Performance Analysis of AODV, DSR and OLSR in MANET

Priyanka Khandelwal

Abstract: *A mobile Ad hoc network (MANET) consists of all the mobile wireless nodes. There is no centralized control which is required to communicate between the mobile nodes which are involved. OPNET is used to compare the three protocols that are AODV, DSR and OLSR. The OPNET modeler is used to work in the sonorous manner .The protocol would be hence judged n the basis of the three metrics that are supposed to be delay, network load and throughput.*

Keywords: MANET, Protocol, OLSR, analysis, simulations.

1. Introduction

Full fo rm o f MANET is Mobile Ad hoc Netwo rk. It is basically an autonomous network which is set to be decentralized and would als o consist of lots of nodes whic h are free. MANET could also be known as the network which is basically mobile mesh and is set t o be a self guiding and self configurable net work so far. A MANET [3] would al so consist o f set of de vices such as th e tran smitters, receivers and the sm art ante nnas t hat would rat her cha nnelize the efforts of the system panel in the network. The antenna to be talked about could be of any type ever since to be taken. The nodes th at are go ing t o participate in th is p articular ef fort could be static or c ould be mobile. The term node though is used to refer th e bod y th at is m oving all aroun d randomly. These nodes could be figured as the phones or the laptops or the PD A which co uld roam i n vari ous directions. These nodes could be located in the cars and the ships and the MP3 players al so which c ould also c onsist of t he personal computers al so. Nodes c ommunicate wi th o ne a nother by just forwarding packet in the laid fashion forward.

Following the gigantic research over the MANET, still it do not completely follow the complete form of the INTERNET based standards to be seen. The recognition of th e tentative Request f or c omments (R FC) si nce t he t ime of 2 003[1] i s been used. In that the questions were unanswere d whose basic concern was implementation the routing protocols. But the algorithms were proposed which as th e trial of the tech nology w ould be t aken a nd t here would be l ot m ore o f chances t hat t he standard w ould be developed. Widespread research ha s been done a nd the m ajor st udies are take n on the variety of the protocols which may consist of the AODV, DSR, TORA an d OLSR. Along with th e st andardization of the interface s olution a nd routin g prot ocol the net work has been estab lished in t he set of n etwork syste m th at may b e taken i n, M ANET w orking group WG [8].Large am ount of the research is done and the performance has been evaluated over the years and the NS2 network simulator arise to be the best choice when conside ring the simulation re ports a greed upon the work [4] [5]. We need to have a broader view of the sources and the work done in the large expansion. The theme would so co nsist of t he P roactive M ANET pr otocol (PMP) and the other one t hat i s R eactive M ANET p rotocol i n the OPNET modeler 14.5[2]. For all the comparisons considered in the work we could easily use the FTP for the traffic con trol w ork in the particular ad hoc network system. The goal of the project would be evaluation of the working of the pro tocols which are reactive and the proactive in nature. In my simulations p erformed w ould have a v ery k een and r obust link with comparison in th e field of network? The FTP traf fic the performance is done practically an d in the real time service. This s tudy w ould al so give great benefit i n f uture work.

2. Aims and Objectives

The two most widely described groups of the routing proto col are Proactive M ANET protocol (PMP), Reactive M A NET protocol (R MP) w hereas the third which could be de rived from both the above could be called as HYBRID MA NET protocol. The prior is generally referred to as the proto col which is basically table driven and would detect the net work periodically over the time. Second one is also know to be an on demand routing protocol and would find the route network when the source would evenly ask for it. This par ticular network would be suitable when the network topolo gy s of high speed and the network is set and the data is sent over the network. Hybrid MANET protocol would integrate the advantage of b oth the above protocols and w ould work effectively.

3. Research Question

My ob jective i n this thesis would be eval uation of t he per formance of both proactive and the reactive MANET proto cols. These two categories of the protocols would definitely have t he di ssimilar beha viors t aking i n m ind t he wi reless routing. The major fault wo uld be to sel ect th e m ost tru st worthy, organized and right routing protocol of the MANET. Some question nee d to be an swered be fore proceeding fur ther they are what are the factors which would be influenced by th e wo rking of th e three set o f the protocols? Finally to give the difference between the protocols.

