to end delay, Routing overhead, Random Walk Mobility Model (RWMM), Random Way Point Mobility Model (RWPMM), Gauss Markov Mobility Model (GMMM), Multi Point Relay (MPR)

## I. INTRODUCTION

**M**OBILE Ad-hoc network is the wireless small area network and is a collection of communication devices or nodes that wants to communicate. MANET does not have any fixed infrastructure and predetermined organization of available links. In MANET each node functions both as host and a router to establish the route to destination. When a source node wants to transfer the data to the destination node, the intermediary nodes [1] pass the data or the data has been directly send. Nodes keep on moving and changing their location frequently in mobile ad hoc network .It is an infrastructure less network. Due to the low resources Mobile ad hoc network is highly vulnerable to various kinds of attacks.

## II. MOBILE AD HOC ROUTING PROTOCOLS

Mobile Ad-hoc routing protocols decides how to find a route to the destination within the network. Because of the mobile nature of nodes routing between two nodes in an ad-hoc network is trivial task. Routing is a function or an activity which makes communication possible between source and destination. The best optimal path to the destination can be found by the routing and routing also inter transfer the packets throughout the network. As there is no access point for connecting the nodes in the mobile ad-hoc network so it is different from infrastructure based network [2]. Moreover, in MANET a node can quit or switch the network suddenly. The popularity of wireless mobile devices have been increased day by day so the researchers have proposed many routing protocols design to allow the nodes to connect with each other when they wish to communicate in an efficient and timely manner .MANET routing protocols are divided into three categories: Proactive, Reactive and Hybrid routing protocol [3].

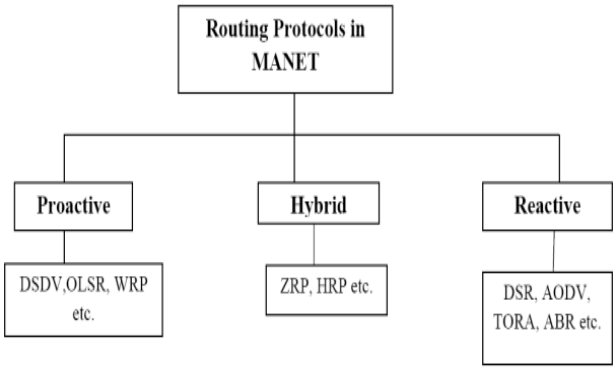


**Figure 1: Routing Protocols in MANET**

A. ***Optimized Link State Routing Protocol***

OLSR protocol inherits the properties of the link state algorithm [4]. Due to its proactive nature it has an advantage of having the routes immediately. The other name of OLSR protocol is table driven protocol. This protocol inherits the properties of the link state algorithm. Due to its proactive nature, it has an advantage of having the routes immediately available when needed. The route is maintained to every destination in the network in the pure link state routing algorithm. Each node shares its table with one another and also maintains a routing table. OLSR protocol is an optimized link state routing protocol for mobile ad-hoc networks. For delivery of control messages the protocol uses

the sequence number, therefore in-order delivery of packets is not required. By looking at the highest sequence number the recent information can be obtained. In OLSR MPR nodes have to be selected, each node in the network selects a set of the nodes in its neighborhood, that set is called MPR nodes. In such a manner the MPR set is selected by

each node among its one hop neighbors so that it can cover all the nodes which are two hop away. MPR set of a node should satisfy the following conditions

i) Every node in the two hop neighborhood must have bi-directional link with the MPR node.

ii) The smaller is the MPR set, more optimal is the routing protocol.

OLSR protocol depends upon the selection of MPR nodes. Therefore every node broadcast its MPR set information, which will be forwarded by the MPR nodes in the network, each node calculates and updates its route to each known destination. Hello message contains the list of the neighbor nodes to which there exists a valid bi-directional link. The selection of multi point relays is done on the basis of this information. By using this hello message, nodes keeps the knowledge of nodes up to 2 hop neighbors. With the link status MPR these selected multipoint relays are indicated. MPR node can construct its MPR selector table, containing nodes who has selected it as their multipoint relays. When a change in the two hop neighbors set is detected the MPR set is recalculated.

