Study of the Various Routing Protocols and Security Mechanism in Mobile Ad-Hoc Network (MANET)

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***Abstract*: With the advent in technology, there is development in applications of wireless communication for increasing the efficiency and structure organization of mobile devices. Mobile ad hoc network is own configured multi hop wireless ad hoc network. MANET is used in wide number of applications which are military purpose, disaster retrieval, monitoring of wild life, agriculture purpose, intelligent transport system (ITS) etc. Unsystematic presence of nodes in mobile ad hoc network leads to fast and undesirable change in the structure of network. Moreover, the restriction frequency ranges of movable node in mobile ad hoc network results in indirect and short communication between system networks. Some issues in routing of MANET are movement of node, energetic network, inadequate frequency and power. Therefore, routing protocol for MANET required to be adapted to unnecessary and random alteration in network topologies. In this review paper, different protocols have been developed for mobile ad hoc network for increasing to efficiency of routing in the network topology. The security of mobile ad hoc network is complex approach so review on security issues and a solution has been described in this research. In addition, a detailed study on security mechanism of mobile ad hoc network has been described with security issues and security aims within the network**.

***Keywords:* MANET, Wireless communication, Intelligent transport system, Routing protocols, Security**

I.INTRODUCTION

Mobile network is recognized as the movement in absence of the infrastructure. The grouping of the mobile nodes in the mobile ad hoc network and the nodes are gathered for the communication between each other and with the fixed node as base station. The mesh mobile network with mobile devices and that is connected via wireless connections. The temporary network is called as the mobile ad hoc network. The movable nodes are linked separately with other nodes and nodes are same in wireless connections. The mobile ad hoc network consist of the temporary network where nodes are same in wireless network. Mobile ad hoc network is the self-infrastructure network deprived of the wired or wireless arrangement. In mobile ad network, every node works as host (source or destination) or route node. The method is not similar to cellular network where transmission is done between main network and base station. The nodes in MANET may be of single vehicle node or multiple vehicle nodes because there may be required frequency. The main applications of the mobile ad network are online classes, military, disaster recovery, management of traffic, inter-personal communicating and so on. The multicasting approach is used in such applications in which packets are transmitted from source to destination with recognized IP address. MANET consists of router with numerous hosts and wireless transmission approaches that can organized at any location in the network structure. The located nodes may independent structure. The interfacing at the joined network and have gateway node attached to functional node

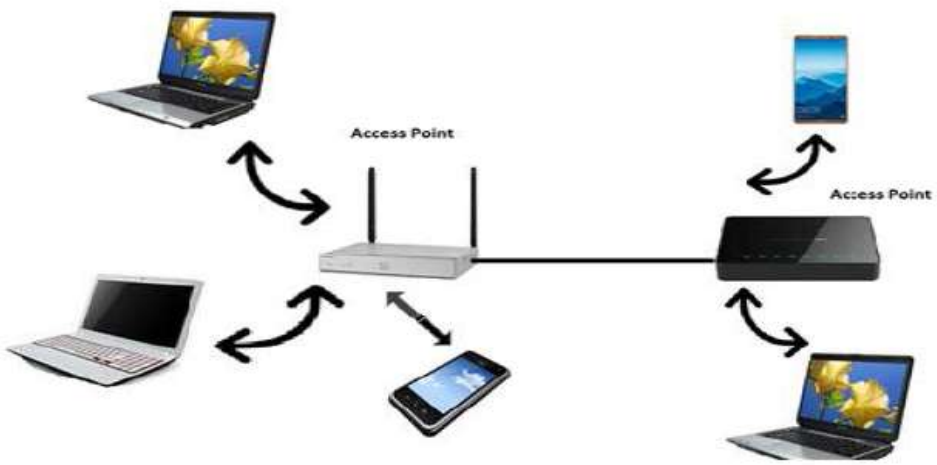

Fig. 1 Architecture of Mobile ad hoc network[5]

II. ARCHITECTURE OF MOBILE AD HOC NETWORK

In mobile ad hoc network, there is presence of the client or small mobile host with less storing capacity, transmission, communicating resources. Server or huge movable host is node that is responsible for the broadcasting of messages and receiving messages from client node. The client node stores the knowledge database with queries and dealing out elements [5]. In MANET,

the transmission may take place in the located area. Server consists of the large number of nodes which are responsible for the mobility and energy of the nodes. The energy level of node reduced with the decrease area of node and the broadcasting will also get decreased. The different phases are used for the decreasing the usage energy in for operating the network nodes are[5][6]:-

i)Dynamic Phase:- In this phase, large amount of energy is utilized for transmitting and receiving of messages.

ii) Receiving Phase:- In this module, the central processing unit get the data and alert message about the other type of the node for broadcasting of messages.

iii) Static Phase:-The central processing unit and node are not capable of sending and receiving data.

