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GENERATION OF A NEW ALGORITHM USING PRIORITY MEASUREMENT BASED ROUTES

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Abstract - With the explosive growth in multimedia wireless applications such as video streaming and conferencing, the need for appropriate bandwidth allocation mechanism has also increased as in absence of this a flow may experience considerable performance degradation due to free admission of randomly large numbers of flows. Thus, admission control is used to deal with this problem. The role of admission control algorithms is to make sure that admittance of new flows into the networks doesn't violate service commitments made by network to admitted flows. This paper compares the performance of four measurement based admission control algorithms for controlled load service. We evaluate link utilization and adherence to service commitments achieved by these algorithms. Further a new algorithm is proposed using priority measurement based on the round trip times of the nodes.

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I. Introduction

The simplicity of access mechanism and less sources made accessing audio and video a simple matter. With incomparable amount of audiovisual information becoming available in digital form, on WWW, broadcast data streams, and in personal and professional databases, there is an explosive growth in multimedia wireless applications and without a proper bandwidth allocation mechanism flow may experience significant decrease during session. This is where admission control comes into play in order to maintain a good quality of existing flow.

There have been many proposals for supporting real time applications in packet networks by providing some requests real-time service, it must characterize its traffic so that the network can make its admission control decision. Typically, sources are described by either peak and average (Ferrai and Verma, 1990) or a filter like token bucket (Ohnishi et al., 1988); these descriptions provide upper bounds on the traffic that can be generated by the source. The traditional real time service provides a hard or absolute bound on the delay of every packet; in (Clark et al., 1992) and (Ferrai and Verma, 1992), this service model is called guaranteed service.

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Admission control algorithms (ACA's) for guaranteed service use the a priori characterizations of sources to calculate the worst case behavior of all the existing flows in addition to the incoming one. Network utilization under this model is usually acceptable when flows are smooth; when flows are bursty, however guaranteed service inevitably results in low utilization(Zhang and Ferrari, 1994; Dyffy et al., 1994).

Admission control is a network Quality of Service (QoS) procedure. Admission control determines how bandwidth and latency are allocated to streams with various requirements [Saito, 1993]. Thus this scheme needs to be implemented between network edges and core to control the traffic entering the network.

An application aiming to use the network to transport traffic with QoS must first request a connection, which involves informing network about the traffic's characteristics and QoS required by application. This information is stored in traffic contract. After judging whether it has enough resources available to accept the connection, the network either accepts or denies the request. This is admission control. It is useful in situations where a certain number of connections may all share a link, while greater number of connections causes significant degradation to the point of making them useless.

The user must be able to get a service whose quality is sufficiently predictable that the application can operate in an acceptable way over duration of time determined by the user" [Braden et al., 1994]. Admission control is the main task that a Bandwidth broker has to perform. Most of the brokers use simple admission control modules, although proposals for more sophisticated controls are also there.

Admission control algorithms ensure that new flow in the network does not violate service commitments made by network to admitted flows. These commitments could be quantitative or qualitative. The main criteria to evaluate the algorithms are to see how it can fulfill its role of ensuring that service commitments are not violated. To ensure complete commitment conformance we can allocate enough resources to meet the worst case requirements of each flow.

II. Role of Admission Control

There are two basic approaches to admission control:

1. Parameter based approach; it computes the amount of network resources required to a set of flows.
2. Measurement based approach; it relies on the measurement of actual traffic load in making admission decisions.

Admission Control types:-

1. Distributed approach
   a. Measurement based Admission Control method.
2. Centralized approach
   a. Flow reservation and admission control.
   b. Call admission control for contention access mechanism.
   c. An admission control strategy for differentiated services.

The performance of four admission control algorithms - one parameter based and three measurements based (measured bandwidth, acceptance region, and equivalent bandwidth) - for controlled load service is compared.

The main results of the comparisons are summarized below:-

1. In the operating region where losses occur under all MBAC's, they can all be induced to give the same loss-load curve by tuning their measurement parameters.
2. All the MBAC's studied perform similarly because they are all based on admission equations of the same form:

$$V' < f(\cdot)\mu - g(\bullet)$$

Where,
V' is the measured load,
μ is the link bandwidth, and
f(-) and g(-) are functions of the source's reserved rate and number of admitted sources.