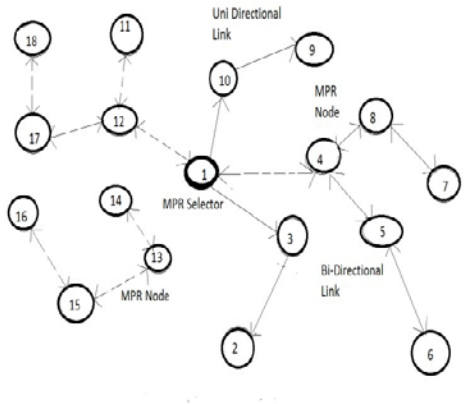


**Figure 2: Multi Point Relay Selection in OLSR**

B. ***Destination Sequenced Distance Vector Routing Protocol***

DSDV protocol was chosen for this study because it is a traditional proactive routing protocol and understanding the behavior of this protocol in military areas gives the extensive analysis of number of other protocols. In DSDV protocol routes are predefined. In DSDV protocol always routing table look up is performed whenever a node wants to send packets to a particular direction[5]. By performing routing table lookup the packet is transmitted to the next hop on the route towards destination. In DSDV protocol routes are predefined. In DSDV protocol always routing table look up is performed whenever a node wants to send packets to a particular direction. By performing routing table lookup the packet is transmitted to the next hop on the route towards destination. Using DSDV protocol the packet is transmitted by using the number of steps In Figure 3.3 node 1 wants to send packets to node 6.Node 1 will look for the next hop in its routing table towards destination node i.e. node 6 .It will then transfer the packet to the next hop node 2.Same process will be repeated at all the nodes, until the packet reaches its intended destination. The sequence number is also important in DSDV protocol. Each original node sends the update packet with a sequence number. The sequence number can be defined as monotonically increasing number which uniquely identifies the update packet from the given node. The sequence number given by the original node also distinguishes it from the node which is not original. The update packet contains the address of both destination as well as the transmitting node.

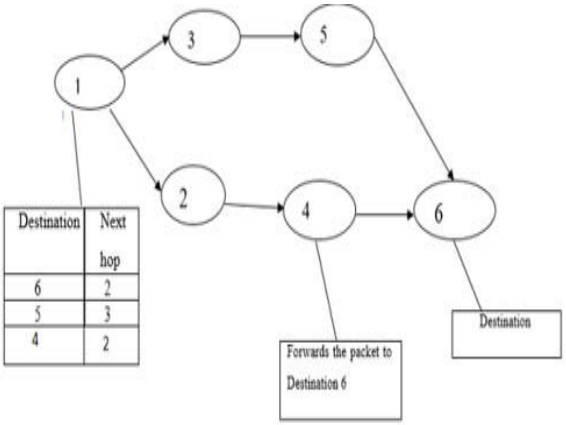


Figure 3: Transmission of Packet from node 1 to node 6

## III. LITERATURE REVIEW

In Mobile Ad Hoc network the routing protocols should have the capability of handling multiple hosts with limited number of resources, such as bandwidth and energy. The routing protocol Optimized Link State Routing Protocol for wireless Networks has been proposed and discussed by [4]**.** The main concept used in OLSR protocol is the concept of multipoint relays (MPRs). The MPRs forward the broadcast messages during the flooding process. [6] has analyzed performance of three MANET routing protocols AODV as reactive protocol, DSDV and OLSR as proactive protocol using Freeway Mobility Model. Performance analysis of protocols is done by varying network load, mobility speed and type of traffic (CBR and TCP). In TCP traffic, OLSR protocol gives better results. Mobile Ad-hoc networks are central of interest for the researchers from the past few years. Various studies have been shown for Mobile Ad-hoc routing protocols. Till now, no study seems to have undertaken that specifically focuses to evaluate the performance of DSDV and OLSR protocols on the basis of military scenarios. Military operations need non-infrastructural network .However in military applications the performance of only AODV and OLSR protocols has been evaluated. And OLSR have shown better performance over AODV in military applications. As per the literature DSDV is also performing well in various MANET applications. With the assumption that DSDV protocol will perform well (or even better) in MANET used in military application, there is need to evaluate its performance and compare with performance of OLSR.

