Secure and efficient message transmission in MANET using hybrid cryptography and multipath routing technique

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Abstract

MANETs, or Mobile Ad hoc Networks, are a group of self-organized mobile devices that can connect with one another without relying on a centralized infrastructure or authority. The key benefit of MANETs lies in their ability to handle mobility while facilitating data communication among users within the network. However, ensuring the security of MANETs is essential for their proper functioning, particularly in terms of maintaining data confidentiality and integrity during transmission. MANETs are highly vulnerable to attacks due to their inherent properties.Clustering is an energetic technique employed in MANETs to handle mobile nodes effectively. It involves dividing the network into sub-networks known as clusters, which can consist of overlapping or disjointed nodes. For each cluster, an enhanced node termed the Cluster Head (CH) is chosen to oversee routing tasks. This approach reduces the operating expense on member nodes and improves the overall system efficiency. However, the relationship between nodes and CHs can change arbitrarily, resulting in re-union and re-grouping in the clustered MANET.

In a MANET, which is characterized by its dynamic and unpredictable nature, multiple path discovery plays a vital role in maintaining connectivity, improving reliability, optimizing resource utilization, and ensuring resilience to network conditions and node failures. This study aims to create multiple paths between a source and destination using a hybrid protocol that combines AODV (Ad hoc On-Demand Distance Vector) and MBOMRP (Multi-Path Byzantine OLSR). Additionally, a hybrid cryptographic technique is applied to securely transmit fragmented data. The primary objective of this proposed solution is to guarantee the appropriate, secure, and accurate delivery of packets. The results of our study demonstrate that the transmission of encrypted messages through multiple paths enhances network performance, efficiency, and the secure transmission of data within these self-configuring and infrastructure-less networks. It achieves these benefits while minimizing bandwidth consumption during routing operations.

Keywords Mobile Ad-Hoc Network (MANET) · Clustering · Energy efficiency · Cryptographic techniques · Multipath route discovery · AODV · MBOMRP

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