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RESEARCH ARTICLE

Improving the Congestion Control over Stateless Wireless Ad Hoc Network Systems

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Abstract— In this Paper, We are dealing with the Current Qos Models for MANETs. We have proposed the Extension of Stateless Wireless Ad Hoc Network (SWAN) in order to improve Qos by using the scheduling Module Stateless network model which uses Rate Control Algorithm to deliver service differentiation in mobile wireless ad hoc network in a simple, scalable manner. In the Results we have shown the Congestion Free Routing between two different nodes of a Network through Router.

Key Terms: - QoS; Congestion Free Routing; Rate Control Algorithm

I. INTRODUCTION

The Internet's excellent scalability and robustness result in part from the end-to-end nature of Internet congestion control. End-to-end congestion control algorithms alone, however, are unable to reduce the congestion control and unfairness created by applications that are unresponsive to network congestion.

To address these, we propose and investigate a novel congestion control mechanism called Congestion Free Router (CFR). CFR entails the exchange of feedback between routers at the borders of a network in order to detect and restrict unresponsive traffic flows before they enter the network, thereby preventing congestion within the network. CFR is a network layer congestion-avoidance protocol that is aligned with the core-stateless approach. The core-stateless approach, which has recently received a great deal of research attention, allows routers on the borders (or edges) of a network to perform flow classification and maintain per-flow state but does not allow routers at the core of the network to do so. It is not feasible to efficiently distribute prompt information to the edges of the system in order to protect real-time traffic, particularly not in ever-changing mobile ad hoc networks. Nevertheless, the local control has to rely on the existence of independent, end-to-end algorithms that can "sense" and react to the distributed, local actions. The most important of such algorithms are TCP with or without ECN, and end-to-end congestion control for UDP-based applications (e.g., based on AIMD or equation-based rate control).

SWAN adapts the well-known AIMD rate control mechanism to address some of these challenges. AIMD algorithms are widely used by a number of transport protocols. For example, the TCP congestion control mechanism uses AIMD window-based control, while WTCP uses AIMD rate control. In, AIMD control is applied to real-time UDP traffic. TCP and WTCP use AIMD control to improve the performance of TCP traffic. In contrast, SWAN uses AIMD rate control to improve the performance of real-time UDP traffic. TCP attempts to avoid network congestion collapse by using packet loss as feedback [7].

II. Existing System

The QoS model described in this paper is called Stateless Wireless Ad hoc Network (SWAN) model. It is a distributed network QoS with stateless approach using rate control for UDP and TCP best-effort traffic based on AIMD (Additive Increase Multiplicative Decrease) [7]. Like DEQA model, it also uses ECN (Explicit Congestion Notification) to regulate real-time traffic in order to react dynamically to topology changes.

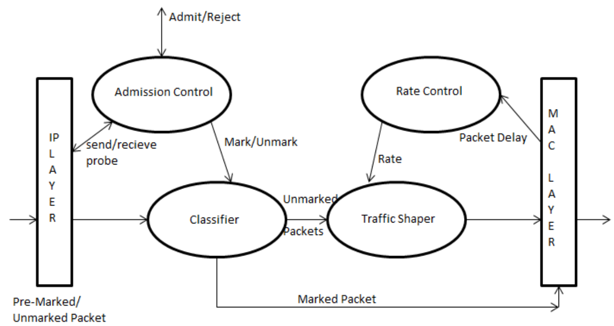

Fig. 1 describes the architecture of SWAN model.

The two main functional block of SWAN model are Classifier and Traffic Shaper which both operate between IP and MAC layer. The role of Classifier is to distinguish real-time traffic that should not go through Shaper. The traffic shaper in this model is represented by simple Leaky bucket shaper which is used to shape best-effort traffic based on the information from Rate Controller in order to delay best-effort packets and thus provide more bandwidth to real-time traffic.

