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Performance Comparison of Ad Hoc on Demand Distance Vector (AODV) and Optimized Link State Routing Protocol (OLSR) Routing Protocols

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Abstract

Mobile Ad hoc Network (MANET) is a new communication model that enables the communication between hosts moving on the network without any infrastructure, this has opened door to develop several new user applications.

One of the major challenges in wireless ad hoc network is the design of robust routing protocols. The routing protocols are designed basically to established correct and efficient paths between source and destination.

This thesis present performance comparison of two mobile ad-hoc network routing protocols (OLSR and AODV) using (OMNET++4.3).The performance analysis is based on different network metrics such as throughput (bit per second), end to end delay (per second), and average jitter (per second).

Performance of each routing protocol has been analyzed and evaluated using three networks with different number of hosts (10, 20 and 30) and with simulation time equal 360 seconds.

The results show OLSR achieved better than AODV with respect to performance metrics end to end delay and jitter, whereas AODV achieved higher performance in terms of throughput. in all networks, this because in OLSR protocol the sending node broadcasts messages to Multipoint Relay (MPR) only, while in AODV protocol the sending node broadcasts messages to all nodes in network.

المستخلص

شبكات الهاتف اللاسلكية الخاصة (Wireless Ad Hoc Network) هي نموذج إتصالات جديد يسمح لأجهزة الهاتف المحمول للإتصال فيما بينها دون الحوجة لوجود بنيات تحتية , مما يسمح بتطوير العديد من تطبيقات المستخدم ، وتعتبر بروتوكولات التوجيه من المقومات الأساسية في شبكات الهاتف الاسلكية ، يتم تصميم بروتوكولات التوجيه لتأسيس مسارات صحيحة وفعالة بين المرسل والمستقبل.

في هذا البحث تمت مقارنة الاداء بين اثنين من أهم البروتوكولات المستخدمة في توجيه الحزم للشبكات اللاسلكية الخاصة وهما AODV و OLSR بإستخدام برنامج المحاكاة OMNET++4.3 وتم تحليل الاداء بإستخدام معايير تقييم مختلفة وهي الإنتاجية أو عدد الحزم التي تم توصيلها للمستقبل (بت/ثانية)، زمن التأخير في إرسال الحزم من المرسل إلي المستقبل (ثانية) ، الإختلاف في أزمنة وصول الحزم (ثانية).

تم تقييم وتحليل أداء كل بروتوكول بناءاً علي اعداد مختلفة للاجهزة داخل الشبكة وهي (30,20,10) جهاز علي التوالي وبزمن محاكاة ثابت وهو 360 ثانية .

أظهرت نتائج بروتوكول التوجيه OLSR أفضل اداءً من بروتوكول AODV في الشبكات اللاسلكية وذلك إعتماداً علي معايير محددة للاداء وهي زمن التأخير والإختلاف في أزمنة الوصول ، أما الأنتاجية فان بروتوكول AODV أعلي من بروتوكول OLSR وذلك لان بروتوكول OLSR يقوم ببث الرسائل الي بعض الاجهزة مستخدما تقنيه MPR بينما بروتوكول AODV يبث الرسائل إلي كل الأجهزة داخل الشبكة.

1.1 Introduction

A Mobile Ad hoc Network (MANET) is a collection of wireless nodes that can dynamically form a network to exchange information without using any existing fixed network infrastructure. MANET is a self organized and self configurable network where the mobile nodes move arbitrarily. The mobile nodes can receive and forward packets as a router. Each node operates not only as an end system, but also as a router to forward packets. The nodes are free to move about and organize themselves into a network. These nodes change position frequently.

Each mobile node has one or more wireless network interfaces, with all interfaces of the same type (on all mobile nodes) linked together by a single physical channel. [19]

Each node in a MANET is free to move independently in any direction, and will therefore change its links to other nodes frequently. This means that links between the nodes can change during time, new nodes can join/leave the network. [20]

1.2 Research Problem

There are several MANET routing protocols, these protocols have varying qualities for different wireless routing aspects it is due to this reason that choice of a correct routing protocol is critical.

This thesis study main question, that which routing protocol between OLSR and AODV provides a better performance in Mobile Ad hoc Network?

1.3 Research Objective

To compare the performance of (OLSR and AODV) routing protocols for wireless ad hoc networks.

1.4 Research Methodology

We used an open source simulator (OMNET++) to compare the performance of two routing protocols (OLSR and AODV).The performance of two routing protocols is compared based on the throughput, end to end delay and jitter.

To study the performance of the two protocols under different situations, we considered three scenarios based on the number of nodes in the network, the number of nodes in the first, second and third scenario is 10, 20 and 30 respectively.

Each experiment scenario is run for 360 second, to get accurate results; each experiment was repeated for each scenario five times and take the average.

1.5 Research Outline

This thesis is divided into five main chapters. Chapter two presents the background and the basic classification of MANETs routing protocols and brief insight into related work. Chapter three presents the simulation software that used and the steps to run the experiments. It also includes the performance metrics to compare between the routing protocols. Chapter four presents the simulation scenarios used in our experiments. It consists of three scenarios to compare the performance of the OLSR and AODV routing protocols, and shows the analysis and results of the simulation. Chapter five presents the conclusion and Recommendations for future work.