## IV. PRACTICAL ASPECTS OF MILITARY MANETS

MANET can be used by military for number of purposes such as monitoring military activities in remote areas, securing the parameters from opponents, other protective measures and sharing information among troops is essential issue for effective combats and minimal causalities. The construction of infrastructure in hostile territory is very

difficult process, because most of the times communication infrastructures have become first target of enemy [7]. Thus constructing and managing communication infrastructure is main process of military operation. Because of infrastructure less characteristic of MANET communicating on hostile territory can be safe. However the feature of MANET is that it is flexible for changeable topology network, so it assures durable communication on this flexible network topology among unpredictable troops. . However, because MANET can cover a large number of nodes in a network and it can assure effective data transfer on different type of troops, if each military unit attaches node, then they can communicate each other irrespective of types of troops. Different types of troops can be connected and communicate each other. Unlike other MANET situations, a military MANET set up has more constraints than normal executions.

## V. MOBILITY MODELS

Mobility models represent the movement of mobile users and how their location, velocity and acceleration change over time. In mobile ad-hoc networks, mobility of nodes play an important role, because in real time environment nodes can pave any path of their choice. There is no standard path or direction a node can follow. Therefore to make the simulation more realistic, mobility models are introduced.

### A. *RWMM*

In RWMM each node randomly chooses an arbitrary direction and speed and the node moves from its current location to a new location within a given range. Random Walk model can be called as specific Random Waypoint model with zero pause time.

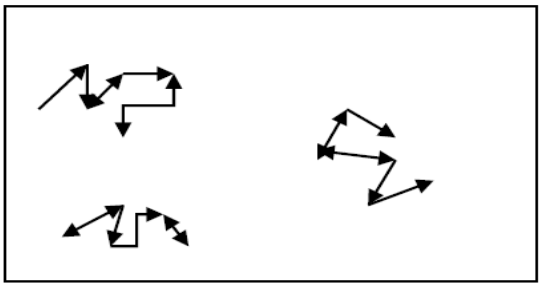

**Figure 4: Random Walk Mobility Model**

### B. *RWPMM*

This model is equivalent to the RWMM except that in RWPMM the pause time is included before changing its direction and/or speed. In this mobility model, the mobile nodes are set free to move randomly in any direction within the simulation area. The process of choosing random destination at random velocity is repeated again and again until the simulation is finished [8]

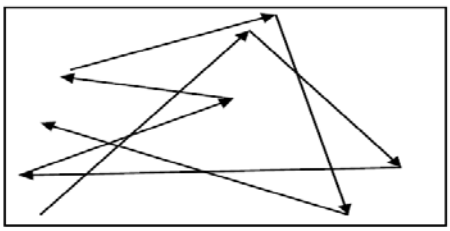

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**Figure 5: Random Waypoint Mobilty Model**

### C. *GMMM*

In GMMM, the mobile node's velocity is assumed to be associated with time. The GMMM is called as temporally dependent mobility model. In GMMM a node's next location can be generated by its previous location and velocity. The sudden stops and sharp turns can be eliminated in this mobility model.