Admission Controller is a block located at source node. Its function is to send a probe request toward the destination node to estimate resources availability. Based on this information, Admission Control module decides whether admit or reject the request. The advantage of SWAN is that all nodes regulate best-effort traffic independently and each source node uses admission control for real-time sessions. When a new real-time flow is allowed by admission control block, all packets, belonging to the particular flow, are marked as a real-time packets. Due to this marking, classifier bypasses shaper and packets remain unregulated.

The fact that SWAN is a stateless model and thus it does not require maintaining information at network nodes makes it very scalable and robust QoS model solution for MANETs. The lack of reservation and signalization mechanism means that this QoS model is not suitable for hard QoS provisioning but it was not the design goal of this model.

III. Proposed System

As stated above, SWAN model is suitable for dynamic MANET topologies. It provides soft QoS in a scalable and robust manner by means of distributed network approach with traffic rate control.

We consider the ability of the model to differentiate only between two types of traffic as a drawback. Typically, there is a need to provide service differentiation in a more precise way than only real-time traffic and best-effort traffic. In many scenarios, real-time traffic needs to be differentiated according to various parameters, e.g. priority. Therefore, this paper proposes an extension to SWAN model with a scheduling module and rate control improvement. The architecture of our proposal is illustrated in the Figure 2.

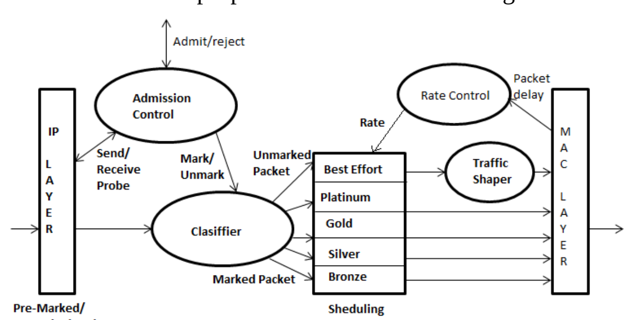

Fig. 2 Proposed Extension of SWAN model.

The scheduling module has been added to the former SWAN model, between Classifier and MAC. Then, the functionality of SWAN model has been modified in the following manner. If Admission Controller admits the request, Classifier differentiates packets according to their marking to five classes: Platinum, Gold, Silver, Bronze, and Best-effort. Then, packets are queued in respective queues and wait for the transmission. There is a special queue for best-effort traffic which can be shaped by traffic shaper, based on the information from rate controller, in a similar way like in the former SWAN model.

IV. METHODOLOGY

In this we have mainly three Modules Source Module, Router Module, Destination Module.

A. Source module :

Sending data in the form of packet.

1. Input data entities: Message to be transmitted from the source to the destination node in the form of packet with IP address for its identification.
2. Algorithm : not applicable
3. Output : formatted packet with the required information for communicating between the source & the destination node.

B. Router Module :

Using rate control and leaky bucket algorithm to rank the nodes in the network.

1. Input data entities: Receives data from source node and determine the rate of the packets
2. Algorithm : Leaky bucket and AIMD
3. Output : Transfers packets into destination nodes

C. Destination Module :

Packets are received from the router nodes.

1. Input data entities: Message to be received from the router to the Destination node in the form of packets.
2. Algorithm: not applicable
3. Output: Formatted packets with the requirement Information for communication between Source and destination nodes.

