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Extended context-aware and load balancing routing protocol for low power and lossy networks in IoT networks (ECLRPL)

Zibuyisile Magubane
Department of Computer Science, University of Zululand, kwaDlangezwa, South Africa
buyinkomose@gmail.com

Paul Tarwireyi
Department of Computer Science, University of Zululand, kwaDlangezwa, South Africa
p.tarwireyi@gmail.com

Adnan Abu- Mafouz
The council for Scientific and Industrial Research, kwaDlangezwa, South Africa
a.abumahfouz@ieee.org

Matthew Adigun
Department of Computer Science, University of Zululand, kwaDlangezwa, South Africa
adigunm@unizulu.ac.za

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Abstract

The Internet of Things is a network of devices that sense and communicate the sensed data over the internet without human intervention. These devices are resource constrained, perform poor in a complex network. Routing becomes a significant factor to enhance the performance of information exchange among the devices. The Internet Engineering Task Force (IETF) proposed a routing protocol for low power and lossy networks (RPL) to route data in IoT devices. RPL consist of objective functions that construct the paths from source nodes to the destination nodes. Each objective function performs routing based on a single routing metric, however, in heterogenous networks they fail to transmit data effectively because they are not considering balancing the load distribution. The researchers noticed the poor performance of RPL in IoT network and proposed a load balancing routing algorithm for RPL with the purpose of improving the performance of RPL in the network. The proposed load balancing routing algorithms are effective in different network scenarios and their performance evaluated in different performance metrics. For this reason, it is difficult to identify the ideal load balancing routing algorithm for RPL protocol in IoT scenario. Therefore, this study evaluates the performance of the Context Aware and load balancing routing algorithm for RPL (CLRPL) in IoT network of different traffic. Then propose to extend CLRPL by introducing a buffer occupancy routing metric to improve the throughput and network lifetime. The performance comparison of the routing algorithms was evaluated in Cooja network simulator. Simulations results depicts that CLRPL performed better in IoT but poorly managed network delay due to high control message overheard were generated when the nodes indicate the channel congestion. However, ECLRPL improved the packets delivered to the destination's ratio, power consumed also mitigated network delay and control messages in the network.