Performance Metrics for DSDV, DSR, AODV in Mobile Ad-hoc Network Using Network Simulator

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***Abstract*— A mobile ad hoc network (MANET) is a collection of mobile nodes that is connected through a wireless medium forming rapidly changing topologies. Mantes are infrastructure less and can be set up anytime, anywhere.. The routing algorithms considered are classified into two categories proactive (table driven) and reactive (on demand). DSDV, DSR, and AODV algorithms are considered. We simulate various MANET routing algorithms in network simulator NS-2 and compare the performance metrics for each Routing protocol like throughput, packet delivery ratio and average end to end delay by varying the number of nodes (Node 20 and Node 30 Group)with different pause time by using cbr source traffic and node movement model.**

***Keywords*—Mobile adhoc network, pause time, throughput, packet delivery ratio ,average end to end delay, NS2.**

1.Introduction-

Mobile ad hoc networks (MANET) that contain wireless mobile nodes that can freely and dynamically self organize into arbitrary and temporary ad hoc network topologies. Mobile Ad-hoc Network (MANET) is a collection of communication devices or nodes that wish to communicate with infrastructure less support and without predetermined organization of available links.In MANET, Routing is main problem to route the data packets from one source node to destination node in networks.

The vision of mobile ad hoc networking is to support . robust and efficient operation in mobile wireless networks by incorporating routing functionality into mobile nodes. Such networks are envisioned to have dynamic, sometimes rapidly-changing, random, multi hop topologies which are likely composed of relatively bandwidth-constrained wireless links.

2. Simulation Strategy-

DSDV,DSR,AODV routing protocols can be implemented using Network Simulator (NS) 2.33. NS is a discrete event simulator targeted at networking research. NS 2 is an object oriented simulator, written in C++, with an OTcl interpreter as a frontend All the work is done under Linux platform, preferably ubuntu.

2.1 Traffic and Movement

We can also define the traffic and movement pattern in separate files called CBR file and **scenario file** respectively**. Cbr file** can be created by using a tcl program called cbrgen.tcl which is present in the directory ”ns-2/indep-utils/cmu-scen-gen/”. To define the movement we use an exe file called setdest present in the folder “ns-2/indep-utils/cmu-scen-gen/setdest/”.

2.1.1-Cbr file

This file is run with certain arguments to create the traffic connection file. The arguments are:

ns cbrgen.tcl [-type cbr|tcp] [-nn nodes] [-seed seed] [-mc connections] [-rate rate]

2.1.2- Scenario file

As cbr file is used to store the traffic connections, similarly scenario file is used to store the initial position of the nodes and movement of nodes at different pause times. Since it will be difficult to manually give initial position, movement of the nodes and their speed for each movement at different times we use a random file generator here also. The node movement generator is available under /indep-utils/cmu-scen-gen/setdest/ directory. It is available under the name "setdest", which is an exe file. This file is run with certain arguments to create the scenario file.

This file is run with certain arguments to create the scenario file. The arguments are:

./setdest –n <num_of_nodes> -p pausetime -s <maxspeed> -t <simtime> -x <maxx> -y <maxy

2.2 Simulation and Design-On the basis of results of *.nam file and *.tr file, the analysis is being done. We also evaluate the performance of these three routing protocols by taking number of nodes as a parameter with different pause time variations. NAM is a built-in program in ns2-allinone package. It helps us to see the flow of packets between various nodes. With this, we are also able to know whether the packets have reached to their destination properly or dropped in between. NAM is invoked within the Tcl file. The NAM scripts are stored in *.nam file and scripts for tracegraph are stored in *.tr file.

The simulation is divided in SIX parts basis on the number of nodes that vary:

1. DSDV with 20 nodes.
2. DSDV with 30 nodes.
3. DSR with 20 nodes.
4. DSR with 30 nodes.
5. AODV with 20 nodes.
6. AODV with 30 nodes.

With different pause time such as p=8.0, p=16.0 , p=24.0 , p=32.0 ,p=40.0 s with speed M=20.0 m/s (constant)

The comparison of performance of DSDV, DSR,AODV based on the number of nodes is done on following parameters like Throughput, Packet delivery Ratio and average end-to end delay.

