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A REVIEW OF AD HOC ON-DEMAND DISTANCE VECTOR ROUTING PROTOCOL FOR MOBILE AD HOC NETWORKS

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ABSTRACT

A mobile ad hoc network is networks which utilizes multi-hop radio relaying and are capable of operating without the support of any fixed infrastructure. Efficient dynamic routing is a challenge in such a network. On-demand routing protocol is widely developed in ad hoc networks because of its effectiveness and efficiency. In this paper, the significance of Ad hoc On-Demand Distance Vector (AODV) routing protocol, Load Balancing AODV, Modified AODV, Adaptive Secure AODV have been reviewed. The simulated parameters such as packet delivery ratio, throughput, end to end delay, routing overload and energy were taken in to consideration. The simulated results showed that the AODV protocol enhances the packet delivery ratio, throughput, decreases the routing overload and end to end delay.

Keywords: *Load Balancing(LB) AODV , Vector Routing Protocol (VRP), Ad Hoc On- Demand Trusted-Path Distance Vector (AOTDV) Routing Protocol.*

1. INTRODUCTION

On a look into the whole life cycle of ad-hoc networks, it could be categorized into the first, second, and the third generation ad-hoc networks systems. Present ad-hoc networks systems are considered as the third generation.

The first generation goes back to 1972 with the introduction of Packet Radio Networks. The second generation of ad-hoc networks emerged in 1980s, when the ad-hoc network systems were further enhanced and implemented as a part of the SURAN (Survivable Adaptive Radio Networks) program. This program proved to be beneficial in improving the radios' performance by making them smaller, cheaper, and resilient to electronic attacks.

In the 1990s, the concept of commercial ad-hoc networks arrived with notebook computers and other viable communications equipment. At the same time, the idea of a collection of mobile nodes was proposed at several research conferences. The research community had started to look into the possibility of deploying “ad-hoc networks” in other areas of application.

The Ad hoc On-Demand Distance Vector (AODV) routing protocol uses mobile nodes to identify routes fastly to reach new destinations and does not require nodes to maintain routes to destinations which are not in active communication. The AODV algorithm enables dynamic, autonomous , multi hop routing between mobile nodes to establish and maintain an ad hoc network. AODV responds to route breakages and changes in network topology in a timely manner. The operation of AODV is loop-free and avoids the Bellman-Ford "counting to infinity" problem offers fast convergence when the ad hoc network topology changes . When links break, AODV causes the affected set of nodes to be notified so that they are able to invalidate the routes using the lost link.

Ever since the first demand driven routing protocol various modifications have been made in the basic algorithm for the better utilization of adhoc networking. In this article comparison of various AODV routing protocols are to be reviewed, and find which protocol is most advantageous. Also the advantages of ad hoc systems and the present challenges are reviewed. The article also throws light on the areas to be improved to realize the potential of the ad hoc networks. The performance metrics such as packet delivery ratio, end to end delay, throughput, energy

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have also been analyzed for Ad hoc On-demand Distance Vector routing protocol.

The remainder of the article is organized as follows. The next section discusses On-demand routing protocol which is widely developed in ad hoc networks because of its effectiveness and efficiency. The section also provides the various modifications and improvements made in the area. The article presents qualitative comparisons between various on demand protocols.

Of many protocols, it is felt that the Way Point Routing Protocol can be utilized compared to others which are discussed in the following section. The applications and challenges faced by the ad hoc networks were also discussed.

2. ON-DEMAND ROUTING PROTOCOLS

AODV and DSR:

Charles E. Perkins [1] carried out a systematic performance analysis of Dynamic Source Routing (DSR) and Adhoc On-demand Distance Vector (AODV) routing protocols which reduces the routing load and compared the same. The simulated parameters showed that DSR outperforms AODV in less stressful situations while AODV outperforms DSR in more stressful situations. The simulated parameters such as packet delivery fraction, average delay, and normalized routing overload were greatly improved as shown in table 1.

