CHAPTER – 8

CONCLUSION AND FUTURE ENHANCEMENT

Once you replace negative thoughts with positive ones, you will start having positive results...

----Willie Nelson

MANETs are highly dynamic and distributed in nature. As a special variety of network, MANETs have received the interest from a big community of researchers in recent years. Researchers are aggressively working on several explore projects comes involved with MANETs. With the emergence of wireless networking and developments in MANETs, new tactics in routing algorithms are required. The research indicates that the algorithms inspired by SI and nature, especially ACO are getting a lot of interest in solving combinatorial problems. Routing in MANETs is also a type of combinatorial problem where there is always a need for an optimized solution.

The main goal of our thesis was to help improve the security in MANETs against black hole attacks. Firstly, to analyzed the behavior and challenges of security threats in MANETs similarly as however black hole attacks the performance and security of such network. When some intensive analysis on several recent concepts of black hole attack prevention and detection in MANETs, it has tendency to be able to recommend concepts to handle the issue of black hole attacks in MANETs.

In the review of literature chapter, several solutions are projected to mitigate the black hole attacks in MANETs, most of the solutions projected were reactive in nature, i.e., they can identify the malicious node only after the attack has been carried out by the malicious node. Several of those solutions also are solely capable of mitigating single black hole attack and are not capable of avoiding collaborative black hole attack.

For mitigation of black hole attack in MANETs, firstly, we have a tendency to proposed the ARA_BHA scheme, a possible ARA based mostly resolution to mitigate black hole attacks in MANETs. The ARA_BHA scheme is reactive in nature and is capable of finding malicious node before the actual routing process is initiated and
before the attack has been carried out. Simulation results showed that (1) the initial AODV heavily suffers from black hole attack in terms of network throughput and packet delivery ratio, (2) the proposed ARA_BHA scheme performs better than the AODV scheme in terms of network throughput and minimum packet loss percentage.

Secondly, the authors proposed a scheme FIS_BHA to identify and mitigate black hole attacks in MANETs. The proposed FIS_BHA scheme merges the advantage of reactive detection in the initial stage if the detection approach sometimes fails to identify the malicious nodes. So we can combine reactive approach and fuzzy logic system to identify the malicious node. The objective of the fuzzy system is to identify the malicious node to decide that in which type of network conditions the protocol performs low, medium and high. As the analysis result shows that the proposed system is performing better than existing routing algorithm in case of packet deliver ratio, throughput, end-to-end delay so the fuzzy logic does solves the problem of the malicious node in the network and hence increases the overall performance of the network. Simulation results showed that the proposed scheme outperforms both AODV and FIS_BHA schemes improved the performance of the network.

**Future enhancement**

As a special variety of network, MANETs have received increasing research attention in recent years. There are several active analysis comes involved with MANETs. Several interesting issues and unsolved problems that require further investigation have emerged in the course of this research. These are briefly outlined below.

- The protocols proposed in this thesis provide the solution for mitigating independent black holes in the routing protocol AODV and ARA. The same proposed method can be implemented for other well known on-demand routing protocols DSR and OLSR.

- To analysis the process of these proposed ant routing algorithms in different metrics like the available energy at each node in the network.
To study and investigate of ant based local repair algorithm under various metrics such as mobility of the nodes in the networks.

Further study of node mobility is also a promising research direction. Such a study might aid in the design of simulation mobility models, improve estimates of link and path lifetimes and develop the performance of MANET routing protocols.