



TRUST BASED MULTI PATH ROUTING & TOPOLOGY HIDING IN MOBILE AD HOC NETWORK : A SECURE PERSPECTIVE

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Abstract— Mobile Ad-hoc Network (MANET) has been attracted large number of researchers in recent years due to its inherent potential for the data transmission. The peculiar characteristics of MANET like limited battery power, mobility of nodes, limited bandwidth provides challenge for the effective and efficient routing among the mobile nodes and at the same time it is necessary to ensure secure data transmission within the given constraints of MANET. Multipath routing is much more flexible and effective approach of routing. Topology hiding protocol i.e. TOHIP resolves the topology exposure problem in multi path routing. FL-TOHIP & AFL-TOHIP has demonstrated the improvement in solution searching and enhanced the efficiency of TOHIP. Malicious nodes and other attacks make MANET vulnerable even with topology hiding. Trust based approach is used to secure communication using the trust between the neighbours. Trust based approach is an alternative to cryptographic techniques. This paper evaluates various trust based protocols and provide a direction to integrate trust based approach with topology hiding multi path routing protocols in MANET to provide optimal data transmission with utmost security.

Keywords : MANET, Multi path routing, Topology hiding, Trust

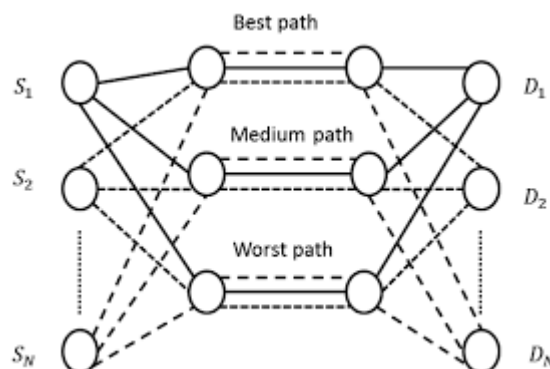
I. Introduction : Mobile ad hoc network (MANET) is a self organising wireless network of mobile nodes. The MANET is an autonomous network with temporary topologies. The striking application of such network is in critical situations like rescue operations, military intelligence, natural calamities where the possibility of existing network or fixed infrastructure is negligible. The peculiar characteristics of MANET is that nodes are mobile and they completely survive on battery. Since external source of power is not possible, the nodes are required to use their battery judiciously. Nodes in MANET also share limited bandwidth. Due to mobility of nodes the probability of failure of data transmission increases significantly. Routing in such constraints is the most vital strategy to improve reliable and efficient data transmission.

Several routing strategies and protocols based on those routing strategies have been explored by the researchers. The primary classification of routing methods can be done as single path routing and multi path routing. The routing protocols are also classified as proactive, reactive and hybrid protocols. Proactive protocols are also called as table driven protocols. Reactive protocols are called as demand driven protocols. Hybrid protocols are the combination of proactive and reactive protocols.

Section II of this paper present the overview of multi path routing & topology hiding. Section III of this paper discusses related work of various aspects of trust based MANET. Section IV of this paper propose integration of topology hiding & trust based approach. Section V concludes the paper.

II. Overview of Multi Path Routing protocols & topology hiding : The Unipath routing protocols uses only one path for the routing between source & destination. The multi path routing protocols consists of finding multiple routes between

source and destination. It offers several benefits like load balancing, fault tolerance, higher aggregate bandwidth, lower end to end delay [1]. Multi path protocols are broadly classified into five categories based on the goals. The goals are to improve delay, provide reliability, reduce overhead, maximise network life and hybrid routing [2]. Several challenges and peculiar issues with regard to multi path routing in Manet are discussed in [3]. Load balancing is one of



the most vital constraints in mobile ad hoc network due to limited bandwidth. To provide a trustworthy quality service guarantee in mobile ad hoc network is very much challenging [4]. With the use of multiple paths for the communication between source & destination, the automatic user becomes almost unaware of the possible network failure due to security attacks or link collapses [5].

Fig 1 : Illustration of Multi Path Routing

Multi path routing protocols offers several benefits over unicast routing but they are vulnerable to various security threats due to different constraints. Topology exposure problem in multipath routing protocol exposes the entire topology between possible pairs of source and destination

while routing . Topology exposure may threaten security in multi path routing protocols in Manet. [6] Topology Hiding protocol eliminates the problem of topology exposure problem by hiding topologies while routing through multiple paths [7] . FL-TOHIP & AFL-TOHIP protocols improved the efficiency & throughput of topology hiding multipath routing protocol[8][9].

