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Throughput Analysis for Wireless Step Network

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***Abstract*—** TXOP is the transmission opportunity scheme given by IEEE 802.11e to enhance the Quality of Service(QoS).This paper observed the TXOP service differentiation for the devices/nodes connected in step network and metrics like throughput is derived. In the current work the simulation is carried out using NS3 and performance of four networks with QoS were estimated by enabling and disabling TXOP and it was observed throughput rate will be increased when TXOP is enabled and decreased when TXOP is disabled.

Keywords— adhoc network, step network, performance metric, simulation tool, ns3, txop.

I. INTRODUCTION

In ad-hoc wireless sensor networks, one approach for estimating the positions of sensor nodes is to use connectivity information of the network or local distance measurement. A comparison using two representative methods, multilateration and MDS-MAP has been done, and a study was performed to on the key issues that affect the performance. Various optimization techniques and the effect of anchor selection for multilateration and the effects of the sizes of local maps and the refinement techniques for MDS-MAP were studied. Secondly, an investigation on the error property was conducted for the localization on different topologies and compared the bounds with the results of the two methods on different anchor placements. Previous results suggest that anchors should be placed on the perimeter of the network to get more accurate solutions and authors results show that MDS-MAP tolerates "ill placement" of anchors much better than multilateration. A comparison of both methods through extensive simulation was performed to identify the better method [1], Routing protocols for mobile ad hoc networks (MANETs) have been explored extensively in recent years. Most of the work is targeted at finding a feasible route from a source to a destination without considering current network traffic or application requirements. Therefore, the network may easily become overloaded with too much traffic and the application has no way to improve its performance under a given network traffic condition. While this may be acceptable for data transfer, many real-time applications require quality-of-service (QoS) support from the network. The authors identifies that QoS support can be achieved by either finding a route to satisfy the application requirements or offering network feedback to the application when the requirements cannot be met. Authors proposed a QoS-aware routing protocol that incorporates an admission control scheme and a feedback scheme to meet the QoS requirements of real-time applications. The novel part of this QoS-aware routing protocol is the use of the approximate bandwidth estimation to react to network traffic. Authors approach implements these schemes by using two bandwidth estimation methods to find the residual bandwidth available at each node to support new streams. QoS-aware routing protocol for nodes was simulated with the IEEE 802.11 medium access control. Results of experiments show that the packet delivery ratio increases greatly, and packet delay and energy dissipation decrease significantly, while the overall end-to-end throughput is not impacted, compared with routing protocols that do not provide QoS support [2], Multiple wireless devices jointly create and maintain ad-hoc networks; their employment is favoured to happen in a variety of environments with distinct topological characteristics. Diversified environmental conditions are expected to vary network performance. In fact, obstacles, buildings and/or mountains may act as either barriers, or source of noise for the radio signals. Nevertheless, most of the previous performance evaluation studies based on simulation, neglected this consideration.. A new, complete and realistic Urban Mobility Model (RUMM) was proposed that provides users motion, and radio signals propagation in a city-like scenario. The aim is to study the effects of realistic network simulation on routing performance. The results prove that a realistic scenario with roads and buildings has a significant impact on routing [3].

A comparison of five Ad hoc routing protocols i.e. DSR, AODV, OLSR, TORA and GRP was done to examine the impact of mobility and the density of nodes on the behaviour of these protocols in a Vehicular Ad hoc Network (VANET). The results show that none of the protocol is favourite for all evaluation criteria. Indeed, each protocol has different behavior in relation to performance metrics considered, including the rate of routing packets sent, delay, and the debit [4].

Multiple wireless devices jointly create and maintain adhoc networks and their employment is favored to happen in a variety of environments with distinct topological characteristics. Diversified environmental conditions are expected to vary network performance. In fact, obstacles, buildings and/or mountains may act as either barriers, or source of noise for the radio signals. Nevertheless, most of the previous performance evaluation studies based on simulation, neglected this consideration as they used simulation models which are too simplistic, and too narrow (i.e. idealistic) in their scopes. A mobile ad hoc network is a collection of autonomous mobile nodes that communicate with each other over wireless links. Such networks are expected to play increasingly important role in future civilian and military settings, being useful for providing communication support where no fixed infrastructure exists or the deployment of a fixed infrastructure is not economically profitable and movement of communicating parties is possible. However, since there is no stationary infrastructure such as base stations, mobile hosts need to operate as routers in order to maintain the information about the network connectivity. Traffic load is increased on MANET and delay was computed, then identical nodes for transmitting over fixed range in wireless networks were studied. The throughput was analyzed under non-interference protocol [5]. Therefore, a number of routing protocols have been proposed for ad hoc wireless networks. A deep study and comparison of the performance of the following routing protocols like AODV, PAODV (preemptive AODV), CBRP, DSR, and DSDV was conducted. A variety of workload and scenarios, as characterized by mobility, load and size of the ad hoc network were simulated. The results indicate that despite its improvement in reducing route request packets, CBRP has a higher overhead than DSR because of its periodic hello messages while AODV's end-to-end packet delay is the shortest when compared to DSR and CBRP. PAODV has shown little improvements over AODV [6].