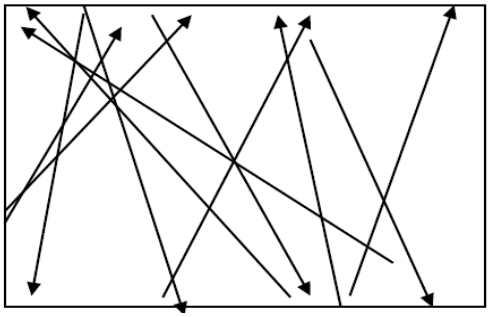

**Figure 6: Gauss-Markov Mobility Model**

## VI. RESULTS

Performance analysis of OLSR and DSDV Routing Protocols is evaluated in military scenarios using different mobility models such as Random Way Point Model, Random Walk Mobility Model and Gauss Markov Mobility Model and different parameters have been analyzed like Packet delivery ratio , Packet loss, Routing overhead and End to End Delay.

### A. *Packet Delivery Ratio*

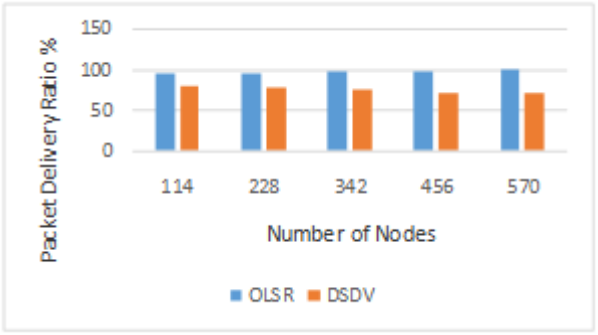


**Figure 7: Packet Delivery Ratio**

**Analysis**: Figure 7 shows that packet delivery ratio is highest in OLSR routing protocol in sparse as well as in dense networks. Because in OLSR protocol, routes are created through MPR nodes. MPR nodes provide reliable packet transmission. DSDV routing protocol performs poor than OLSR because in DSDV routing protocol routes always routing table look up is performed whenever a node wants to send packets to a particular direction.. By performing routing table lookup the packet is transmitted to the next hop on the route towards destination, this will take so much time to the packet to reach to destination. If the routing table is not updated at appropriate time then loop may be formed.

B. ***End to End Delay***

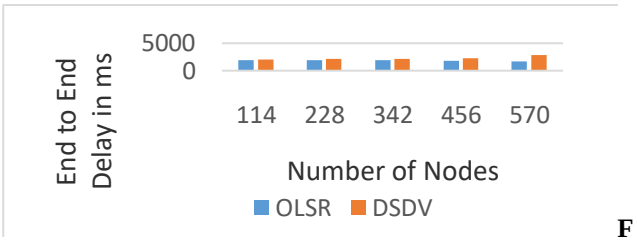


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**Figure 8: End to End Delay**

**Analysis:** Figure 8 shows End to End delay in OLSR and DSDV routing protocol in different military scenarios. In DSDV protocol with increase in number of nodes, the delay time increases. When number of nodes in the network increases, the number of intermediate nodes required to transmit packets from source to destination also increases. So, End to End Delay in DSDV is higher than OLSR routing protocol. OLSR routing protocol performs well in dense and sparse network than DSDV routing protocol.

C. ***Packet Loss***

**Analysis**: Packet Loss metric is inversely proportional to packet delivery ratio metric. Packet Loss is highest in DSDV protocol and in DSDV protocol with the increase in number of nodes packet loss gets high because routing table information is also maintained after each transmission So the packet gets lost during maintenance process. In OLSR protocol the packet loss is less with the increase in number of nodes because node calculates the route to the destination whenever it needs.