Simulation Parameters	DSR	AODV
Packet Delivery Fraction	56.88	83.66
Average Delay	1.36	0.26

Table 1: Variations in the AODV and DSR simulation parameters.

Simulation Analysis of AODV

Karthikeyan Bhagavan and Carl A Gunter [2] demonstrated the simulation analysis of Adhoc On-demand Distance Vector (AODV) routing protocols for packet radio networks. The integrated system version consisting of a network simulator and a logic based –checker for traces of events which corrects the network simulation properties has been demonstrated and showed its flexibility to improve the turn-around time in debugging.

R.S.AL Qassas[3] evaluated a Vector Routing Protocol (VRP) which lowers the communication overhead to establish a route from source to destination and proved that VRP reduced communication overhead than DSDV and AODV routing protocols. This protocol increases packet delivery ratio, routing overhead and number of routing packets.

Srdjankrco , marjna dupcinor [4] overcomed the problem of affecting the neighbor detection algorithm of the AODV protocol by significantly deteriorates network performance. All routes are established over good quality links as good neighbors only are kept in routing tables. This improves the parameters such as data throughput, decrease delays and overall user performance.

Vincent W.S.Wong [5] compared the performance of Load Balancing(LB) AODV protocol with both the original AODV and gossip-based routing protocols. LB AODV delivers more data packets to the gateway and decreases the end to end delay of packets. Vincent W.S. Wong considered a mobile adhoc wireless access network in which the mobile nodes can access the Internet via one or more stationary gateway nodes and controlled the on-demand routing overhead by Load Balancing(LB) AODV routing protocol.

Reactive Routing Algorithm

Z. Fan [6] developed a reactive routing algorithm for multirate adhoc wireless networks which enhances the AODV protocol results in higher throughput over traditional adhoc routing protocols. The Medium Access Control (MAC) delay protocol is a very useful metric to identify congestion hot spots and measure the link interference in an adhoc network. This MAC delay protocol outperforms the old protocol mainly in low mobility scenarios. The significance of the routing protocol is to find the least cost path from the source to the destination.

Nianjun Zhou and Huaming Wu[7] presented a mathematical and simulative framework for quantifying the overhead of reactive routing protocols such as dynamic source routing and ad hoc on-demand distance vector routing in wireless topology networks. The effect of traffic on routing has been studied and the result is possible to design infinite reactive routing protocol for variable

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topology network. Route discovery and route maintenance mechanisms are adopted. The parameters analyzed are average notification packets per node failure and successful percentage of finding paths.

Caching and Multipath

Alvin C.Valera[8] implemented a new protocol called Caching and Multipath [CHAMP] routing protocol which uses a packet caching and shortest multipath routing to reduce packet loss due to frequent route failure. The routing is proactive based and can be able to detect the broken line. CHAMP routing protocol is executed only when packet receive or forward failure is detected. CHAMP eliminates the drawbacks by spreading packet in all the route in Round Robin fashion.The simulated parameters analyzed are end to end delay, packet delivery ratio, delay routing overhead. Route discovery, Route maintenance and packet salvaging mechanisms were adopted.

Zygment J.Haas[9] implemented a Gossip based approach where each node forward message with some probability to reduce the number of messages sent. The behavior is bimodal type which means that the source send the request with some probability and when the node receives with probability, it send to its neighbor. Zone Routing Protocol(ZRP) is used for updating each change. The parameters analyzed are packet delivery ratio, end to end delay, route length ratio. The limitations in this approach are traffic reduction is only up to 35%.Moreover nodes are chosen at random and due to this small fraction of node will not broadcast.