3. For immediate implementation of MBAC for controlled-load services, we recommend the following algorithm:

$$V' < v\mu - kr$$

Where,
V' is a utilization factor,
μ is the link bandwidth,
k>0 a constant,
r, the reserved rate of an incoming flow.

The performances of these algorithms, while somewhat insensitive to the form of the admission control equations, appears rather sensitive to changes in the parameters controlling the measurement process.

Types of Measurement Based Admission Control algorithms (MBAC):-

1. Measured Sum: - It uses measurement to estimate the load of existing traffic. This algorithm admits the new flow if the following test succeeds:

$$V' + r\alpha < v\mu$$

Where v is a user-defined utilization target as explained below, and V' the measured load of existing traffic.

2. Acceptance Region tangent at origin:- It computes an acceptance region that maximizes the reward of utilization against the penalty of packet loss.

Given link bandwidth, switch buffer space, a flow's token bucket filter parameters, the flow's burstness, and desired probability of actual load exceeding bound, one can compute an acceptance region for a specific set of flow types, beyond which no more flow of those particular types should be accepted.

3. Acceptance region tangent at peak:- A new flow is admitted by the network if the condition stated under satisfies :-

$$\eta p(1-e-sp) + e-spv' \leq \mu$$

4. Hoeffding Bounds (HB):- It computes equivalent bandwidth for a set of flows using the Hoeffding bounds. The equivalent bandwidth of a set of flows is defined in references as the bandwidth C(£) such that the stationary bandwidth requirement of the set of flows exceeds this value with probability at most £(called as loss rate in this paper).

In an environment where large portion of traffic is best-effort traffic, real time traffic rate exceeding its equivalent bandwidth is not lost but simply encroaches upon best-effort traffic. In reference the measurement based equivalent bandwidth based on Hoeffding bounds (Ch) assuming peak rate (p) policing of η flows is given by:

$$(Ch)\ (v,\{pi\}\ 1\leq i\leq n, £) = v' + \sqrt{}\ (\ln(1/£)\ \sum(pi)2)\ /2$$

Where,

V' is the measured average arrival rate of existing traffic, £ is the probability that arrival rate exceeds the link capacity. It indicates that the measured average arrival rate may be approximated by measured average load.

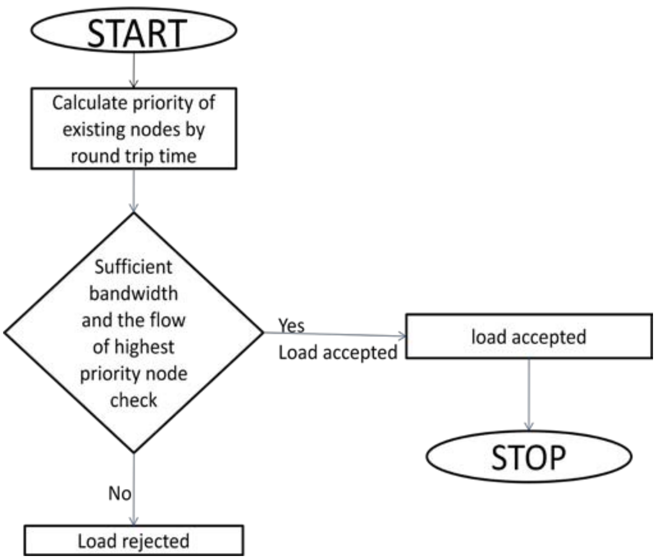
III. New proposed Algorithm

In this priority based algorithm, priority is decided using the ROUND TRIP TIME (RTT) of various nodes. Node with highest priority i.e. least RTT is allowed to admit flow first. To calculate RTT a source node sends a ping packet to a receiver and track the sending time. The receiver sends a packet back and the sender calculates RTT from tracked sending time. The changes in certain files are

