

Intelligent Traffic Management of the ABR/UBR Service for TCP/IP in Fair Rate ATM Networks

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Abstract: A Central issue in congestion control for available bit rate service ATM networks is the comparison of the fair rate for every connection at each switching node in the network. The objective is to determine the fair rate for all the connections in a distributed network under dynamic changes in the changes in the absence of centralized knowledge about the network and without the synchronization of different network components. The problem of fair rate allocation specifying the requirements of a fair rate allocation algorithm and providing a survey of various proposed fair rate allocation strategies in the content of ABR service. Design of congestion control mechanism for multimedia streaming over the mobile network is challenging. Streaming applications require a smooth transmission rate which the internet is unable to provide whenever there is congestion in the network. The standard TCP congestion control mechanism is not able to handle to special properties of a shared wireless multichip channel well. The frequent changes of the network topology and the shared nature of the wireless channel post significant changes. We propose a router assigned approach where router provides explicit feedback which allows quick increase of throughput.

Key words Congestion control, Quality of service

1. Introduction

TCP couples congestion control with reliability control. It direct congestion by packet loss is strongly correlated to the congestion in wire line network but not a reliable congestion signal in wireless network where packet loss can be introduced by medium related errors and mobility related routing failures . TCP relies on the additive increase multiplicative decrease adjustment of its congestion window to coverage to a fair sharing of network bandwidth. It cannot acquire spare bandwidth efficiency after rerouting events . The throughput of multichip wireless network is highly dependent on the traffic load. When traffic load increases over some threshold the link error rate increases and throughput drop down. TCP flow control aims to fill the bottle neck interface queue and often put too many packets into the network .

The rate feedback data flow control problem in one source single bottle neck communication system and proposes a fuzzy logic based controller that guarantee stability and performance. The controller is also robust with respect to the uncertainty caused by the channel time delay known to be significantly characterized common system. The advantages of this solution it is simplicity

when compared to another opportunities and its independence on the adopted model. ABR is a promising best effort service designed to achieve in ATM networks high efficiency and low cell loss. Since the ATM forum approved a first standard intensive research has been done about ABR. The aim of this paper is analyze the main research topics involved in ABR namely the evolution of traffic and congestion control scheme conformance and policing and charging.

2. Related works

CBR is the highest priority category designed for traffic that must meet strict throughput and delay requirements. CBR service is specifically for real time voice and video traffic. CBR continuous must guarantee throughput with minimal cell loss and low variation in cell delay. Data is transmitted over the link at the referred rate no more and in most cases and no loss. VBR is used to send at the rate varying from the minimum cell rate to the peak cell rate and designed for applications whose information transfer is bursty. As with CBR, UBR user received guaranteed QOS. ABR less ATM uses access idle bandwidth to transmit delay and tolerant traffic. ABR exploits excess network bandwidth but it uses traffic management techniques to gauge network congestion and avoid cell loss.

ABR is the service in which the network provides rate feedback to the sender asking it to slow down when congestion occurs. Assuming that the sender complies with such request cell loss for ABR traffic is expected to be low. The UBR was included for applications like file transfer with minimal cell requirements. UBR provides no specified bit rate and no traffic parameters and no QOS guarantees. Such connections are not required on the basis of bandwidth shortage. Even if cell rate are lost the sources are not expected to reduce their cell rate. UBR is the peculiar feature is its lack of flow control and inability to take other traffic types into account.

We deal with delays which can be unknown and time varying. We show that the optimal control does not adequately solve the problem because the verifying the controllers are fragile. This can be seen even in the simplest case of a simple link. Where any variation of the time delay from the normal one reduces the closed loop system unstable. We propose a classical control design approach based on a PID controller for which will established design tool are available. For the single link case we provide some analytical condition which assume that the controller stabilities the system for all delay values below an assigned upper limit. We finally consider the multicore case and we prove the following equivalencies property. The multi source case reduces in our framework to the single source case in which the MAC admissible delay is equal to that of the source at the maximum distance.