Way Point Routing Protocol

Rendong Boi and Mukesh Singhal [10] introduced a Way Point Routing Protocol [WRP] where the intermediate nodes on route are selected as way points and the route is divided in to segment. In this, when node fails instead of discard the whole path or route, it discovers new route from source to destination. The advantages of this protocol are loop detection, multitarget discovery , work uniformly, increased lifetime, global route discovery and division of nodes lead to good path. The parameters simulated are control overhead, packet delivery ratio, end to end delay, average route length route repair success ratio and scalability. The limitations encountered in this are more control overhead, more average route length other than packet delivery ratio and end to end delay and security.

Congestion Adaptive Routing

Duc A.Tran and Harish Raghavendra[11] dealt with congestion control which overcome longer delay and more packet loss and introduced Congestion Adaptive Routing(CAR) where the route is changed only based on congestion status. The parameters taken in to consideration are route discovery , bypass discovery, traffic splitting ,congestion adaptivity, multipath minimization and failure discovery. The simulated parameters analyzed were packet delivery ratio, end to end delay, routing overhead and energy. The limitations are longer delay, high overload, ineffective under stressful network traffic situation and applicable only for limited load. The advantage of this CRP is that it makes less congested and less delay.

Secure Ad hoc On-Demand Distance Vector Routing Protocol

Davide Cerri and Alessandro Ghioni[12] proposed a mechanism A SAODV that tunes the SAODV behavior adaptively. In SAODV hop count cannot be signed by the sender in prior since decryption cannot be done at each node by enabling hop count. Here A SAODV uses a multi thread application in which a dedicated thread performs the cryptographic operations to block the malicious messages. Here two threads are used for execution; one for cryptographic operations and the other for rest functions. Thus the hop count can be incremented at node and also the sender can sign the hop count in prior which increases the security of transmitting the data's. This improves the SAODV performance.

Modified Ad hoc On-Demand Distance Vector Routing Protocol

G. Ferrari, S.A. Malvassori and O.K. Tonguz[13] discussed to reduce the packet loss by minimum BER criterion instead of considering shortest path. They proposed a new protocol MAODV (modified ad hoc on demand distance vector) and the benefits of using power control (PC) with the selected route are evaluated. This MAODV is similar to AODV with the only difference that the BER is reduced at the destination node by mathematical analysis with the SNR value. It's shown that MAODV-PC protocol has good packet delivery ratio than AODV at low node mobility, low traffic load and low node spatial density situations.

Secure Routing Against Collusion

Ming Yu, Wei Su, Mengchu Zhou[14] proposed an integrated protocol (with (AODV) and

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dynamic source routing (DSR)) called secure routing against collusion (SRAC). It identifies the various internal attacks like Byzantine attack In this protocol the node makes its route based on the performance and trust of its neighborhood nodes. Pair wise secret keys by public key cryptographic mechanism at source, destination and between some intermediate nodes from source to destination along the route are used to protect the route discovery messages. Only those nodes with asymmetric key are able to join the path. The advantage is that the packet delivery ratio is more in SARC than in AODV.

B. Hu H. Gharavi[15] proposed a directional routing approach for two multi hop ad hoc networks namely AODV and DSR. It considers hop count, power budget and overlaps between adjacent beams for route discovery process. The beam overlaps between the nodes along the route are reduced in these two protocols by exploiting the direction of directional antennas. DAODV and DDSR are examined separately. In DDSR, the positional information of the node is given along with the RREQ and RREP for the calculation of overlap count. In DAODV the RREQ is sent to the source node with out considering whether it has the route to destination or not which helps in calculating the overlap counts. Also if the link breaks to the destination the upstream buffer gets cleared and it requests to all active upstream nodes to reach the destination. The result shows that the performance of DDSR is better than the performance of DAODV because it could find many routes to the destination in a single request.

Loay Abusalah, Ashfaq Khokhar, and Mohsen Guizani[16] reviewed four important protocols on the basics of security aspects. First DSR with QOS guided route discovery and secure Quality of Service route discovery. Secondly AODV with secure version like CORE, SAODV and SAR. Lastly TORA with ad hoc security techniques SPREAD and ARAN. Non-repudiation integrity, confidentiality, non-repudiation, authentication, and availability are the security requirements that the ad hoc network should achieve. The solutions are proposed for different problems that are being faced.

