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Congestion Control in Adhoc Network

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Abstract: Adhoc wireless networks are characterized by multihop wireless connectivity, infrastructure. In this networks we are behavioral study of different MANET routing protocols i.e Aodv , Aomdv and Dsr protocol and identify which protocol is most suitable for efficient routing over Mobile Adhoc Network (MANET) by analyzing the throughput and Packet delivery ratio by using the NS2 network simulator. In this paper, I tried to evaluate the effects of the congestion in the wireless Adhoc Networks and To achieve this I analyzed the various algorithms then I simulated the wireless adhoc network scenarios in NS Network. NS uses OTcl (Object oriented Tool Command Language) programming language to interpret user simulation scripts. I demonstrated a simple flow counting algorithm in this paper. My paper concludes a design which is a set of congestion control mechanisms in wireless network and implementation will be done through simulation on various network parameter such as varying queue length and number of sender increased. My result shows the performance of congestion control mechanisms and how mechanism behaves when we increase number of sender and usages.

Index Terms—AODV, AOMDV, DSR, SFQ, FIFO

1. Introduction

A WANET is a wireless network where the wireless nodes can be located anywhere over the globe. However, the underlying design is such that the nodes believe they are part of a single-hop or multi-hop wireless network at the PHY and MAC layers. This is accomplished by using Software Defined Access Points (SoDA) that are based on the idea of Software Defined Radio (SDR). For the uplink, each SoDA samples the down-converted channel using an ADC (analog to-digital converter). The sampled data is then multicast to the other SoDAs via the Internet. At each end-point, the received digital signals from the other SoDAs are summed and sent through the DAC (digital-to-analog converter) and transmitted on a designated channel after up conversion. Then the RF environment is mixed at geographically separate locations (albeit with a time shift). When the number of packets increases beyond the limit that can be handled by the network resources, the network performance degrades, and this situation is called congestion. Congestion simply means overcrowding or blockage due to overloading .It is similar to traffic jam caused by many cars on a narrow road. Two styles of control, proactive and reactive control, are presented. It is shown that congestion control must happen at several different time scales.

2. Related Work

If the number of flows a router would have to handle is fixed at the factory, routers could be shipped with parameters set to achieve a reasonable trade-off between loss rate and queuing delay. An ideal router would automatically adapt its queuing configuration to the load. This problem divides into three parts.

- First, a mechanism to count active flows.
- Second a choice of target queue length and drop rate based on the flow count.
- Third a mechanism to enforce the targets on a FIFO queue.

Our queuing scheme will

- Provide 70 packets of buffering per active flows.
- Preserve the simplicity of FIFO queuing.
- Require no manual tuning.

A counter can count flows with just one bit of state per flow as follows. Create a vector of vmax bits called v. the index for v is the hash of a packet identifier. Maintain the count of bits sets in v in a variable c. When a packet arrives and the bit in v for its identifier is not set, set it and increment c. Clear bits out of the table, so that that every bit is cleared, and c decremented if the bit was set after the passage of tclear seconds.

The expected value of count c of one bits in v is

$c = vmax \left(1 - ((vmax-1)/vmax)^{f} \right)$

$f = \ln(1-c/vmax) / \ln((vmax-1)/vmax)$

Proposed Algorithm

Step 1: Initialization:
v (0..vmax-1) = 0;
c = 0;
f = 0;
tlast = current time;
Step 2: As each packet p arrives
h =h(p);
If (v(h) = 0)
V(h) = 1;
c = c + 1;
t=current time;
nclear = vmax * ((t-tlast)/tclear)
if (nclear > 0)
tlast = t;
for I = 0 to nclear – 1
r=random (0..vmax-1)
if (v(r) = 1)
v(r) = 0;
c = c - 1;
f = ln (1-c/vmax) / ln ((vmax-1) / vmax);
Step 3: End

Enhanced performance and better congestion control can be achieved only by considering the routing and the flow control together. This was not done in earlier researches. We have used the Ad hoc On demand Distance Vector Adhoc On demand Multipath Distance Vector ,Dynamic Source Routing (AODV,AOMDV,DSR)[5] as the routing protocol in our simulation studies.