To a nswer all t he a bove questions t he m odel nee ds t o be established in the MANET scenario which would be having different para meters each defi ned. The worki ng of the AODV, DSR [6] and OLSR would be judged with respect to the parameters con sidered like d elay, network lo ad and throughput [7]. Simulations wou ld b e do ne with respect to above laid factors. Which protocol would be providing best performance o ut of t he t hree consi dering the m obile net work? The a nswer to t his q uestion w ould be gi ven by t he overall performance judgment of the network protocols with

the given topology.

4. Scope of Research

As t he t wo ca tegories of t he r outing protocol i s k nown. A hybrid tends to be the best of combination of the two which is called p roactive an d t he reactive pro tocols. It tend s to have the best qualities of the both the other protocols. In the following work the three protocols are considered which are need to be the AODV [9] and DSR whic h are reactive and OLSR which is tend to be proactive. In th e fo llowing work the evaluation need to be done for the mentioned above protocols and th e network n eed to be implemented upon it. I would also t est the performance o f t he protocols which a re to be performed a nd h ow t he network si mulation i s done. The design would also focus on the effect of the protocols. These ef fects would b e varying wi th t ime of pa use w hich would not be taken in consideration.

5. Ad hoc on Demand Distance Vector Protocol

AODV is a protocol which works on the procedure of the on demand routing. The AODV al so would t hus gi ve an eas y way to be lin ked to t he n etwork topo logy. The notification would thus be canceled. Taking example if a par ticular link failure info rmation is b een sent in th e network nodes then the unicast route would be built from the source to the destination and the traffic also created would be minimum of its own kinds. AODV would n ever entertain t he pr ocedure of the extra routing when not in u se to be done. I f any of the 2 nodes wants t o c ommunicate wi th one a nother t han t he AODV i s t he one which i s r esponsible fo r bui lding of the multi h op route. AODV wou ld rat her use th e destination sequence number 9DSN0 to avoid counting and causing the problem of the infinite looping in the network topology. The favorable route is also bee n selected on the basis of the well defined sequence number been used.

6. Dynamic Source Routing

DSR i s a n O n dem and routing protocol which i s t o be known as reac tive protocol. It is the one which is m eant for the source routing and is yet very simple and efficient one to work with. It could be u sed in th e m ulti hop wireless networks that are ad hoc networks. The DSR is sel f managing and self attainable protocol. It does consist of just two of the mechanisms that are route discovery and the route maintenance.

7. OLSR

It is th e on e wh ich is basically meant for the syste m of the table d riven m anner to be t aken. It would permanently up date and store the routing in formation insi de its cache a nd would maintain a table out of it. It wou ld also keep the track of the data in the network so as to get the best work done on the system. It could be easily implemented in the table so as to see the working. The figure 3-5 shows how the work has been done in the case of OLSR which could be implemented in ad hoc networks. The multi point relay would then help to get the node in the time.

8. Performance

There are suppose to be variety of the parameters which help in t he e valuation of t he performance of t he p rotocol been used. They have different behavior for all the network topologies been defined. There would be in exact the three parameters whic h needs to be evaluated. These parameters may be the delay, network load and the throughput on the basis of which the working is done a nd t he m easurements are be en judged in the system.

8.1 Delay

The packet would als o cost the end to end delay at the ti me of the generation of the packet by the source up to the work of the destination reception been done. So this would be the time which a packet ta kes to travel and go across t he network to set t he bo undaries to be don e in th e network. This time would be expressed in seconds and hence all the delays in th e n etwork are supp osed to be known as th e end to end packet delay. Sometimes these delays could be also called as the latenc y o f the network to b e seen which is sup posed to be same as t he delay packet end to end delivery delay with the constraints that the network is set and the packet is se nt over the network topology to be taken. Some application the delay is major d rawback an d th ey are rath er sen sitive to it such a v oice application which c ould n ot withstand the delay. So in t hat case the voice would rather require t he low delay in the etwork.FTP is rath er much more to lerant to the delay of the network in the system.

$$D\ (end-end) = N\ [d\ (trans) + d\ (prop) + d\ (proc)]$$

8.2 Network load

Load of the network is the t otal amount of the bit/sec to be submitted to the wireless network to be seen the data is set to the wireless netw ork LA N l ayers which is tak en b y all t he higher layers of the network [23] When there would be more and lot of traf fic which is been coming on the network system then it wou ld become time by time difficult for the network to handle the traffic been tak en in th e network topology. The better and wel l organized network would handle up the network in the unique fashion to be stayed to work within the system . Various tec hniques a re als o been introduce d for that.