The nodes having the special type of RTS or CTS packet transmission by the nodes handling high priority flow in the utility. The nodes having the RTS or CTS of the high priority flow measure the high priority flow rate from the difference between 2 successful RTS or CTS transmission. Control messages are used to update the changes of the network topology therefore they prevent data packet to be transmitted through broken path. Data packets are common oriented and guaranteed services to their destinations by TCP , In contrast control messages are Connectionless is the dropped message will not be transmitted again. Control message size is very small compared to data packet normally in routing protocols. Control message size is 64 bytes while data packet is 512 bytes is the control message takes small space in the queue and

fast processing time in the node.

Traffic shaping based on ATM version of leaky bucket called GCRA. This includes the prominent service types of constant bit rate and VBR as well as guaranteed frame rate. Decoupling rate regulation from link scheduling. This allows one to replace the priority policy or mechanism without changing the regular point. It also allows for a single analysis of the maximum call delay and the buffer space requirements. The computation overhead of the regulator is low enough to be implemented in software. The computation depends only on the actual number of the cells transmitted regardless of the number of connections. This property makes algorithm highly scalable.

Group management promises which allow the user to open multicast group set group information and gracefully close a group. Connection management group which allow both client and server to join and leave QOS groups. Flow management promises which allow both s & C and server to join outgoing management and monitoring of flows in which they are packetizing. Bandwidth analysis which evaluates the ability of the flow scheduling flow shaping and ATM infrastructure to respond to varying bandwidth demands. Loss analysis which evaluates the effort of multiple flows on delay distributions. Jitter filtering analysis which evaluates the jitter filter delay estimation and payout algorithm at the receiver. Adaptation analysis which evaluate the QOS adaptor mechanism at the end system and network.

3. Simulation analysis

End to end delay is measured. This variable should be minimized for video traffic. Queue occupancy is recorded. Small queues are size affect cell delay and switch cost. Utilization is measured since it limit the number of simultaneous connections. A low utilization is best a fixed number of sources because it would enable more connections to be added to fill the excess capability. Jitter is important because it affect how the customer perceives the quality of the quality of the service. The smaller is the jitter is better service. Queue size affect delta and cell loss characteristics as well as the cost of the switch queue length are directly proportional to cell delay and switch cost. However it is inversely proportional to cell loss. Source control methods are from node at all. MPEG b-picture is discarded and MPEG p and b picture discard.

The seed for the simulation random number generator is varied to ensure the stability of the network model. The down modular design was automatic because of OPNET hierarchical modeling approach For example of anti bugging and debugging methods are print statements were interested into various portion of code animation was used extensively to verify network packet flows and process model state transmission. Cells transmitted at the source were composed to those received at the destination and OPNET debugger was used. During the model development stage the model was explained to colleagues. Network node and process model level behavior including line of code were discussed. Simplified cases were run representative dummy trace data was created to flood the network for short situations and long simulations. Multimedia applications usually have a higher bandwidth requirement as compare to the usual internet applications like file transferring . Supporting Multimedia streaming over prevents a number of packet transfer is practical challenge. Any congestion events TCP reacts conservatively and have its transmission such a drastic changes and the rate could be deteriorate the performance of these streaming applications. So uniformity applying congestion control for

each loss will need to unacceptable performance degradation. On the reception of a data packet the receiver packets the ER field of the data packet into a small feedback packet to the sender. An optimal delay acknowledgement strategy allows the receiver to send a feedback only after receiving certain number is mentioned in the table 1-4.

XRCC does not take any wireless loss into consideration. And this also affect XRCC throughput the limitation of an proposal lead to some directions for future improvement. The rate feedback can be made more accurate by considering the available network bandwidth. By identifying and performing approach actions for router failure and channel error included packet losses and performance of XRCC congestion control mechanism can further be improved. The sender sets the ER field as its desired maximum rate and the CR field as its current sending rate in every data packet is sends out. On the reception of a feedback packet the sender assignment its sending rate to the explicit rate included in the feedback packet.

Start the rate allocation of each session which is MCR increases the rate of each session with the smallest rate increment such that either same link between saturated or some session reaches its PCR whichever comes first. Remove those sessions that either traverse saturated links or have reached their PCR or the capabilities associated with such sessions from the network. If there is no session left the algorithm terminate otherwise go back to their step for the remaining sessions and network capacity. The expected the rate at which the forward cell flow arrives at the interface. Which will be the transmission rate delayed by the propagation delay thus we have planned in the given graph. The accepted rate would be coincided with ACR in a UPC performing the tightest rate conformance mentioned in the figure 1-3.