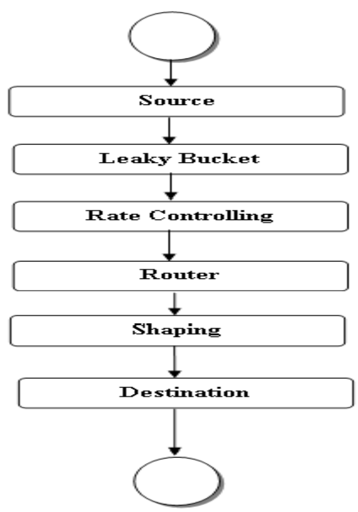

Fig. 3 State Diagram for Congestion Control over SWAN

V. ALGORITHM ANALYSIS

A. Leaky Bucket Algorithm

The "leaky bucket" algorithm is key to defining the meaning of conformance. The leaky bucket analogy refers to a bucket with a hole in the bottom that causes it to "leak" at a certain rate corresponding to a traffic cell rate parameter the "depth" of the bucket corresponds to a tolerance parameter each cell arrival creates a "cup" of fluid flow "poured" into one or more buckets for use in conformance checking. The Cell Loss Priority (CLP) bit in the ATM cell header determines which bucket(s) the cell arrival fluid pours into. In the algorithm, a cell counter represents the bucket. This counter is incremented by one for each incoming cell.

The "leak rate" in the algorithm is the decrement rate which reduces the counter value by one at certain intervals. This rate is given by the cell rate under consideration and is governed by the minimum distance between two consecutive cells. The bucket volume is analogous to the cell counter range, which is represented by the permissible time tolerance for the incoming cells. This value is determined through the traffic contract or is set by the network provider and is called CDVT (cell delay variation tolerance). If the counter exceeds a certain value, the cells are assumed not to conform to the contract.

Algorithm:

Case : Checking the content of the Bucket.

Initially the Bucket Content = Bucket content at last compilation time - (current time - last compilation time)

F=X-(t-LCT)

if "Bucket content now < 0"

Then

Bucket content =0 or Conforming Cell

Else

Bucket is having some content

If "Bucket Content now > Size"

Then.

Non- Conforming Cell in the Bucket

Else

Conforming the Cell and also Incrementing the Bucket content By I and last Compile time becomes current time.

X = F + I;

LCT = t ;

End if

End if

B. AIMD rate control algorithm

The SWAN AIMD rate control algorithm is shown in Fig. Every T seconds, each mobile host increases its transmission rate gradually (additive increase with increment rate of c Kbps) until the packet delays become excessive. The rate controller detects excessive delays when one or more packets have greater delays than the threshold delay d sec. As soon as the rate controller detects excessive delays, it backs off the rate (multiplicative decrease by r percent). The threshold delay d is based on the real-time delay requirements of applications in wireless network.

The shaping rate is adjusted every T seconds. The period T should be small enough to be responsive to the dynamics of mobile ad hoc networks. If there is a large difference between the shaping rate and the actual transmission rate, then a mobile host is capable of transmitting a burst without due control, potentially limiting the performance of real-time traffic. To resolve this problem, the rate controller monitors the actual transmission rate. When the difference between the shaping rate and the actual rate is greater than g percent of the actual rate, then the rate controller adjusts the shaping rate to be g percent above the actual rate. This "gap" (i.e., g percent) allows the best-effort traffic to increase its actual rate gradually.

Algorithm:

CASE : Procedure for update and shaping rate
called every T second period

if "Packet Delay is Greater than Threshold delay d sec"

then

Multiplicative decrease by (Rate) r %

S ← S *(1-r/100)

Else

Additive increase by increment rate of c Kbps

S ← S + c

If "Diff between Actual rate and Shaping rate is > (gap) g % of Actual rate"

((S-a)>a*g/100)

Then

Adjust Shaping rate to match the Actual rate

S← a*(1+g/100)

end if

end if

Advantages of SWAN Model:

1. Increased Source Data Rate, Unchanged Queue Size:

In this case the source data rate of source is increased and the data rates of sources are maintained at the same level as the original case.

2. Reduced Queue Size, Unchanged Source Data Rate:

In this case the source data rates are unchanged and the queue size of node is reduced to minimum packets.

3. Average end-to-end delay

Limitations of SWAN Model:

1. Networks with large bandwidth-delay.
2. The slow-start phase of the algorithm

VI. Results

In the Sender side, sender is selected valid text file from the directory and content of that is displayed on the provided text area in the window. then, selected file will be transferred to Router machine which is in the form of packets. In the sender module any algorithms are not acceptable.