The node is in static phase where the messages are not sent or received for limited period of time in absence of the energy. In whole of the network the nodes are not connected when transfer back to opposite node. On other hand, nodes are acquired by server and client. The types of connection used in MANET are described as:-

1. Hierarchical network system architecture: -In this approach, the network system is divided in to different network where static node is elected where one node works as gateway node with other network. The building of the hierarchical is connection of the one to one network or one to multiple network. The benefit of this technique is management of mobile data,

2. Flat Route Architecture: -In this method, every node is specific and there is no requirement unique gateway node.The benefit of this method is that there is no one point of the failed node and different node in the network so survival rate is increased. For instance, the wireless connections are reduced in optimal routing and single tool used balancing of the load.

III. LITERATURE SURVEY

Komai, Y. and Sasaki, Y et al., 2015[7] focused on the query processing for k nearest neighbour in mobile ad hoc networks. The main issue in planning the system protocol for mobile ad hoc networks was that the network topology changes due to motion and less overhead of the mobile nodes. In this research, a method was proposed named as filling space method using k nearest neighbour in mobile ad hoc network. The proposed approach helps in the reduction of the finding area with less overhead in query processing. In this method, data at the nearest position was the data items are gathered and located with the nearest data items. The data for nearest k neighbour nodes was recovered. The proposed approach attained less overhead and increase accuracy rate.

Rishiwal, V and Agarwal, S. K. et al., 2016[8] analyzed the performance and the energy of the AODV routing protocol in same and different MANET. The parameterthat used in this research was throughput, average delay, energy consumption of the nodes. NS2 was the simulation tool that was used in this research. The experimental result proposed that the parameters are compared to improve the efficiency of the AODV routing protocol.

Rathod, N and Dongre, N et al., 2017[9]proposed a research on the video streaming of routing protocols of mobile ad hoc network. The streaming video is the method of sending data in the form of the data frames over internet of things. In this research, the experimental result specified in video streaming of the routing protocols in mobile ad hoc network. The routing protocol used in this research was Ad-hoc On-request Distance Vector (AODV), Ad-hoc On-request multipath Distance Vector (AOMDV), Enhanced Video Streaming in MANET (EVSM) . The performance is evaluated by comparing the protocols using parameters which are throughput, packet delivery ratio and packet delay.

Sherine, M. E et al.,2015 [10] proposed a research on the recognition of the Enhanced Adaptive Acknowledgment method in mobile ad hoc network. In this research, Enhanced Adaptive Acknowledgment method overcomes the issues of the various methods. The experimental approach improves the security of the mobile ad hoc network.

Timoshenko, A. and Molenkamp, K. et al., 2017[11]researched on the different scenarios of the communication system in mobile ad hoc network. The different methods used for improving the performance using unidirectional antenna in wireless sensor network. Optimisation was done regarding sensing signal of every single node. In this research, numerical graph was generated for improving the accuracy to desired distance.

IV. SECURITY MECHANISM

A. Security Issues In Manet

Mobile ad hoc network are susceptible to security issues in wired network. Main security issues are explained as,

1. Undefined border area: -Physical boundary of mobile ad hoc networks not defined. In such drifting environment, nodes may connect or disconnected. Due to opposition of the nodes frequency range of the network may vary during communication of the network. Some attacks in mobile ad hoc network are denial of service attack, tempering.

2. Opposition in internal network: -Some movable nodes in mobile ad network may connect or disconnect connection within the network. Malicious node may be present in the network. Malicious attack is dangerous type of attack in the network. Nodes present in network are called as compromised nodes[12].

3. Unavailable Centre controller: -It is not easy to detect the kind of attacks in this approach. There is unavailability of centre control. Control is dispersed at each node instead of distributed at the centre of the network. It is not easy to detect the attacks because consultative changes may take place and leads to issue of network. Main reason of issue of security, it is not easy to classify the nodes as confidential node or unprocessed node.

4.Inadequate Power: -The operation of mobile ad hoc network is dependent on energy resource. The other source of the energy resource is not present in the network. Opposition may send large traffic load towards objective node. Central node acquires the number of data frames that leads to fatigued of battery power. In such case there may denial of service attack may take place. Huge battery power is consumed during performance evaluation of nodes. Some nodes work as single nodes that may not perform during mutual approaches. For instance, cluster based interruption discovery method in bunch of nodes used for detection of intrusion in the network[13].