Problem	Given solution
Jamming	DSSS, FHSS
Disclosure of location	NDM, SRP
Routing problem	ARIADNE,SEAD, ARAN
DOS	ARAN, SEAD

Table 2: Solution for security problems

Zaheer Ahmed, Habibullah Jamal, Shoab Khan, Rizwana Mehboob and Asrar Ashraf[17] presented a vehicular device and a communication protocol. Here the routing protocols are widened to serve as Cognitive layer across physical layer and MAC for seamless switching, Quality of Service parameters and optimum connectivity. Three routing protocols are given in CCVN environment for ubiquitous connectivity. They are GPS enabled optimized linked state Routing protocol for multiple interfaces(GOLSR-MI),Server oriented Routing protocol(SORP) and Ad hoc On Demand vector for Multiple interfaces(AODVMI). The routing table of these proposed protocols consists of dynamic maintenance and update of GPS info and Link state Table. The advantage of this VND is that it allows two networking domains to work together. Also the logic introduced in Cognitive Controller uses routing and switching logic to provide optimum connectivity relaying on user defined interface priorities, QOS parameters and user subscribed devices.

Further improvements were made by Chang Wen Chen, Byung Joon Oh [18] evaluated two novels to improve the performance of video transmission over wireless ad hoc network. The performances are increased in terms of packet loss rate, latency and throughput by employing congestion aware cross-layer interaction system which has congestion aware optimizations and MLR. Packet loss is reduced in this method compared to TMMAC and MMAC. Also this provides a stable PSNR traces for video and high video quality transmission in wireless ad hoc networks.

Ad hoc On- Demand Trusted-Path Distance Vector

X. Li Z. Jia P. Zhang R. Zhang H. Wang[19] proposed a protocol ad hoc on- demand trusted-path distance vector (AOTDV) which is a stretched out model of AOMDV. The paths identified are based on hop counts and trusted values. Trusted values are calculated

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mathematically with the given values for each node. Trusted value is incremented or decremented at each node based on the strength of the node. When this trusted value falls below the threshold value the link breaks and the buffer gets cleared. It then again sends the RREQ to reach the required destination. A special algorithm based on this process is given. Also computation of path trust is derived. This model increases the packet delivery ratio and defends the problems due to black hole, modification attacks and grey hole.

Santosh Kalwar[20] compared the performance of the reactive protocols and the comparative study is listed in this paper. The protocols are AODV, DSR and TORA. The performance of AODV is said to be loop free without the support of unidirectional link and multiple routes but other attributes are supported. In DSR periodic broadcast is alone unsupported. TORA has short lived loops and also unidirectional link is unsupported. It shows that the reactive protocols needs much concern in many issues mainly security. It's concluded in here that reactive protocols are lazy protocols.

M. Iqbal X. Wang S. Li T. Ellis[21] proposed a scheme based on Quality of service (QOS) in multimedia multicast communication in wireless mesh networks. A new bandwidth is calculated with the information it receives from the network and application layer to provide rate-adaptive admission control and also operates the MAC layer independently. This proposed QOS algorithm's functionality is seen with the help of Swan-Mesh WMN test-bed. This rate adaptive admission control QOS depends on the interaction of UDL-MAODV, LBGD-AODV and rate-adaptive real time video application for real multimedia time application. Here the multimedia sender adapts the sender's bit rate for real time traffic flow regarding the congestion feedback for optimizing the network resources. The advantage of the proposal of new QOS scheme and new bandwidth calculation based on network and application layer for rate-adaptive admission control is, it allows working independently on MAC layer.