III. Trust based Multi path Routing Protocols in Manet :

Due to multi -hop routing and absence of centralised administration Manets are vulnerable to several attacks [10] . The Manet with multi path routing is more prone to said attacks . A node trust and continued path trust is used to discover trustworthy paths and reduce attacks from malicious nodes [10]. Several trust based models and protocols are discovered to secure data transmission by reducing the possible attacks . Light weight IDS takes care of black hole attack & grey hole attack.Light weight ttrust based protocol l is used to reduce overhead and increase scalability[11]. The deployment of any security policy requires the definition of trust model that defines who trusts who and how . Certification based model with public service key is used to secure Manret [12]. The purpose of secure and trust based on demand multi path routing is to find trust based secure routes between source and destination. The mesh based multi path routing scheme in [13] is used to discover all possible secure paths using adjacent trust verification . Trust and reputation mechanism is used in [14] to improve link quality and channel utilisation. Trust mechanism is preferred over cryptographic techniques The trust mechanism secures data forwarding by isolating nodes with malicious intentions using trust value on the nodes[15].

IV. Proposed Integration of Topology Hiding & Trust Based topology Routing for Multi Path Routing inManet :

Topology hiding overcomes the problem of topology exposure problem while routing the transmission between source and destination but though it eliminates some of the attacks , efficiency reduces under attacks . The purpose of efficient transmission in Manet with constrained resources like limited bandwidth , limited power and mobile nodes is to increase the lifetime of network through efficient and effective routing . Several attacks and malicious nodes threaten the security of network and may reduce the network life time in Manet . Multi Path routing compared to single path routing offers more flexibility and more probability of successful transmission in the mobile environment of Manet with given limited resources and constraints. To increase network life time and enhance security against all possible attacks and the problem of malicious nodes we propose the integration of topology hiding and trust based multi path routing in Manet . The proposed integration will escalate the security at two levels Viz. 1st level : Due to hiding of topology the complete path between source and destination will be hidden and hence it will be difficult for the attackers to intrude or evadrop the communication . 2nd level: Trust mechanism will allow to choose reliable neighbors based on the trust established . The reliable nodes helps to choose the optimal and secure path among multiple paths in multi path routing . The integration of topology hiding and trust based routing is sought to reduce end to end delay , reduce packet drop, increase throughput with utmost security from all possible attacks. The proposed integrated topology hiding and trust based protocol intends to

use four phase approach i.e. [1] Route creation at the source .[2] Route creation at the intermediate nodes . [3] Route creation at the destination node .

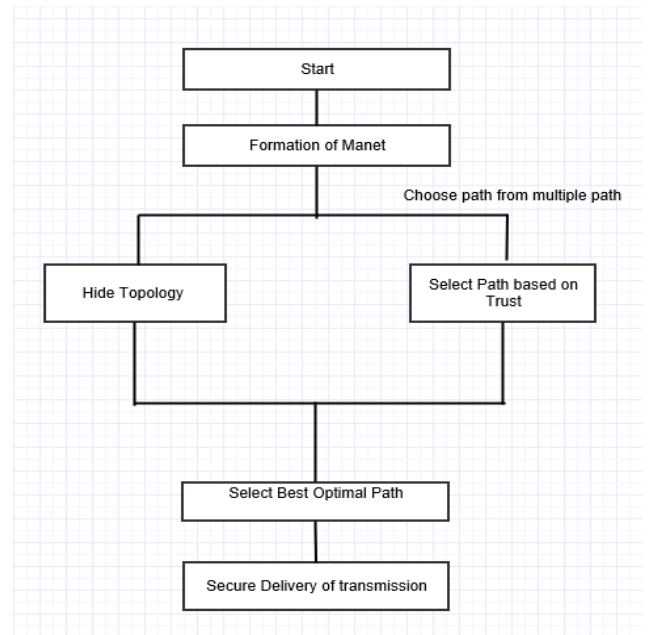


Fig.2 : Proposed Block Diagram of integration of topology hiding and trust based routing .

V. Conclusion : In this paper we have discussed the multi path routing protocols in Manet . We have discussed flexibility and benefits of multi path routing over single path routing in Manet with restricted resources and constraints . The exposure topology while multi path routing may expose the network for the attackers with greater security risk . Topology hiding protocols eliminates the problem of topology exposure but they are not sufficient to meet all security precautions . We further discussed the trust based routing to improve security against various attacks . In this paper we have proposed two level security approach integrating topology hiding & trust based routing using multi path routing in Manet. The proposed work intends to increase fault tolerant data transmission by allowing the capabilities of multi path routing and securing the data transmission with topology hiding and trust based routing among the multiple paths .

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