B. Security Aims In Manet

Security is the main concern in network and that involves the easy access of nodes, packet forwarding, ease of communication between networks.

1. Available Resources: -Resources are available and accessible for authorized access at suitable time period. The main users who access the network may easily use the required set of procedure and access the network. If there is an unauthorized access to network then denial of service attack occurs in the network.

2. Privacy: -Authorized member access or use computer system guarantees the privacy of the network. In order make the privacy of the network, data transferred from sender to receiver must be confidential. Confidential key encryption method is used as private and public key during communication between nodes.

3. Reliability:-Information is available to authorized party and user can modify and update the data in the network.Alterationin system network comprises lettering, altering rank, removing and generating. Information present in network is secure and private[14].

4. Verification: - In large network, huge number of nodes may be present in the network and there may loss of data during communication in network. Along with that, system is more vulnerable to attacks so it becomes a main approach to recognise and authenticate every single node.

V. ROUTING PROTOCOLS IN MANET

Routing is the method of transmission of information from sender to receiver node. Interchanging of data between sender and receiver is routing process[15]. Routing protocols have ability to control data in system.Process of forwarding data frames from sender to receiver using appropriate route is method of routing.
Routing table is maintained to have record of data placed at nearest node or at neighbour node. Routing Protocols of VANET are described as:-

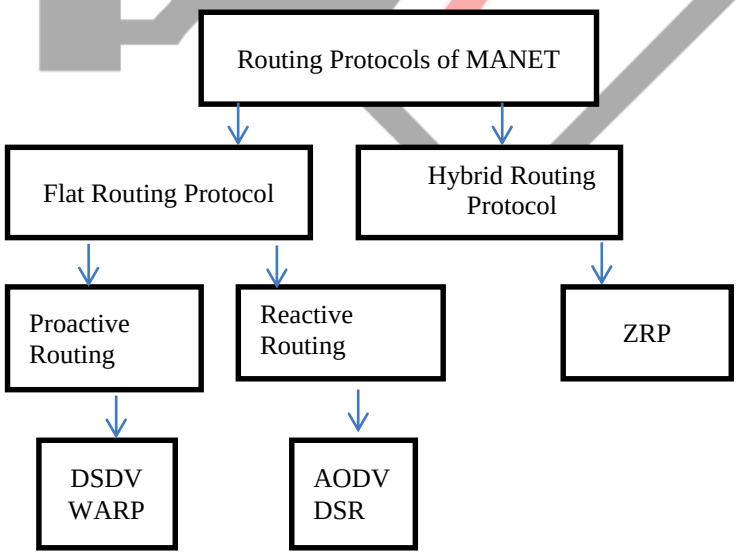

Fig. 2 various routing protocols of MANET

1. Flat Routing

Every single node are recognised by the identification in flat routing. There may be presence or the absence of the network structure due to large possible nodes. Routers may be placed in flat symmetrical network structure. There are various type of flat routing protocol which are Table driven or on demand routing protocol.The work of the nodes in flat routing protocol are equivalent[16].

i) Proactive (Table Driven) Protocol

Proactive active protocol is known as table driven protocol in which routing table is maintained by updating the data at every set of node. Transmission of data frames above already defined route determined by route table. Linked state route approach is used for the neighboring nodes in proactive route protocol. Routing table in this protocol is updating at regular intervals whereas inactivity is low. Routing data in route table are maintained through the network structure in proactive route protocol. Pro-active route protocol is Table driven protocol because it is having all data of route table[17]. The information in route table may be static or updating at given time or from time to time. Examples of Proactive route protocol are DSDV and WARP.

a)DSDV protocol:-

In Distance sequence routing vector protocol, during updating of each table arrangement or sequence amount is increased each time when data is maintained and updated. When network structure or topology is changed or broadcasted for constant data through system network, there is an updating of the route table. Distance sequence routing vector protocol contain two route table where, first is to forward packets and other is broadcast the route packets that are incremented. Node forwards roué data occasionally and have series of new arrangement of the receiver, quantity of node to receiver node. The presence of large number of nodes in Distance sequence routing vector protocol increase the amount of packet in ad hoc network.

b) WARP

WARP is wireless ad hoc routing protocol that is reliable on route searching algorithm.wireless ad hoc routing protocol is advanced version of Distance sequence routing vector protocol. wireless ad hoc routing protocol consists detail approach of system network structure. The data with short distance contains the route data recognise structure of route