Ad hoc networks are characterized by multi-hop wireless connectivity frequently changing network topology and the need for efficient dynamic routing protocols plays an important role. A performance based comparison of two prominent on-demand routing protocols for mobile ad hoc networks like Dynamic Source Routing (DSR) and Ad Hoc On-demand distance Vector Routing (AODV) was conducted. A detail simulation model with MAC and physical layer models is used to study the interlayer interactions and their performance implications. The demonstration shows that even though DSR and AODV share similar on-demand behavior, the differences in the protocol mechanisms can lead to significant performance differentials. This paper examined two on demand routing protocols AODV and DSR based on packet delivery ratio, normalized routing load, normalized MAC load, average end to end delay by varying the number of sources, speed and pause time [7]

Wireless Communication is one of the popular areas of research these days. The Mobile Adhoc Networks (MANETs) is an infrastructure less network consisting of wireless mobile nodes. MANET is a self configuring network and the topology of the network keeps on changing as the nodes move randomly and organize themselves in an arbitrarily manner. Many protocols have been proposed for such networks. One such protocol is Adhoc On Demand Distance Vector (AODV) routing protocol. AODV is preferred because it minimizes the routing overhead than the other protocols and hence enhancing the performance of the network. In this paper, the performance analysis of AODV routing protocol is done on the basis of few performance metric parameters such as average end-to-end delay, throughput and packet delivery ratio. The simulation is done through MATLAB[8]

Mobile Ad-hoc network system (MANET) is a self-ruling arrangement of versatile hubs associated by remote connections. Every hub works as an end framework, as well as a switch to forward bundles. The hubs are allowed to move about and compose themselves into a system. These hubs change position much of the time. The primary classes of routing protocol are proactive, reactive and hybrid. A reactive (on-demand) routing methodology is a prevalent directing classification for remote specially appointed routing. It is a moderately new routing logic that gives an adaptable answer for generally extensive system topologies. The outline takes after the thought that every hub tries to lessen sending so as to steer overhead directing bundles at whatever point a correspondence is asked. This paper provides an endeavour to analyze the execution of two conspicuous on demand responsive routing protocol for MANETs: Ad hoc On Demand Distance Vector (AODV) conventions. AODV is responsive entryway disclosure calculations where a cell phone of MANET associates by passage just when it enquired. According to our discoveries the distinctions in the routing mechanics lead to noteworthy execution differentials for both of these conventions. The execution differentials are broke down utilizing changing reenactment time. These reproductions were done utilizing the ns-2 system test system. The outcomes displayed in this work represent the significance in precisely assessing and

executing routing protocol in a specially appointed environment [9].

MANET stands for Mobile ad hoc network and is an infrastructure-less network and it is having ability to configure itself. The topology of network changes dynamically. It consists of wireless mobile nodes which communicate with each other without any centralized administration. In MANET different types of routing protocols are introduced. These protocols can be categorized into reactive, proactive and hybrid routing protocols. This paper compares AODV and DSDV protocols and performance analyzed in terms of routing overhead, packet delivery ratio, throughput and end to end delay. The performance of AODV is better than DSDV in terms of throughput, packet delivery ratio and routing overhead. As the DSDV is a proactive routing protocol, it is having a less end to end delay as compare to AODV. The performance of the AODV protocol may be affected by the black hole attack. A modification in AODV protocol was done which helps to improve the performance of AODV in presence of black hole attack [10]. Maximal throughput scaling for a mobile network was studied with restricted mobility and it was observed that mobility restriction was not responsible for throughput scaling [11]. The mobility models were studied under unified framework and delay capacity relationship in adhoc network was compared with earlier networks [12]. Adhoc network is infrastructure less and dynamic which is helpful tor creating a strong and self organized MANET with mobile nodes [13].Mobile adhoc routing protocols like DSDV,AODV and DSR were compared using NS2.34 and the performance was estimated in terms of packet delivery ratio, throughput, E-E delay etc.[14].The detail characteristics and features of adhoc networks were well described[15].A brief introduction about Manet is well explained by author[16].

In the current work four independent nodes were connected and data packets were transmitted to access points by stations.The throughput was measured and it was depicted that when TxOP was enabled then throughput rate increased and channel granted for longer duration of time.