2.3 Simulation Enviornment-

Parameter	Value
Simulator	ns-2 (Network Simulator 2.33)
Number of Nodes	20/30
Studied Protocol	DSDV,DSR,AODV
Simulation Time	3000 seconds
Simulation Area	1500 * 1500 m
Traffic Type	CBR(UDP)
Pause time	P=8,16,24,32,40 s
Speed	M=20.0 m/s (constant)
Channel Type	Wireless Channel
MAC Type	802.11
Traffic	Cbr
Packet Size	512 byte
Antenna Model	Omni

2.4 Performance Metrics:

The following different performance metrics are evaluated to understand the behavior of DSDV ,DSR and AODV routing protocols .

I-Throughput
II-Packet delivery ratio
III-The average end to end delay.

2.4.1. Throughput -Throughput is the total number of packets received by the destination.

2.4.2 Packet Delivery Ratio- The packet delivery ratio defined as the number of received data packets (CBR) divided by the number of generated data packets (CBR).

2.4.3 Average end to end delay- The end to end delay is defined as the time a data packet is received by the destination minus the time the data packet is generated by the source.

The average time from the beginning of a packet transmission at a source node until packet delivery to a destination. This includes delays caused by buffering of data packets during route discovery, queuing at the interface queue, retransmission delays at the MAC, and propagation and transfer times.

3.Simulation Results-

3.1 Results of DSDV with pause time variation-

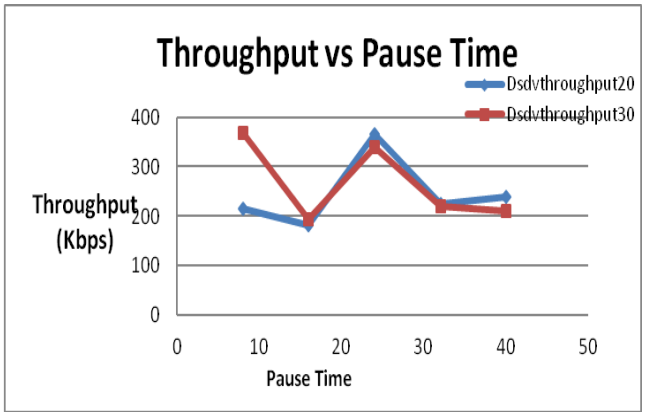

Figure 3.1 (a) DSDV Throughput vs Pause Time variation

Initially for pause time p = 8 and p = 16 ,Throughput of DSDV routing protocol for node 20 is low than throughput of node 30. when pause time increases Throughput for less number of nodes increases than throughput of more number of nodes .

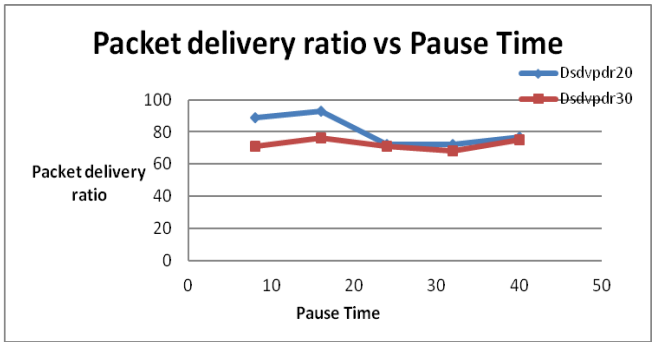

Figure 3.1(b) packet delivery ratio vs Pause Time variation

For pause time p = 8 ,16,24,32,40 s Packet delivery ratio of number of nodes is superior than packet delivery ratio of more node.

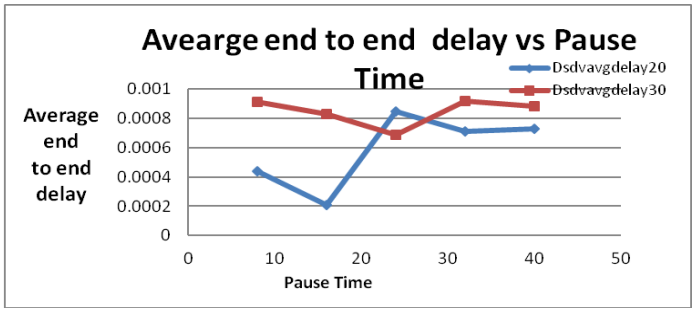

Figure 3.1(c) avg end to end delay vs Pause Time variation

Average end to end Delay for packets increases as number of nodes increases.