8.3 Throughput

Above word could be defined as the perfect ratio of the total data which would reac h the receiver form the sende r. The time taken by the recei ver to receive the packet sent by t he sender is called th e thr oughput of th e particular network been taken. This could be eas ily expres sed in the bytes and bits defined p er sec ond. Some of t he fact ors t hat are been affecting the changes in t he networks are th e un faithful communication am ong t he m oving nodes. The l imited amount of bandwidth that is been used. The limited amount of the energy been used. A throughput is a major point so it is nee ded t o high a nd t o w ork i n the u nique fashion t o be done.

Equation used:

Number of the packets delivered in network*packet size*8) / (total duration taken)
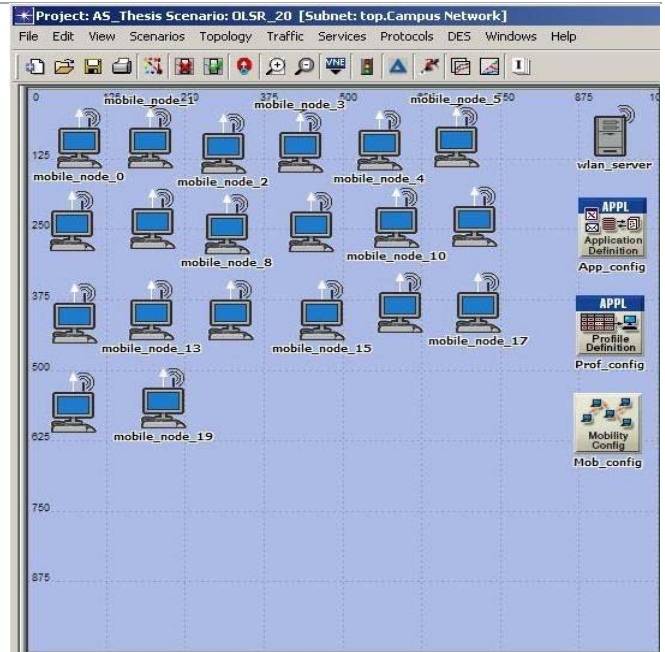
9.   Software Environment

I am using the OPNET V14.5 software for making my simulation of t he project. OPNET is th e n etwork sim ulator. It thus helps in providing the large amount of solutions for the network m anagement and t he ap plication for e xample t he operations of the networks, r esearch been done on the network, development p hase of t he net work, Pl anning been done on the network. It would also help to take care of the technologies been used in the network.

9.1 Simulation Environment

The master thesis has the si mulations that are bee n carri ed with the help of the OPNET modeler been used. Below diagram woul d r ather m ake i t clear ho w t he wo rk had be en done and how it needs to be done in th e network. The key parameter th at are b een prov ided in su ch si mulations are having 20 m obile no des for OLSR routing p rotocol. The major feat ure of th is p articular state is th at it h as different amount of nodes bee n attached t o i t i n t he w orking been done to the system been done. In the case of the first scenario 20 nodes are been taken which are put through the parameters of the throughput, delay and load. In the next one 40 nodes a re bee n t aken an d i n t he f ollowing 8 0 bee n t aken. Each would have the running of 240 seconds. All the simulations would be taken and the results would be shown eventually. Under each we would check the behavior of AODV, DSR and OLSR.WE wou ld th en get multiple g raphs of si mulations th at are of delay, n etwork lo ad and t hroughput being taken. I would rather collect the DES on each of the protocol taken and t he wireless LAN assumed/I would also rather ch eck th e a verage of th e ORK been tak en and th e throughput be en a djusted. A m odel of t he net work of t he campus is been assumed bel ow where the network is been spread in1 000m x 10 00m.The file transfer is b een an alyzed with bit rate of 11.
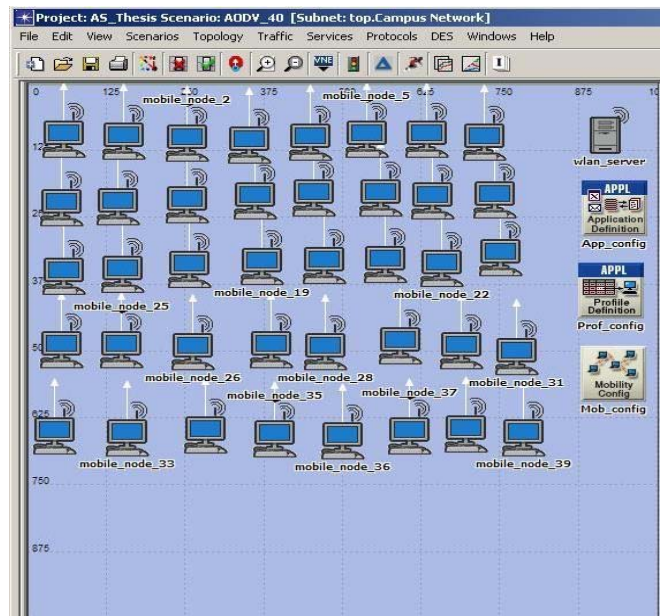
9.2 Simulation of first scenario