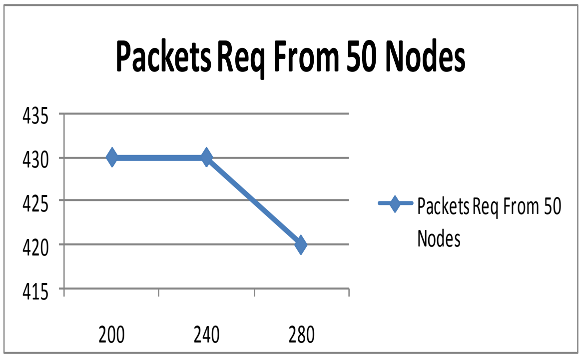
We have utilized a simple fair-queuing scheme in developing our solution. To appreciate the novelty of our work in the presence of other literature on fair-queuing consider that any fair-queuing scheme requires 3 policies for choosing: *1)* Which packet (queue) will be transmitted? For this, we use simple round-robin. *2)* When is the packet transmitted? *3)* Which packet(s) will be dropped in case of congestion? The fundamental innovation of this work lies in combining the last 2 policies to control belligerent flows.

3. Simulation Result

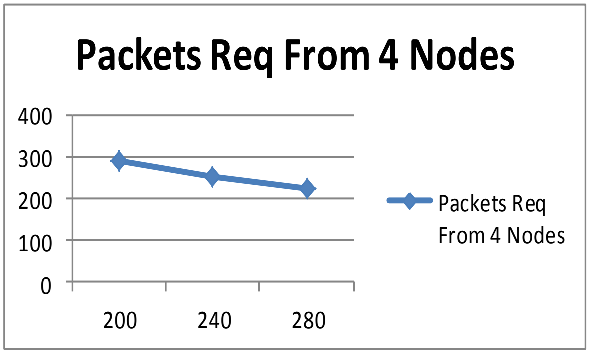
Performance of congestion control mechanism using AODV

Queue Length	Packets Req From 50 Nodes	Packets Req From 4 Nodes
200	430	290
240	430	250
280	420	222

Table 1.1



Graph 1.1



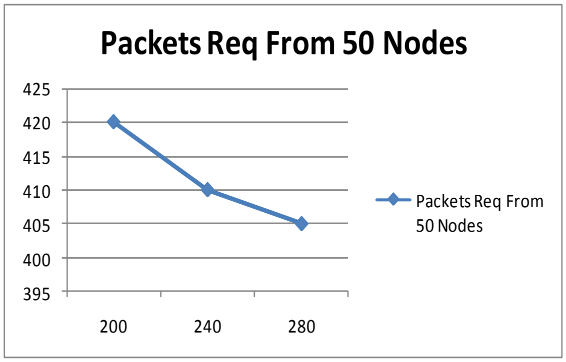
Graph 1.2

Here no. of packets per sender is 70 packets, and maximum allowed senders are 4. There- for maximum no. of packets that can be buffered in queue is 280. Figure 4 shows the simulation results. Here red line shows buffering request from 50 senders is approaching to maximum size of approximately 420 packets. This is because of no congestion control mechanism is applied. Green line shows buffering request from 4 senders is approaching to maximum size of approximately 220 packets, which is less compared to buffering capacity of queue (280 packets in our case). The result shows a mechanism to count active flows, target queue length and drop rate to enforce the targets on a FIFO queue.