Physical Realization of Ad hoc Networks

Amit Kumar Saha, Khoa Anh To, Santashil PalChaudhuri, Shu Du, and David B. Johnson[22] designed and evaluated the performance of a new system PRAN(physical realization of Ad hoc networks). The simulation models are used unmodified creating physical implementation of same protocol also it unifies the both types of evaluation methodologies. The existing simulation models of Ad hoc network routing protocol is used unmodified in PRAN for physical implementation of the same protocol. They implemented the protocols and multiple operating systems of AODV and DSR in PRAN and evaluated the simplicity and portability of this approach. Its also made possible to transmit robot control messages and all videos along multi hop mobile ad hoc network with PRAN DSR implementation.

Heading-Direction Angles Routing Protocol

M. Al-Akaidi and M. Alchaita[23] introduced a scheme having there novels ideas making use of some information's such as heading direction angle to establish and maintain robust and long lived routes. They named it as heading-direction angles routing protocol (HARP).In HARP algorithm, each neighboring nodes are classified into eight zones. Also it finds the robust and long lived route through HDA of the current node. This minimizes the connection breakdown and control packet overhead. Changes in network topology are balanced in this method.

Nawaporn Wisitpongphan, Fan Bai, Priyantha Mudalige, Varsha Sadekar, and Ozan Tonguz[24] studied the disconnected network phenomenon and its characteristics with the measured empirical vehicle traffic data on I-80. The predictions of developed analytical frame work is demonstrated by Monte-Carlo simulation and showed that they are same. Thus this has good estimates over the average re healing time.

Ra'ed Y. Awdeh[25] examined the co-existence between the Reno and Vegas in wireless IEEE 802.11 Ad hoc networks. They said Vegas are generally dominating in heterogeneous Reno/Vegas network scenario. It's said that Vegas are more conservative in mechanism with accuracy. It's proved that Reno's aggressive behavior is not rewarded by ad hoc network environment. They have showed that TCP Vegas is better in giving more good put (11 times as TCP) than TCP. This can be adopted only when AODV or DSR reactive routing protocols are used since they get feedback from MAC layer to forward a packet to its destination, after a node failure.

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HEAT

Rainer Baumann, Simon Heimlicher, and Bernhard Plattner, ETH Zurich[26] introduced a protocol HEAT based on tailor made for multi hop wireless mesh networks: field based anycast routing. This protocol is based on the concept of temperature field in thermal physics. HEAT's performance is first noted with reference to AODV. Secondly it is done with OLSR. It's noted that the performance of OLSR improves roughly by ten percent. Again the evaluation results of OLSR, AODV were poor when compared to HEAT. The packet delivery ratio remained nearly 70 percent for HEAT but only 50 for AODV. The field based routing algorithm of HEAT provides robust routes even with mobile nodes moving at car speeds. At the same time for nodes moving at car speed HEAT protocol performance was far better than AODV and DSR.

Bidirectional Abstraction Of Asymmetric Network Routing Protocols

Venugopalan, Ramasubramanian and Daniel Mossé[27] presents a simulation study stating the impact of asymmetric links on routing performance and network connectivity. Then it follows a frame work called BRA. It provides a bidirectional abstraction of asymmetric network routing protocols. This protocol provides improved connectivity by taking advantage of unidirectional links, detection packet loss on unidirectional links and reverse route forwarding of control packets to enable off-the-shelf routing protocols. First it's said how the network asymmetry takes place due to various sources which affect the conventional MANET protocol. Finally proved that a typical routing protocol namely AODV when functioned over BRA shows a superior connectivity in asymmetric networks.

Jenn-Yue Teo, Yajun Ha, and Chen-Khong Tham jave[28] improved the performance of Wireless Sensor Networks (WSN) in the high rate streaming basis. First they considered the effect of wireless interferences and that the nodes that interfere beyond the communication ranges and evaluated the quality of a path set for multi path load balancing. Then they proposed a protocol named Interference-minimized Multipath routing (I2MR). It discovers the zone disjoint paths for load balancing, requiring minimal localization support and increases the throughput. Next they introduced a congestion control scheme which increases the throughput further more. It happens by loading the paths for load balancing at the highest possible rate supportable. Performance of these protocols is validated by comparing with AODV and Node Disjoint Multipath Routing (NDMR). Finally it's concluded that that protocol is able to capture the effects of inter and intra path wireless interferences. Then the I2MR increases the throughput more. The proposed congestion control scheme increases the throughput by loading the active paths at highest possible rate that can be supported.