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ii) Re-active (on demand) Protocol

Information of the active node from sender to receiver is present in this protocol. For every new receiver, route scanning is done by which overload in network is reduced. Along with this, the searching time period in the network is reduced. Sudden alterations in the network topology may cause breakage of the dynamic routes. Re-active routing protocol is also known as on demand routing protocol. Examples of reactive routing protocol is AODV and DSR routing protocol[17].

a) AODV

AODV is on demand or on request ad hoc route protocol or reacting route protocol. AODV is based on Bellman-Ford Distance process. Path is searched from source to destination during the demand principle or strategy. Suppose there is exchanging of data or the message for connection between the nearest nodes. There are various phases of the AODV routing protocol like as path detection, path maintenance, manage route table and manage native connections. In path discovery phase, there is connection between sender and receiver node through the middle node. A path demand(PREQ) forwards through sender having information about sender and receiver address, sender series number, receiver series number, connection identification.Series number of sender and receiver are required for updation detail of information of nodes. On demand request is recognised by connection between sender address and receiver identification [18].

b)DSR

Dynamic Source Routing protocol is an example of dynamic source routing protocol.There is absence of swapping of data in this protocol. Sender is not aware about the path of the receiver for making connections between the nodes[19]. Therefore, Dynamic Source Routing protocol relies on two phases which are path discovery and path preservation.Memory of sender is checked during the connection between sender and receiver for authentic communication in network[20].

2. Hybrid Protocol

This protocol is the collaboration of the proactive and reactive protocol for directing better proficiency and reliability in system network[21]. In form of example, short range communication is required in proactive whereas in re-active there is requirement of distant communication network. Hybrid Protocol is named so because there is presence of hierarchical structure in system network mainly relies on nearest nodes[22].

i) ZRP Protocol

Zone routing protocol is an instance of hybrid routing protocol that is based on proactive and re-active routing protocol. In ZRP there is high rate of transmission between the network nodes. Selection of the protocol within the network is established for high transmission rate in the system network. Path is established in similar native zone for recognition of the dynamic route table[23].so sender and receiver may be present within the similar zone. Data packets that builds zone have the path beyond the path whereas reactive protocol selects every corresponding zone of the path to determine zone at receiver end. Data is transmitted over the network once the zone is confirmed over the network[24].

VI CONCLUSION

Over the last few decades, there has been wide research in branch of mobile computing or mobile ad hoc network. MANET is more prone to external attacks due to high mobility of network. This research casts on various ideas of mobile ad hoc network.In mobile ad hoc network, routing plays a main role for better communication in network. It is difficult to main a constant route from sender to receiver due to common alterations in system network. Detailed explanation of routing protocols of mobile ad hoc network is given in this research. A major focused on comparative approach and different routing protocols which are pro-active, re-active and

hybrid protocol. It is noticed from this research that Distance sequenced routing vector protocol performs best from other protocol in mobile ad hoc network. When movement of nodes is increased then ad hoc routing protocols needs to work higher as compared to other protocols. Zone routing protocol depends on the zone of the area of network. Routing protocols of mobile ad hoc network mainly focused on the enhancement of better security and higher power of system network.