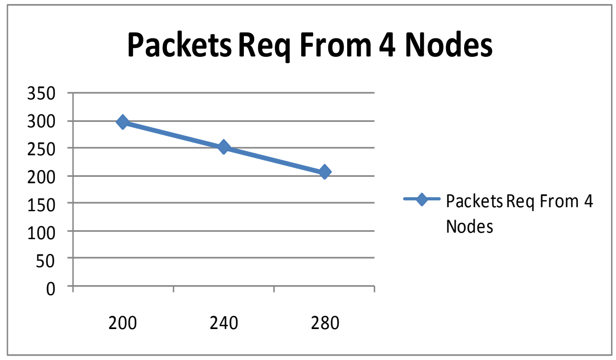
Performance of congestion control mechanism using AOMDV

Queue Length	Packets Req From 50 Nodes	Packets Req From 4 Nodes
200	420	295
240	410	250
280	405	205

Table 1.2



Graph 1.3

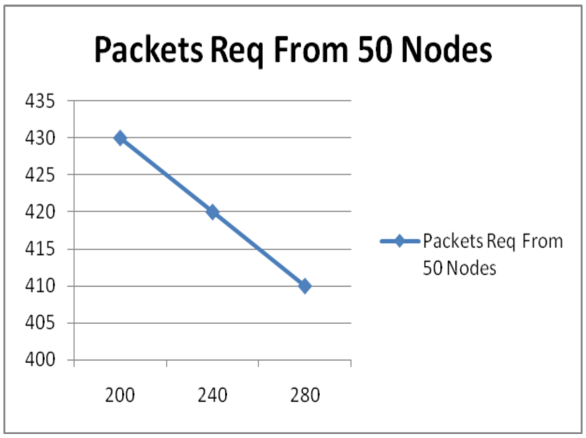


Graph 1.4

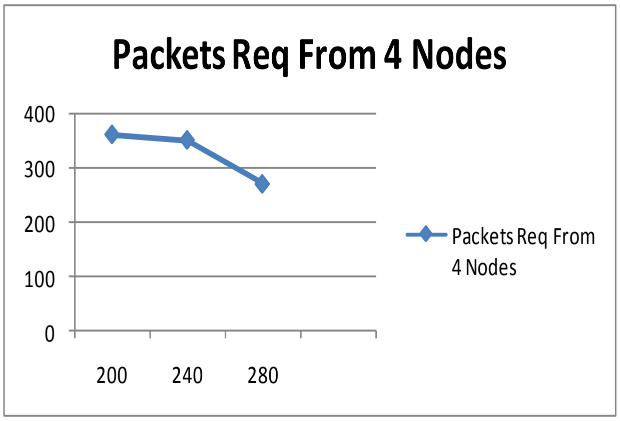
Performance of congestion control mechanism using DSR

Queue Length	Packets Req From 50 Nodes	Packets Req From 4 Nodes
200	430	365
240	420	350
280	410	270

Table 1.3



Graph 1.5



Graph 1.6

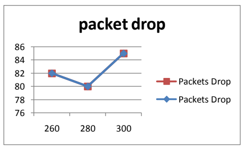
Here queue length is varied as 200, 240, & 280 packets request for buffering is analyzed when no flow count mechanism is applied then packets request from all the 50 nodes goes beyond the buffering capacity. When flow count is applied then packets request from 4 senders remain within the queue limit.

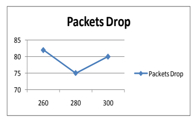
Packet Drop:

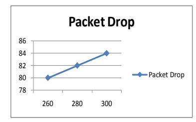
In the table the packet drop of AODV ,DSR,AOMDV protocol by varing the Queue length without using any congestion control mechanism packets can still be dropped if the queue overflows.[1]

	Protocol Aodv	Protocol AOMDV	Protocol DSR
Queue Length	Packets Drop	Packet Drop	Packet Drop
260	82	82	80
280	80	75	82
300	85	80	84

Table 1.4







AODV Graph 1.7 **AOMDV Graph 1.8** **DSR Graph 1.9**

Here queue length is varied as 260 280 & 300 Aomdv protocol gives less packet loss rate(80) compared to Aodv & Dsr(84) protocol for larger queue length(300)

4. Conclusion

In ad-hoc network we study the congestion control through simulation on various network parameter such as varying queue length and number of sender increased. Check the performance of congestion control mechanism .This paper contains a comparative study about the protocols for control congestion in adhoc network. I used three protocol (AODV,AOMDV and DSR) after analysing various protocol and among these three protocols I prefer AOMDV protocol for implementation is higher than other two.

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