Pin-Chuan Liu ab, Da-You Chen c, Chih-Lin Hu c, Wei-Cheng Sun a, Jen-Hwa Lee d, Chung-Kuang Chou e,Wei-Kuan Shih[29] analyses the performance of TCP in wireless and mobile ad hoc environments. It first compares the throughput of TCP under various scales of TCP window sizes and data block sizes. Its then proceeded by comparing packet delivery rate, flow counts and hop counts on the basis of two protocols namely OLSR and AODV in mobile Ad hoc network environment. Conclusion is given as that the performance of OLSR is exceeding the AODV. Even though OLSR cannot catch-up with node mobility when AODV does, it shows a better throughput.

SFUS Protocol

R.S. Shaji R.S. Rajesh B. Ramakrishnan F. Rajesh [30]discussed the service migration to other devices after the failure to continue the service. Additionally they present a routing scheme called SFUSP (Self Eliminating Fault Tolerance Based Uninterrupted Reliable Service Switching Mobile Protocol). Based on the context in request it discovers proper services in pervasive environment using Pervasive Discovery Protocol (PDP). This PDP has extra functionalities like clustering and comparison technique to find the correct path with appropriate efficient nodes with services. Routing protocols such as AODV, DSR and OLSR are used in comparing the fault success and migration time. This scheme works with the efficient broadcasting technique to find and eliminate the weak node from cluster and makes this algorithm more efficient.

Miguel A. Wister, Pablo Pancardo and Francisco D. Acosta, Dante Arias-Torres [31] showed the best performance towards rescue task operations between two reactive protocols. The evaluated protocols are AODV (Ad Hoc On Demand Distance Vector) and DYMO (Dynamic MANET On demand routing protocol). Secondly they summarized the functions and performance of AODV and DYMO. Next they give the experimental simulation configuration with metrics.

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Here DYMO has good performance towards throughput, packet delivery ratio and control message overhead when there is fast mobility speed. At the same time AODV's results were poor in these metrics. Conversely DYMO showed poor performance in the presence of energy consumption but AODV showed average performance. Even then DYMO has good performance letting to conclude that DYMO performs well than AODV.

Meysam Alikhany and Mahdi Abadi[32] proposed a approach named DCAD based on clustering-based anomaly detection approach. This DCAD allows dynamic updating of profile. They used weighted fixed width clustering (WFWC) algorithm in order to establish a normal profile and to detect anomalies. Also to update normal profile periodically they use weighted coefficients and a forgetting equation. Here they use two phases. First is training, where a normal network behavior profile is established using WFWC algorithm. Second is detection, where the normal profile is periodically updated using weighted coefficients and a forgetting equation. This simulation results showed that DCAD works better than DCAD without updating in terms of detection and false alarm rates.

Hui Li1,2, Xiaoguang Zhang 1, Ying Liu1[33] aimed in increasing reliability for mine equipment monitoring by proposing a routing protocol ZACA-EEC(Zigbee Ant Colony Algorithm Energy Efficient Cluster) which prolongs the lifetime of network considerably. Since the nodes are considered to be fixed the node distance is constant. So that the probability weighted value will be calculated and more accurate model can be designed. It's concluded that ZACA-EEC improved the Zigbee protocol reliability, prolonged the network lifetime and achieved the target of protocol.