In the ca se of the first and the foremost scenario been taken the 20 n odes which c ould be mobile an d one of t he ser ver which is WLAN and it is supposed to be fixed. The network topology wou ld be of size 1000 x 1000 meter s. After the allotment of the IPv4 addressing which was been assigned to all the nodes which have been working. The configuration of the application bee n done and t he profile i s been tested all over the network topology. Now you cou ld deploy and configure the pr ofile. The judgment is done on the basis of th e network where the FTP would be selected as the traffic load occurs and so the deployment is been done in the network. The c onfigured fi rst scena rio ha s bee n s hown i n the fi gure given below.

9.3 Simulation of Second Scenario

In case of relayed second scenario, where the total nodes a re 40 which all are m obile. All the c haracters would be t he same but the number of nodes would be changed n each and every scenario been taken in the network topology. It would be give the appropriate name and the work to be seen. In the case of t he Se cond network in t he p rotocol t he param eters are tend to be the same. The whole network is been shown in fig below.
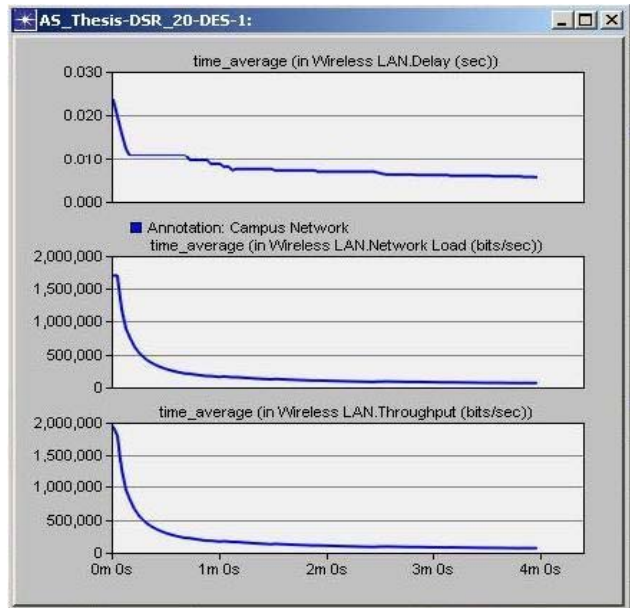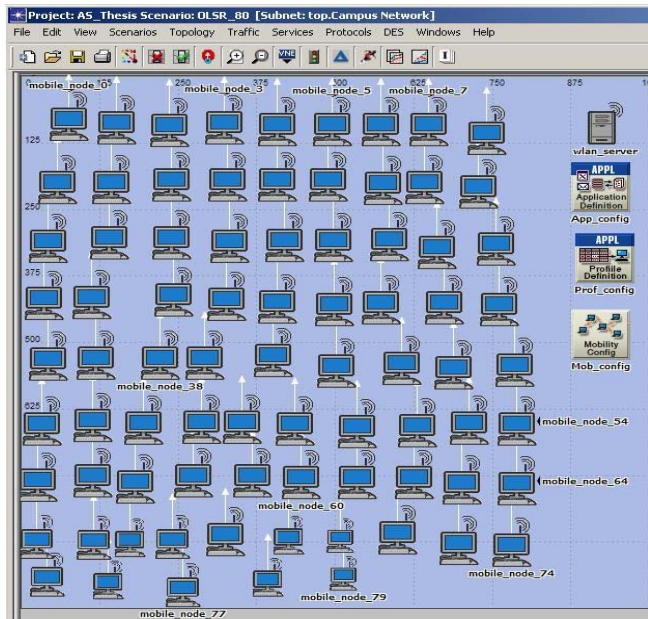