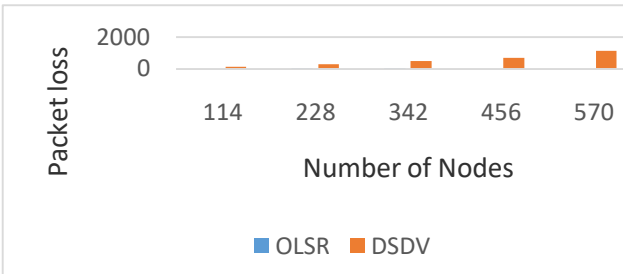


**Figure 9: Packet Loss**

D. ***Routing Overhead***

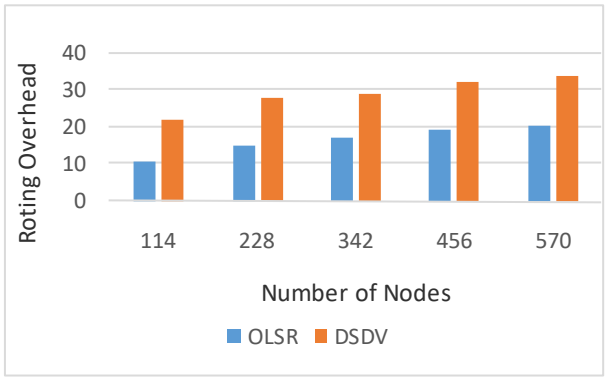


**Figure 10: Routing Overhead**

**Analysis:** Figure 10 shows routing overhead of OLSR and DSDV protocols. Routing overhead is lowest in OLSR protocol, because routing packets exchanged in OLSR protocol is very less as compared to DSDV protocol. In OLSR protocol routes are always created through MPR nodes, each node selects its MPR set from the neighbors. In DSDV protocol, routing overhead is more than OLSR protocol, because in DSDV multiple routes are created for destination leads to lot of routing packets exchange and therefore, as the number of nodes increases routing overhead of DSDV also increases.

## VII. CONCLUSION

The result of this paper is based on various simulations with several different environment parameters to compare performance of DSDV and OLSR in military operation. Density of nodes and network traffic could increase abruptly and significantly in military operation due to unexpected situations. Each node has insufficient transmission range and reserve battery power to prevent attack from enemy. As a result of several simulations, in military operation, OLSR is more suitable than DSDV because OLSR show better performance (on the *Packet Delivery Ratio, End to End Delay, Routing Overhead, Packet Loss)* than DSDV. It means that OLSR has stronger resistance than DSDV on environment change such as increment of density of node on network, insufficient transmission range and heavy traffic on the network which happened abruptly on military operations.

## REFERENCES

[1] Medadian, M. ,Mebadi, A., and Shahri, E.(2009).Combat with blackhole Attack in AODV Routing Protocol. Proceedings of the 2009 Malaysia International Conference on Communication,530-535.Malaysia.

[2] Dhurandher, S. K., Obaidat, M. S., & Gupta, M. (2010, December).A reactive Optimized link state routing protocol for mobile ad hoc networks.17th IEEE International Conference on Electronics, Circuits, and systems(ICECS),2010(pp. 367-370).IEEE

[3] Ullah, I., & Rehman, S. U.(2010).Analysis of Black Hole attack in MANET.

[4] P. Jacquet, P. Muhlethaler, T. clausen, A. Laouiti, A. Qayyum, L. Viennot Hipercom Project, INRIA Rocquencourt, BP 105,78 153 Le Chesnay Cedax,France.

[5] D. Loganathan, P. Ramamoorthy (2013) Research Inventy: International Journal Of Engineering And Science Vol.2, Issue 10 (April 2013), Pp01-08.

[6] Gagangeet Singh Aujla and Sandeep Singh Kang, "Comprehensive Evaluation of AODV, DSR, GRP,OLSR and TORA routing protocols with varying number of nodes and traffic applications over MANETs", IOSR-JCE Vol. 9(3), pp. 54 -61, 2015.

[7] Katiyar, S., Gujral, R., & Mallick, B. (2015, October). Comparative performance analysis of MANET routing protocols in military operation using NS2. In Green Computing and Internet of Things (ICGCIoT), 2015 International Conference on (pp. 603-609). IEEE.

[8] Gupta,A.K.,Sadawarti,H.,&Verma,A.K.(2013).Performance analysis of MANET routing protocols in different mobility models. International Journal of Information Technology and Computer Science (IJITCS),ISSN,2074-9015.