

Dempster-Shafer Evidence Theory Based Trust Management Strategy against Cooperative Black Hole Attacks and Gray Hole Attacks in MANETs

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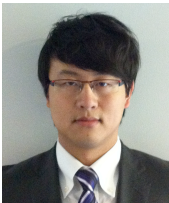
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Abstract—The MANETs have been experiencing exponential growth in the past decade. However, their vulnerability to various attacks makes the security problem extremely prominent. The main reasons are its distributed, self-organized and infrastructure independent natures. As concerning these problems, trust management scheme is a common way to detect and isolate the compromised nodes when a cryptography mechanism shows a failure facing inner attacks. Among huge numbers of attacks, black hole attack may collapse the network by depriving the route of the normal communication. The conventional proposed method achieved good performance facing black hole attack, while failing to detect gray hole attacks. In this paper, a Dempster-Shafer (D-S) evidence based trust management strategy is proposed to conquer not only cooperative black hole attack but also gray hole attack. In the proposed method, a neighbour observing model based on watchdog mechanism is used to detect single black hole attack by focusing on the direct trust value (DTV). Historical evidence is also taken into consideration to go against gray hole attacks. Then, a neighbour recommendation model companied with indirect trust value (ITV) is used to figure out the cooperative black hole attack. D-S evidence theory is implemented to combine ITVs from different neighbours. Some of the neighbour nodes may declare a false ITV, which effect can also be diminished through the proposed method. The simulation is firstly conducted in the Matlab to evaluate the performance of the algorithm. Then the security routing protocol is implemented in the GloMoSim to evaluate the effectiveness of the strategy. Both of them show good results and demonstrate the advantages of proposed method by punishing malicious actions to prevent the camouflage and deception in the attacks.

Keyword—Dempster-Shafer evidence, Trust management, Direct trust value, Indirect trust value, Black hole attack, Gray hole attack, MANETs



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