9.4 Simulation of Third Scenario

In the case of the third one the number of the nodes would be t aken as 80.The sam e way wo uld be t aken t o see t hat whether the network to be seen is there. By cli cking on the scenario and giving the appropriate work to be done i n the name. All t hese st eps would be remaining in the w ork and the n umber of n odes t o be seen i n t he w ork. The rea son where the mobile nodes would be pro found and the perfor-
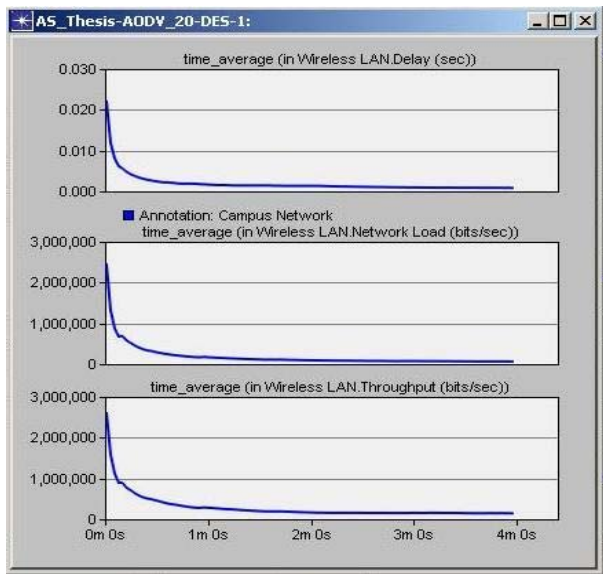
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mance of the protocols to be judged in the third scenario.
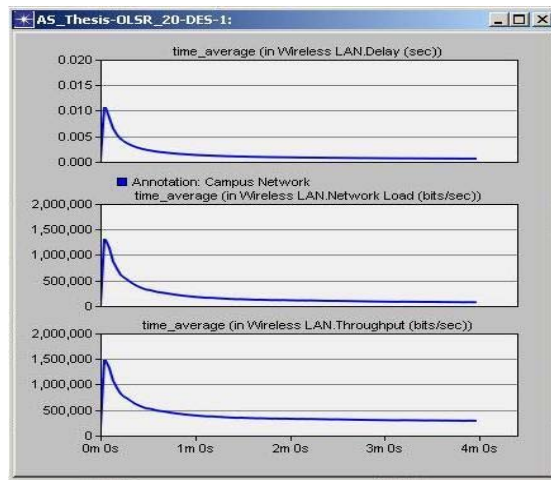

9.5 Overall AODV Performance

9.6 Overall OLSR Performance

9.6 Overall DSR Performance

10. Conclusion

AODV and DSR protocols in terms of delay, network load and throughput in 20 mobile nodes. In 40 mobile nodes again the OLSR perform well than AODV and DSR in delay and throughput. The AODV puts low load than OLSR and DSR respectively. In 80 mobile nodes OLSR is again showing good results in delay and throughput than AODV and DSR respectively. AODV offer good results in offering low load on the network than OLSR and DSR respectively. The average values are taken from the graphs. From the above given graphs it is shown clearly that the OLSR gives the outstanding results in delay and throughput and the AODV performs well in the network load. High network load affects the MANET routing control packets. By comparing AODV and DSR the results in the entire figures, it can be seen that AODV perform well than DSR in delay, network load and throughput. Average values are shown in the above table 5.1.The study of the protocols is been done and it would rather show that OLSR I better choice when talked about the MANET and accordingly the simulations results

nut it m ight n ot be t he case OLSR would al ways pe rform well i t m ight perform di fferent i n t he different net works. Selection sho uld be done accu rately wh en th e network to - pology is been tak en and at t hen it would ultimately in flu- ence the efficiency of the network in the magnificent way.

The study of these routing protocols shows that the OLSR is better in MANET according to our sim ulation results but it is not necessary that OLSR perform always b etter in all th e networks, its performance may vary by varying the network. At t he e nd we cam e t o t he point from ou r si mulation a nd analytical study that the performance of r outing protocols vary with network a nd sele ction of accurate routi ng proto- cols acco rding to the network, ultimately influence th e effi- ciency of that network in magnificent way.

11. Acknowledgement

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Zahary and Al addin A yesh, Faculty of Computing Sciences and Engineering De Montfort University Leice- ster, LE1 9BH, UK