

AN ENERGY EFFICIENT ACKNOWLEDGEMENT-BASED METHOD FOR
SELFISH NODE DETECTION AND AVOIDANCE IN OPEN MANET

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This thesis is dedicated to my beloved parents for their endless support and encouragement.

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ABSTRACT

Mobile Ad-Hoc Networks (MANET) is a decentralized infrastructure with relatively low capacity of connections for communication with the special measures described as a collection of autonomous mobile nodes. In such networks, weak communication links and node mobility can lead to highly unpredictable and dynamically changing topologies. Open MANET is one of the types of MANET in which any node is able to join or leave the network. Thus, it is vulnerable in oppose of selfish nodes which they do not like to spend their resources to participate in network activities such as routing. This helps them to preserve their limited energy while they have a huge negative impact on the network performance and total energy usage. One of the category of methods to for selfish node detection and avoidance is acknowledgement-based methods. Negative Acknowledgement (NACK) is the best method for detecting and avoidance selfish node in this category. The NACK method has high level of packet delivery, and high throughput in opposed of misbehaving action. However, this method suffers from extra charge by number of routing overhead, and more energy consumption when number of selfish nodes or mobility of nodes are increasing. In this study, using the Selective Acknowledgement (SACK) a new selfish node detection method has been developed called S-NACK. This method uses SACK instead of full TCP over the NACK. The proposed method was implemented in NS2 and its performance was compared with NACK. The extensive simulation results showed that S-NACK reduces the network overhead and improves the energy consumption in comparison to NACK whereas the packet delivery ratio is almost similar at the same time.

ABSTRAK

Mobile Ad-Hoc Networks (MANET) adalah infrastruktur berpusat dengan kapasiti sambungan komunikasi yang rendah dengan langkah-langkah khas digambarkan sebagai koleksi nod yang bergerak sendiri. Dalam rangkaian-rangkaian tersebut, hubungan komunikasi dan mobiliti nod yang lemah boleh mengakibatkan topologi yang sangat tidak menentu dan berubah secara dinamik. MANET terbuka adalah salah satu jenis MANET di mana mana-mana nod mampu untuk menyertai atau meninggalkan rangkaian. Oleh itu, ia terdedah dalam menentang nod yang menyendiri dimana sumber-sumber tidak mudah dihabiskan semasa mengambil bahagian dalam aktiviti-aktiviti rangkaian seperti penghalaan. Hal ini amat membantu dalam mengekalkan tenaga yang terhad semasa memberi kesan negatif yang besar kepada prestasi rangkaian dan jumlah penggunaan tenaga. Salah satu kaedah untuk mengesan nod ini dan bagi mengelakkannya adalah kaedah perakuan berasas. Negative Acknowledgement (NACK) adalah kaedah yang terbaik bagi mengesan dan mengelakkan nod yang menyendiri dalam kategori ini. kaedah NACK mempunyai tahap penghantaran paket, dan pemprosesan yang tinggi dalam penentangan daripada menimbulkan tindakan negatif. Walau bagaimanapun, kaedah ini mengalami caj tambahan dengan beberapa laluan beban dan penggunaan tenaga yang lebih apabila bilangan nod yang menyendiri atau mobiliti nod semakin meningkat. Dalam kajian ini, dengan menggunakan Selective Acknowledgement (SACK), kaedah pengesanan nod baru yang menyendiri telah dibangunkan dan dipanggil sebagai S-NACK. kaedah ini menggunakan SACK dan bukannya TCP penuh ke atas NACK. kaedah yang dicadangkan telah dilaksanakan pada NS2 dan prestasinya telah dibandingkan dengan NACK. Keputusan simulasi yang luas menunjukkan bahawa S-NACK mengurangkan beban rangkaian dan meningkatkan penggunaan tenaga berbanding NACK, manakala nisbah penghantaran paket adalah hampir sama pada masa yang sama.