3.2 Results of DSR with pause time variation-

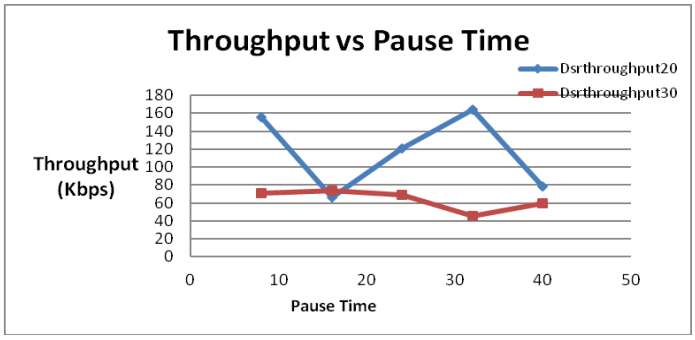

Figure 3.2 (a) DSR Throughput vs Pause Time variation

When pause time increases ,Throughput for fewer number of node is superior than throughput of bulky number of nodes.

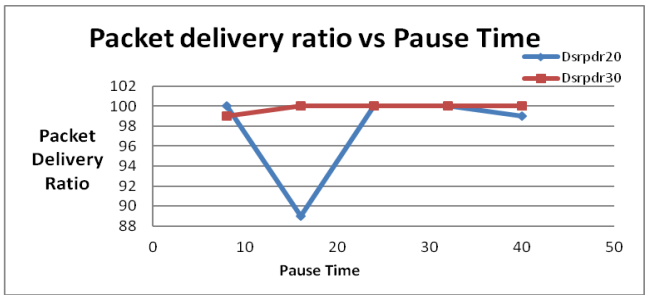

Figure 3.2(b) packet delivery ratio vs Pause Time variation

For pause time p = 8 s Packet delivery ratio of node 20 is more than packet delivery ratio of node 30.
For pause time p = 24,32 s Packet delivery ratio of node 20and node 30 is constant

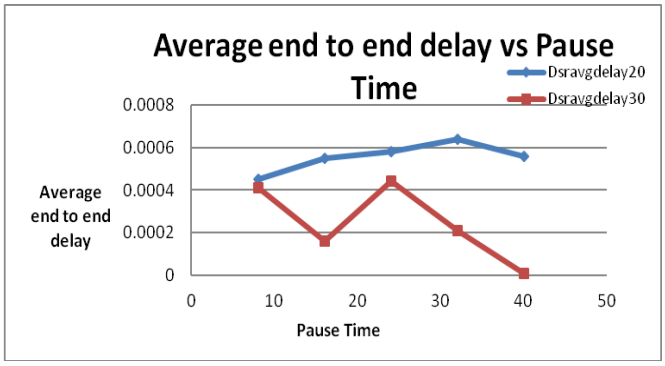

Figure 3.2(c) average end to end delay vs Pause Time variation

Average end to end Delay for DSR packets decreases as number of nodes increases.it means Average end to end Delay is low in DSR for bulky nodes.

3.3 Results of AODV with pause time variation-

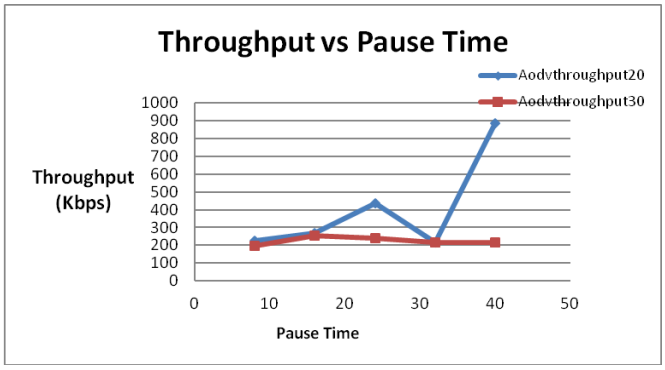

Figure 3.3 (a) AODV Throughput vs Pause Time variation

For pause time variations Throughput of AODV routing protocol is better for fewer number of nodes than throughput of bulky number of nodes. When pause time increases Throughput for fewer number of node is high than throughput for bulky number of nodes.