II. METHODOLOGY

NS3: NS3 is a simulation tool used for simulating real world network using C++ or Python scripts. Various virtual nodes were created by using NS3 and helper classes were used to install devices, internet stacks etc. The NS3 can be helpful in creating point to point, wireless connections. The NS3 tool performs various functions similar to real world network.

Throughput: Throughput is an important criterion to measure the performance of a network. Throughput measures how many packets a system can process in a given amount of time. It is generally measured in bits per second(bps), bytes per second(Bps), kilobytes per second(KBps),megabytes per second(MBps) and gigabytes per second(GBps).

Step Network:
Authors have proposed step topology as shown in figure 1 using the concept of graph theory for static connection under distributed system environment in a network. The step topology well if link failure occurs between nodes.

Transmit Oppurtunity (TxOP): TxOP is the amount of time taken by a station to send frame on a wireless medium. When a station transmits a frame then it access the wireless medium and contention arises. The contention window is categorized as AC_VO (Voice),AC_VI(Video),AC_BK(background) and AC_BE (Best effort).Normally AC_BK and AC_BE has TxOP of 0.AC_VI has higher frame sending rate than AC_VO.

III. RESULTS AND DISCUSSION

In the current work four independent wifi networks were connected in step manner and each network has one access point and a station. The station transmits data packets data to its access points. The simulation result shows that throughput of AC_BE with default TxOP limit was 28.5945Mbits/sec, throughput of AC_BE with non default TxOP limit is 36.2147 Mbit/sec, throughput of AC_VI with default TxOP limit is 36.87Mbit/sec, throughput for AC_VI with non default TxOP limit 32.17Mbit/sec. The throughput for four network were measured and it was observed when TxOP is enabled the throughput rate will be increase since the channel will be granted for longer duration. It was also observed that TxOP is enabled by default for AC_VI(video) and AC_VO(voice), so they can use the channel for longer duration then AC_BE(best effort) and AC_BK(background).

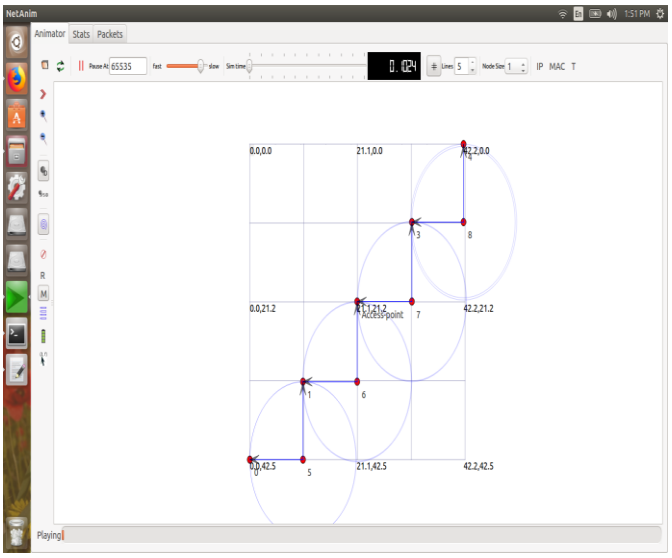

Figure 1:Step Network

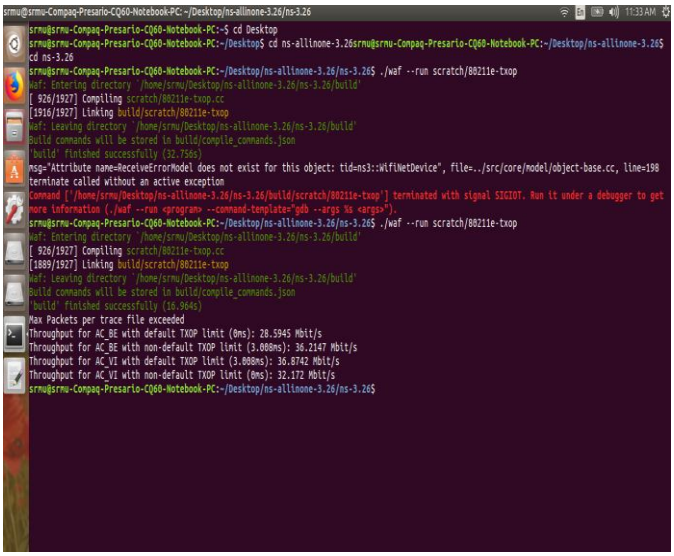

Figure 2: Throughput Of Step Network

IV. CONCLUSION AND FUTURE SCOPE

Adhoc networks play important role in networking. We have measured the throughput of step network using NS3 simulator and it was observed when TxOP is enabled throughput rate will be increase since the channel will be granted for longer duration of time.

In future work we will propose a new routing protocol for estimating the performance of Adhoc network using the concept of routing protocols like AODV and DSDV.

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