- packet.h
- tcl/lib/nsdefault.tcl
- tcl/lib/nspacket.tcl
- ping.tcl

The file ping.tcl is executed which contain the procedure to calculate the round trip time of each node. The four node architecture is created in the file and the ping packets are sent to each node one by one. The procedure recv is defined which calculate the RTT of each node. Now in a network a new flow is admitted, first priority of the nodes is checked for the conflicting flows and node having the highest priority i.e. the minimum RTT of the conflicting flow is admitted to the network given that the bandwidth is available to admit the flow. To deal with the problem of starvation in the network time stamping can be used. In this if a unique time stamp is attached to each flow. And if the flow is rejected then its time stamp is increased by 1. So all the flow can be admitted and no flow can go with starvation.

Flowchart



Algorithm:-

1. Select the new admission control algorithm.
2. Round Trip Time(RTT) for all entering nodes calculated.
3. Compute the priority of those entering flows on the basis of RTT values.
4. Check for the bandwidth requirement of the highest priority flow and if the required bandwidth is available then that load is accepted else the flow is rejected.
5. If the flow is admitted, then create a new TCL object using a tcl class.

Video transmission on the Network using Admission Control:-

First the packet of 125 bytes was sent on the network. Then instead of the packets the video packets were inserted in the network. For this purpose the video foreman_qcif.yuv was used. The file intserv.tcl was changed and the video packets were inserted. The x-graph was drawn and actual and estimated utilization of the bandwidth was compared.

IV. X-Graph Drawn for Algorithms

a) For Measured Sum (MS)

ns test-suite-intserv.tcl ADC=MS EST=TimeWindow S_=5e3 T_=3 utilization_=0.95 trace_flow=1

Here, S is the sampling period

T is the measurement time window trace_flow flag to 1, the output would indicate times at which flows come in and leave. Utilization is the predefined bandwidth utilization

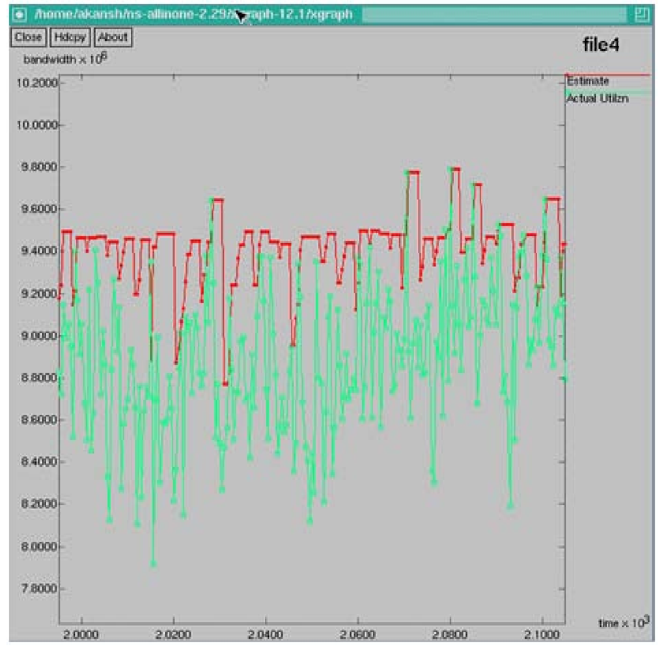


Fig 1.1 : X-graph for Measured Sum

b) For Hoeffding Bounds (HB)

Ns test-suite-intserv.tcl ADC=HB EST=ExpAvg w_= 1/8.0 epsilon_=0.7 S_=5e3;

Here, epsilon is the probability that arrival rate exceeds the link capacity and is set to 0.7 S is the Sampling period which defines the sensitivity of exponential averageing; w is the weigh function.