Yang Ting, Li Ang, Wu Jiaowen, Cao Zhiheng, Qianqian Zhang[34] use anycast technology 2FCA that can fasten broken routing path, which increases packet's success rate and decreases the failure delay. It saves scarce energy and bandwidth resource by restricting the participant nodes and prolongs networks lifetime and improves the networks performance. Also they have found the lower message complexity of 2FCA than AODV by mathematical analysis. The final observation is that the present routing algorithm 2FCA recovers the routing path in a minimal time and saves energy and bandwidth to prolong the networks live-cycle.

Sofiane HAMRIOUI, Mustapha LALAM[35] have studied the interactions between the IETF standardized reactive and proactive routing protocols under varying network conditions like mobility and load. The performance of MANET is improved by improving the parameter performance like sending rate of TCP packets. These improvements come under the algorithm back off improvement of MAC protocol (IB-MAC). This proposed algorithm is based on a dynamic adaptation of its maximal limit according to the number of nodes and their mobility. The CWmax terminal is based on the mobility and the number of nodes used. It reduces the number of collisions in the nodes after having learnt the same values of the interval backoff algorithm. The results provide a neat improvement in TCP performance and on MANET performance.

3. APPLICATIONS AND CHALLENGES

Ad hoc wireless networks play a major role in armed services. These have made information exchange much easier than any. Also in small vehicular devices, this technique is made a beneficial one like with cameras - to deploy the targeted regions which helps us in gathering important location and environmental information's which will be communicated back to a processing node via ad hoc mobile communications.
Ad hoc wireless networks include certain commercial scenarios:

- Emergency services
- Seminars/conferences
- Law enforcement

Recent trend reveals us that when a particular crew attends a meeting or conference they surely have a laptop or a palmtop rather than notebooks. The main reason of this lies on the fact that the network information plays an active important role in sharing information faster than with a fixed base stations. More over it delivers information via data, video or voice from one rescue team member to another over a small hand held or wearable wireless device.

Current challenges for ad hoc wireless networks include

- Energy management
- QoS support
- MAC protocol

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As mentioned energy management in handheld devices, which can seriously prohibit packet forwarding in Ad hoc mobile environment Hence routing traffic based on nodes energy management is one way to distinguish routes that are more long lived than others. Next important factor is QoS. Its inadequate to consider QoS merely at the network level without considering the underlying media access control layer. Now the trend has moved slightly towards adaptive QoS approach.

Several new paradigms are introduced in recent Ad hoc routing approaches, like improved packet delivery ratio, decreased time delay, improved techniques in finding path and TCP performance. A flexible Ad hoc routing protocol can responsively invoke on-demand approaches based on situations and communication requirements. Further work is necessary in the areas of media access control, security to realize the potential of Ad hoc networks. Also a work could be made in combining two or more work results {[1] [6] [9] [10] [11]} together to make it much more efficient one.

4. CONCLUSION

In this review article, the performance metrics such as packet delivery ratio, end to end delay, throughput, energy have been analyzed for Ad hoc On-demand Distance Vector routing protocol. The simulated parameters were also analyzed using A-SAODV, MAODV, LB AODV and AOTDV routing protocols. The performance comparison of Dynamic Source Routing (DSR), Temporally Ordered Routing Algorithm (TORA) protocols with AODV protocol were done. The techniques such as route discovery , bypass discovery, traffic splitting ,congestion adaptivity, multipath minimization and failure discovery have been adopted to overcome the limitations namely routing overhead ,end to end delay, energy, security, average route length, number of collisions in the node ,bandwidth, packet delivery ratio and throughput.

Any particular algorithm or class of algorithm is the best for all situations but every protocol has its own advantages and disadvantages. But compared to various AODV routing protocols reviewed, the Way Point Routing Protocol (WRP) [11] seems to be have more advantages such as loop detection, multi target discovery , work uniformly, increased lifetime, global route discovery and division of nodes lead to good path.

There are still greater challenges for ad hoc networks that are to be met which if met could lead to the wide spread use in the field in the forth coming years.

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