Proposing a Hybrid RPL Protocol for Rank and Wormhole Attack Mitigation using Machine Learning

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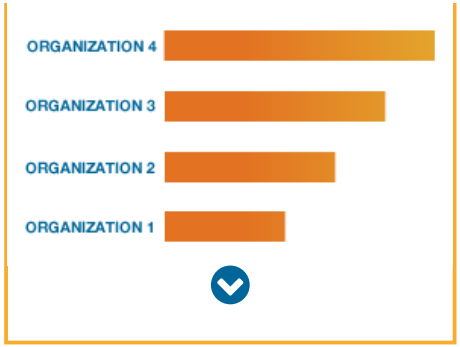

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Abstract:
Internet of Things have profoundly transformed the way technology is deployed today in different domains of life. However, its widescale implementation has also caused major security concerns in context of data communication because of escalating interconnectivity of resource-constrained smart devices. Due to the exacerbating security attack vulnerability, it has become necessary to address the issue of insecure routing in these devices. Low-power and lossy IoT networks on which they run commonly use RPL for routing due to its lightweight nature and compatibility for data transmission. However, RPL is prone to both WSN-inherited and RPL-specific attacks. Several existing solutions have addressed the detection of some of them. However, lack of mitigation techniques is observed which can extenuate attacks of both types such as wormhole as well as rank attack; when they are launched on an RPL-based network. Therefore, the aim of this study is to introduce RPL, its vulnerability to the two attacks, and the proposition that machine learning techniques like support vector machines can be effectively used to develop a secure and improved version of RPL for mitigation of both WSN-inherited and RPL-specific attacks in an RPL-based IoT network.

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Contents

IoT has attained massive recognition for its smart implementation in diverse systems as well as industries. Starting from a small project like an IoT button [1] as its implementation to as big as a smart home [2] and a smart city, the magnitude of IoT application has immensely grown wider with time. Despite its popularity in today's technological world, security remains a vital domain of concern in terms of data communication and routing. One of the main reasons is the widescale interconnection of not only digital gadgets but also 'things' that humans use in their daily life because they are connected to the internet. Considering the expansive use of technology to volumize smart infrastructure, active exploration and development is being done in regards with suitable protocols, standards [3], and schemes for different layers of IoT architecture to provide authentication [4], [5], authorization and integrity among other security traits. Same is the case when dealing with routing in this type of network.

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Figures

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