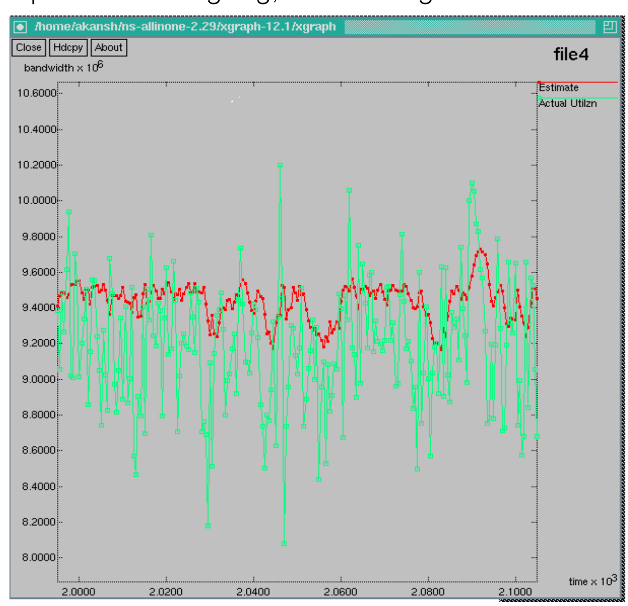


Fig 1.2 : X-graph for Hoeffding Bounds

We used above specified parameter for simulating HB algorithm over ns2. The above graph specifies the packet drops and bandwidth utilization.

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- Packet drop=7.5492e-05
- Utilization =0.920020

If a flow is denied admission no other flow of a similar type will be admitted until an existing one departs.

c) For Acceptance Region Tangent at Peak (ACTP)

Ns test-suite-intserv.tcl ADC=ACTP EST= Point Sample s_=2e-6 S_=2.5e4

Here, S is the Sampling period s is the period of point sampling which cannot be greater than 1

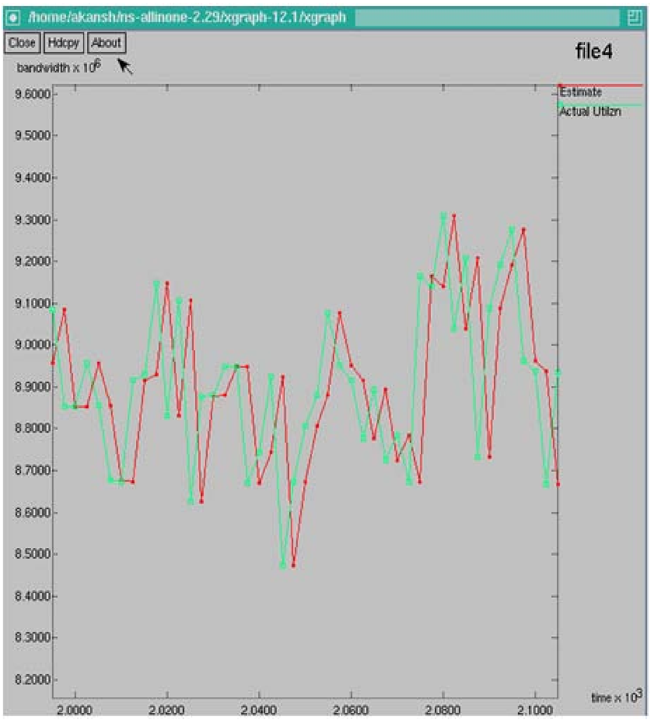

Fig 1.3 : X-graph for Acceptance Region Tangent at Peak

We used above specified parameter for simulating HB algorithm over ns2. The above graph specifies the packet drops and bandwidth utilization.

- Packet drop=5.7212e-06
- Utilization =0.892432

In this we are artificially adjusting the admittance of a new flow. If a flow is rejected the admission algorithm does not admit another flow until an existing one departs.

d) For Acceptance Region Tangent at Origin

Ns test-suite-intserv.tcl ADC=ACTO EST=PointSample s_=2e-6 S_=2.5e4

Here, S is the Sampling period s is the period of point sampling which cannot be greater than 1