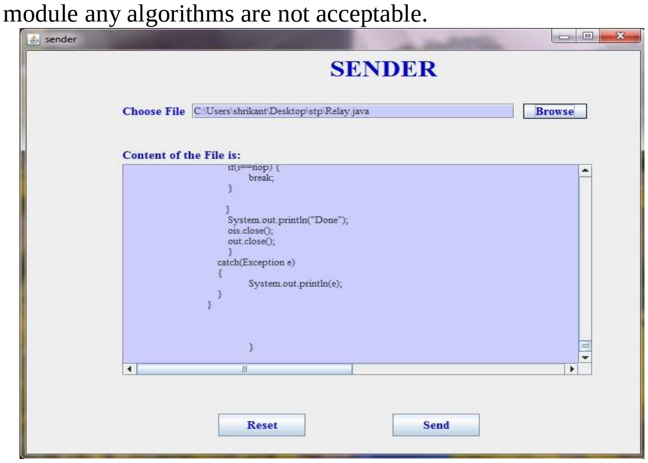

Fig. 4 Shows the Sender Side Window that selects and displayed the text file

In the Router side, two algorithms are implemented first one is Additive Increase and Multiplicative Decrease which is for data rate control. Second is Leaky Bucket algorithm which is for network shaping and constant output rate if input rate is variation. Content of the file will be displayed when receiving and sending. The packets are transferred to Destination machine from the Router side.

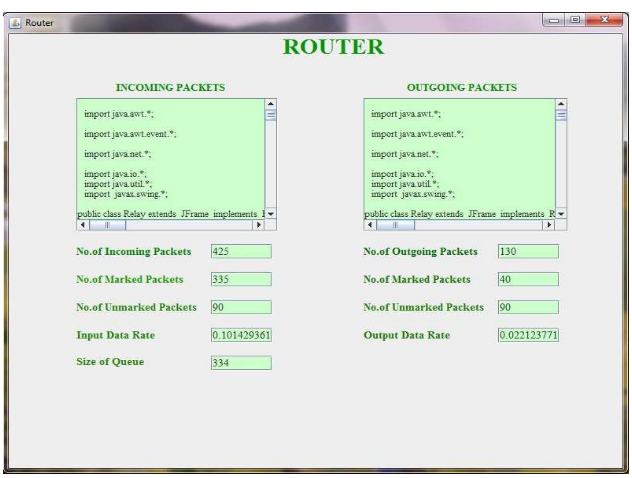

Fig. 5 Shows the Packet receiving and transferring in router

In Destination side, algorithms are not acceptable. Destination only receives the packets from the Relay machine and simply determines incoming packet rate and keep the packets whatever the Router send.

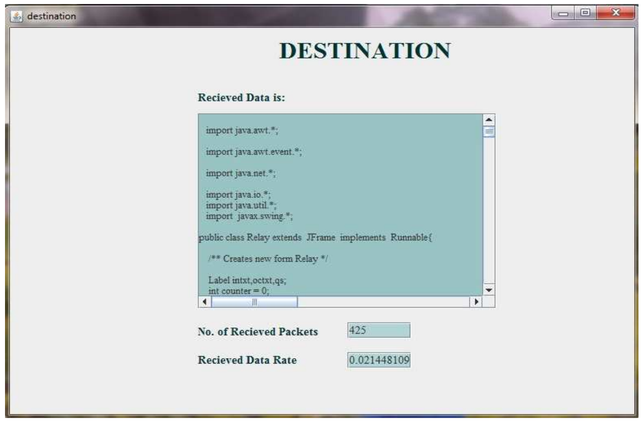

Fig .6 Shows the packets received at Destination side

VII. CONCLUSION AND FUTURE SCOPE

We propose an extension of SWAN model in order to increase level of service differentiation and by adding probabilistic scheduling approach also end-to-end delay. An important benefit of SWAN is that it is independent of the underlying MAC layer, and can be potentially suited to a class of physical/data link wireless standards. As part of the future work we would like to conduct simulations for more realistic scenarios with many wireless nodes and we would also like to explore queuing models based analysis for queue dynamics.

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