REFERENCES

[1] Loo, J., Mauri, J. L., & Ortiz, J. H. (2012). Mobile Ad Hoc Networks. *Mobile Ad Hoc Networks: Current Status and Future Trends*.
[2]Zoican, R. (2007, September). Analysis of Scalability in MANET's Protocols. In *2007 8th International Conference on Telecommunications in Modern Satellite, Cable and Broadcasting Services* (pp. 605-608). IEEE.
[3] Al-Sultan, S., Al-Doori, M. M., Al-Bayatti, A. H., &Zedan, H. (2014). A comprehensive survey on vehicular ad hoc network. *Journal of network and computer applications*, *37*, 380-392.
[4]Saranya, A. S., & Ravi, G. (2015). A Review on Power Saving Techniques in MANET. *International Journal of Scientific and Research Publications*, *5*(5), 1-4.
[5] SWAMI, S. Mobile ad hoc networks (MANETs) are not a fundamentally flawed architecture. *Is MANET a flawed architecture [online].[cit. 2012-10-15]. Dostupné z URL: http://www. cs. rutgers. edu/rmartin/teaching/fall04/cs552/papers/012. pdf*.
[6] Zoican, R. (2007, September). Analysis of Scalability in MANET's Protocols. In *2007 8th International Conference on Telecommunications in Modern Satellite, Cable and Broadcasting Services* (pp. 605-608). IEEE.
[7] Komai, Y., Sasaki, Y., Hara, T., &Nishio, S. (2015). K nearest neighbor search for location-dependent sensor data in MANETs. *IEEE Access*, *3*, 942-954.
[8] Rishiwal, V., Agarwal, S. K., &Yadav, M. (2016, April). Performance of AODV protocol for H-MANETs. In *2016 International Conference on Advances in Computing, Communication, & Automation (ICACCA)(Spring)* (pp. 1-4). IEEE.
[9] Rathod, N., &Dongre, N. (2017, January). MANET routing protocol performance for video streaming. In *2017 International Conference on Nascent Technologies in Engineering (ICNTE)* (pp. 1-5). IEEE.
[10] Sherine, M. E. (2015, March). Effective intrusion detection method for Manets using EAACK.In *2015 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2015]* (pp. 1-6).IEEE.
[11] Timoshenko, A., Molenkamp, K., Volkov, A., &Solodkov, A. (2017, February). Synchronization and performance of MANET-based obstacle detection systems. In *2017 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (EIConRus)* (pp. 231-234). IEEE.
[12] Shi-Chang, L., Hao-Lan, Y., & Qing-Sheng, Z. (2010, February). Research on MANET security architecture design.In *2010 International Conference on Signal Acquisition and Processing* (pp. 90-93).IEEE.
[13] Sheikh, R., Chande, M. S., & Mishra, D. K. (2010, September). Security issues in MANET: A review. In *2010 Seventh International Conference on Wireless and Optical Communications Networks-(WOCN)* (pp. 1-4).IEEE.
[14]Lalar, S. (2014). Security in MANET: Vulnerabilities, attacks & solutions. *International Journal of Multidisciplinary and current research*, *2*, 62.
[15]Mohseni, S., Hassan, R., Patel, A., &Razali, R. (2010, April). Comparative review study of reactive and proactive routing protocols in MANETs.In *4th IEEE International Conference on Digital Ecosystems and Technologies* (pp. 304-309).IEEE.
[16] Perkins, C. E., Royer, E. M., Das, S. R., & Marina, M. K. (2001). Performance comparison of two on-demand routing protocols for ad hoc networks. *IEEE Personal communications*, *8*(1), 16-28.
[17] Mbarushimana, C., &Shahrabi, A. (2007, May). Comparative study of reactive and proactive routing protocols performance in mobile ad hoc networks.In *21st International Conference on Advanced Information Networking and Applications Workshops (AINAW'07)* (Vol. 2, pp. 679-684).IEEE.
[18] Tuteja, A., Gujral, R., &Thalia, S. (2010, June). Comparative performance analysis of DSDV, AODV and DSR routing protocols in MANET using NS2.In *2010 International Conference on Advances in Computer Engineering* (pp. 330-333).IEEE.
[19] Williams, B., & Camp, T. (2002, June). Comparison of broadcasting techniques for mobile ad hoc networks. In *Proceedings of the 3rd ACM international symposium on Mobile ad hoc networking & computing* (pp. 194-205). ACM.
[20] Rahman, A. H. A., &Zukarnain, Z. A. (2009). Performance comparison of AODV, DSDV and I-DSDV routing protocols in mobile ad hoc networks. *European Journal of Scientific Research*, *31*(4), 566-576.
[21] Abolhasan, M., Wysocki, T., &Dutkiewicz, E. (2004). A review of routing protocols for mobile ad hoc networks. *Ad hoc networks*, *2*(1), 1-22.
[22] Raheja, K., &Maakar, S. K. (2014). A survey on different hybrid routing protocols of MANET. *IJCSIT) International Journal of Computer Science and Information Technologies*, *5*(4).
[23]Marwaha, S., Tham, C. K., &Srinivasan, D. (2002, November). Mobile agents based routing protocol for mobile ad hoc networks. In *Global Telecommunications Conference, 2002.GLOBECOM'02.IEEE* (Vol. 1, pp. 163-167).IEEE.
[24]Beijar, N. (2002). Zone routing protocol (ZRP). *Networking Laboratory, Helsinki University of Technology, Finland*, *9*, 1-12.
[25]Sinha, P., Krishnamurthy, S. V., & Dao, S. (2000). Scalable unidirectional routing with zone routing protocol (zrp) extensions for mobile ad-hoc networks. In *2000 IEEE Wireless Communications and Networking Conference. Conference Record (Cat. No. 00TH8540)* (Vol. 3, pp. 1329-1339).IEEE.