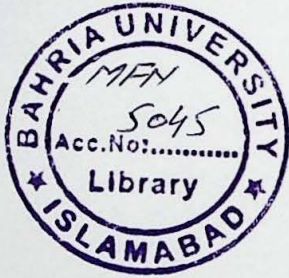


Sink-to-sink coordination framework for enhancing network performance using routing protocol for low power and lossy networks (RPL)



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DECLARATION OF AUTHENTICATION

I declare that the research work presented in this thesis is my own. All sources used and any help received in the research of this dissertation have been acknowledged. I hereby certify that I have not submitted this material, either in whole or in part, for any other degree at this or any other institution.

Signature.....

DEDICATION

To My Wonderful Family...

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ABSTRACT

Low power and lossy networks (LLNs) consist of devices having limited battery power, less memory, reduced processing capability. Wireless links between the devices are characterized by low data rate, high loss rate and instability. Despite several resource constraints, LLNs have emerged over the years as the first choice for remote sensing and data acquisition. RPL (Routing Protocol for low power and Lossy networks), is recently approved by Internet Engineering Task Force (IETF) as the standard routing protocol for IPv6-based LLNs. RPL uses a proactive routing approach and the sink or controller node within the network creates a Directed Acyclic Graph (DAG) of the network. RPL supports both point to point and point to multi-point communication to facilitate the data flows from nodes to sink and sink to nodes, respectively. As a result, each node has a path to the sink node and the sink has routing paths to all nodes within the network. In case of multiple sink nodes within the network, nodes attach themselves with the DAG of closet sink depending on the objective function used by RPL. In a multi-sink environment sink nodes can coordinate for evenly distributing the network load, increasing network life time, resource sharing and quick data collection. Currently, RPL does not provide any coordination framework that can define message exchange between different sink nodes for enhancing the network performance. In this work, sink-to-sink coordination framework is proposed that utilizes the periodic route maintenance messages issued by RPL. The overall objective of this research is to enhance RPL so that in the presence of multiple static or mobile sinks within the network, the network load is distributed among sink nodes for achieving higher throughputs and longer network's life time.

LIST OF ABBREVIATIONS

6LOWPAN	Ipv6 Low Power Personal Area Network
BN	Border Node
DAG	Direct Acyclic Graph
DAO	DODAG Advertisement Object
DAO-ACK	DAO-Acknowledgment
DIO	DODAG Information Object
DIS	DODAG Information Solicitation
DODAG	Destination Oriented DAGs
ETX	Expected Transmission Count
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
Imax	The maximum interval size
Imin	The minimum interval size
IoT	Internet of Things
IP	Internet Protocol
LLNs	Low Power and Lossy Networks
MAC	Medium Access Control
MANET	Mobile Ad-hoc Network
MP2P	Multipoint to Point
MRHOF	The Minimum Rank with Hysteresis Objective Function
M-RPL	Multipath-RPL
NCI	Network Coordination Interval
NOMs	Network Optimization Metrics
NSA	Node State and Attribute
OF0	Object Function Zero
P2MP	Point to Multipoint
P2P	Point to Point

PDR	Packet Delivery Ratio
PST	Packet Service Time
ROLL	Routing Over low power and lossy Network
RPL	Routing Protocol for Low Power and Lossy Networks
TCP	Transmission Control Protocol
TT	Trickle Timer
uIP	Micro IP
WMSN	Wireless Multimedia Sensor Network
WSN	Wireless Sensor Network

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