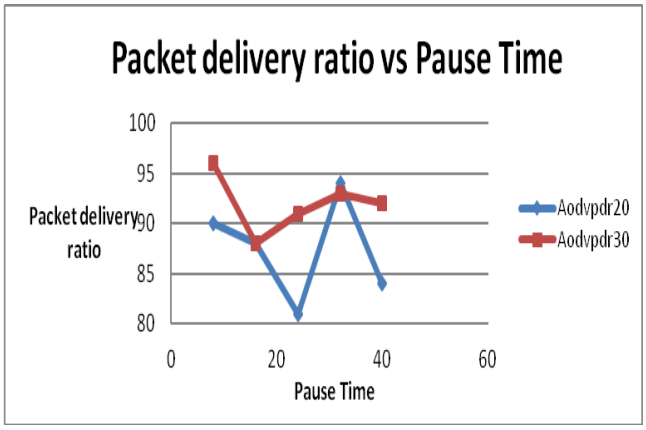

Figure 3.3(b) packet delivery ratio vs Pause Time variation

For pause time p = 8,16,24,32,40 s Packet delivery ratio of node 20 is superior than packet delivery ratio of node 30.

When pause time increases Packet delivery ratio for bulky number of node is not superior than Packet delivery ratio of less number of nodes in AODV.

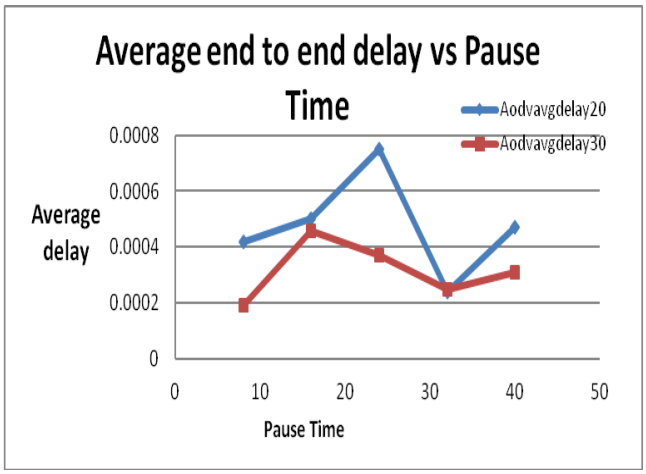

Figure 3.3(c) average end to end delay vs Pause Time variation

Average end to end Delay for AODV packets decreases as number of nodes increases.It means Average end to end Delay is low in AODV for large number of nodes for pause time p =8,16,24,32,40 s.

4.Conclusion-

This paper does the realistic performance metrics of three routing protocols DSDV, AODV and DSR. The significant observation is, comparison results agree with expected results based on theoretical analysis.

Our analysis of the result guides us to conclude that:

I- DSDV Routing Protocol

Throughput-For Pause time variation,Throughput of DSDV Routing protocol for fewer number of nodes is superior than bulky number of nodes.

Packet delivery ratio- For Pause time variation, Packet delivery ratio of DSDV Routing protocol for small number of nodes is improved than large number of nodes.

Average end to end delay- For Pause time variation, Average end to end delay of DSDV Routing protocol for fewer number of nodes is low than large number of nodes.

II- DSR Routing Protocol

Throughput- For Pause time variation, Throughput of DSR Routing protocol for less number of nodes is better than large number of nodes.

Packet delivery ratio- For Pause time variation, Packet delivery ratio of DSR Routing protocol for bulky number of nodes is enhanced than fewer number of nodes.

Average end to end delay- For Pause time variation, Average end to end delay of DSR Routing protocol for less number of nodes is better than large number of nodes.

III - AODV Routing Protocol

Throughput- For Pause time variation, Throughput of AODV Routing protocol for more number of nodes is low than less number of nodes.

Packet delivery ratio- For Pause time variation, Packet delivery ratio of AODV Routing protocol for more number of nodes is better than less number of nodes.

Average end to end delay- For Pause time variation, Average end to end delay of AODV Routing protocol for less number of nodes is better than more number of nodes.

5. REFERENCES-

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