

# Abstract

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Wireless ad hoc network (WANET) is a collection of two or more devices equipped with wireless communications and networking capabilities. As WANET is self organized and decentralized infrastructureless network, it is susceptible to inside and outside attacks. It is desirable to design a light-weight and efficient security mechanism for such scenario. Cryptography and trust managements can work together to provide holistic security solution. Due to the unique characteristics and the inherent unreliability of the wireless medium, the concept of trust should be carefully defined. Moreover, a trust decision framework should not assume that all nodes are cooperative in resource restricted environments. In this thesis, firstly a distributed secure trust aware cluster based routing protocol (DSTCRP) is proposed to provide secure routing solution. Direct trust is calculated using a quantitative trust model where PI model is used. Self and recommendation evidences are combined using a proposed weight based Dempster Shafer model. The proposed trust model is analyzed using Markov model and shown as a continuous time Markov chain (CTMC). The network is organized into 1-hop disjoint clusters and elects the most qualified and trustworthy nodes as clusterhead (CH) using secret voting and parallel multiple signatures scheme. The network load (per cluster) is determined empirically studying false positives with varying number of packet collision. Using the clustering framework as backbone, secondly an auction based rewarding scheme (STACRP) is developed to mitigate selfishness of nodes. The amount of incentive is determined depending upon the trust behavior of the node and using Procurement and Dutch auctions. Simulation study shows that the STACRP gives better packet delivery and throughput in presence of selfish nodes in the network. Finally, an energy model and energy aware secure routing scheme (SEAR) is proposed to increase the lifetime of a node and the network as a whole. All the proposed schemes and trust metrics have been evaluated with a set of simulations (using NS-2) that shows proposed schemes provide security without any trusted third party with a reasonable communication overhead.

**Keywords:** WANET, Trust, Security, Cluster, Liferime.