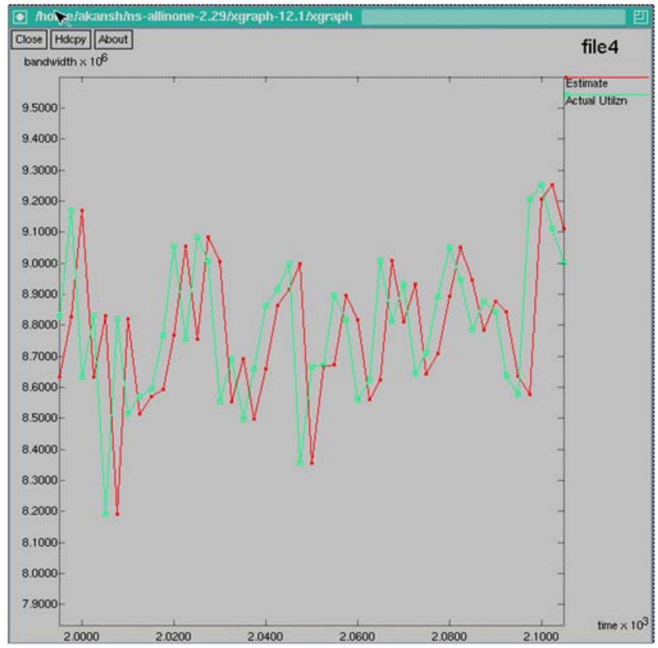

Fig 1.4 : X-graph for Acceptance Region Tangent at Origin

We used above specified parameter for simulating HB algorithm over ns2. The above graph specifies the packet drops and bandwidth utilization.

- Packet drop=5.7212e-06
- Utilization =0.892432

In this we are artificially adjusting the admittance of a new flow.if a flow is rejected the admission algorithm does not admit another flow until an existing one departs.

V. Conclusion

Graphs were drawn comparing actual and estimated bandwidth utilization. The red line show estimated utilization and green shows the actual utilization. All the four graphs were prepared to justify the algorithms prepared and compared them for the different video packets. The utilization of bandwidth and the packet drops were checked and compared.

The performance for each of the admission control algorithms above is calculated by the measuring the actual link utilization and the drop rate. x-graph plots a snap shot of actual and estimated bandwidth utilized in the period [2000, 2100] seconds at the end of the simulation. Also if you set the trace_flow flag to 1, the output would indicate times at which flows come in and leave.

The HB algorithm gives the best utilization for smaller packet size and the drop rate of packet is minimum for ACTO algorithm.

For the transmission of packet of size 1250 Bytes the ACTO algorithm give the best bandwidth utilization .The ACTP algorithm gives near about the same utilization. But the packet drop rate in MS and HB algorithm is near to zero.

So finally we conclude that the algorithm HB is best for smaller packets but as the packet size increases and the algorithms ACTO and ACTP gives the best bandwidth utilization.

References References Referencias

1. Hiroshi Saito. Teletraffic Technologies in ATM Networks. Artech House. ISBN 0-89006-622-1. 1993
2. Braden, R., Clark, D. & Shenker, S., "Integrated Services in the Internet Architecture: an Overview", RFC 1633 June 1994.
3. Duffy D. E. A. A. McIntosh, M. Rosenten and W. Willinger. Statistical analysis of CCSNSS7 traffic data from working CCS subnetworks. "IEEE J Select. Areas Commn. Vol. 12. No 3. Pp. 544-551. 1994.
4. Ferrai D. and D. C. Verma. "A scheme for real time channel establishment in wide area networks. "IEEE. J. Select. Area. Commun. Vol. 8 no. 3. Pp. 368-379. 1990.
5. Clark, D. D. S. J. Shenker and L. Zhang. "Supporting real time applications in an integrated services packet network; architecture and mechanism" in Proc. ACM SIGCOMM' 92, pp. 14-26.
6. Ohnishi, H, T. Okada and K. Noguchi. "Flow control schemes and delay/loss tradeoff in ATM networks "IEEE J Select Areas Commun. Vol. 6 no 9 pp. 1609-1616. Dec. 1988.
7. Zhang, H. and D. Ferrari. Improving utilization for deterministic service in multimedia communication, presented at the IEEE Int. Conf. Multimedia Computing and Systems, 1994.

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