Fig-1:

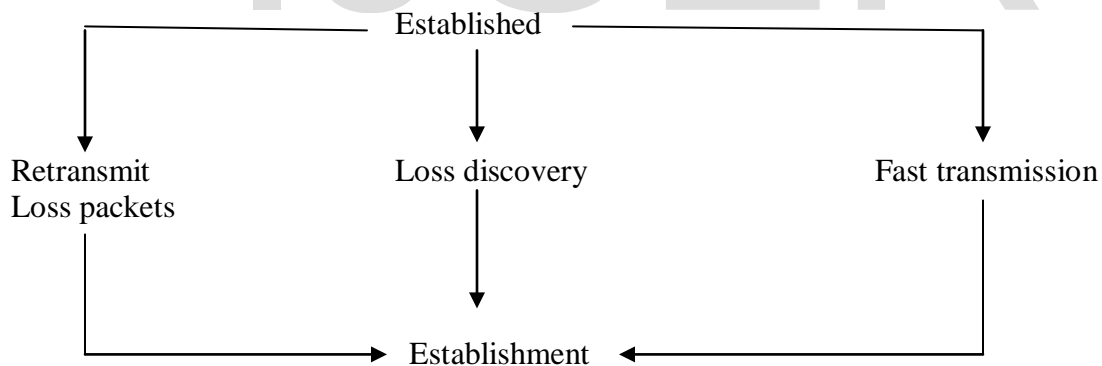
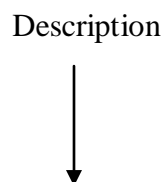


Fig :2



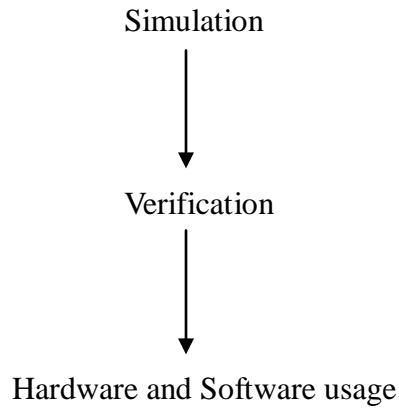
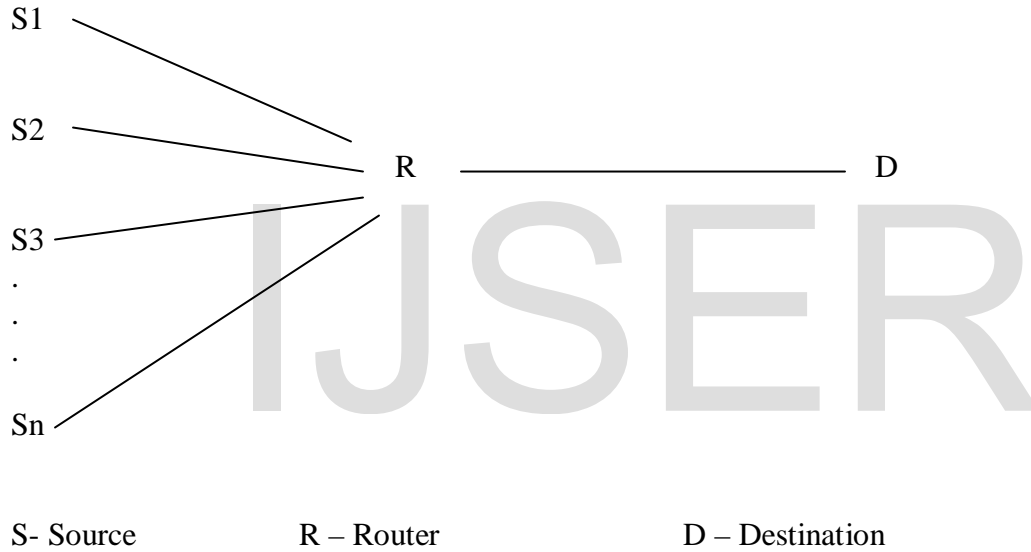


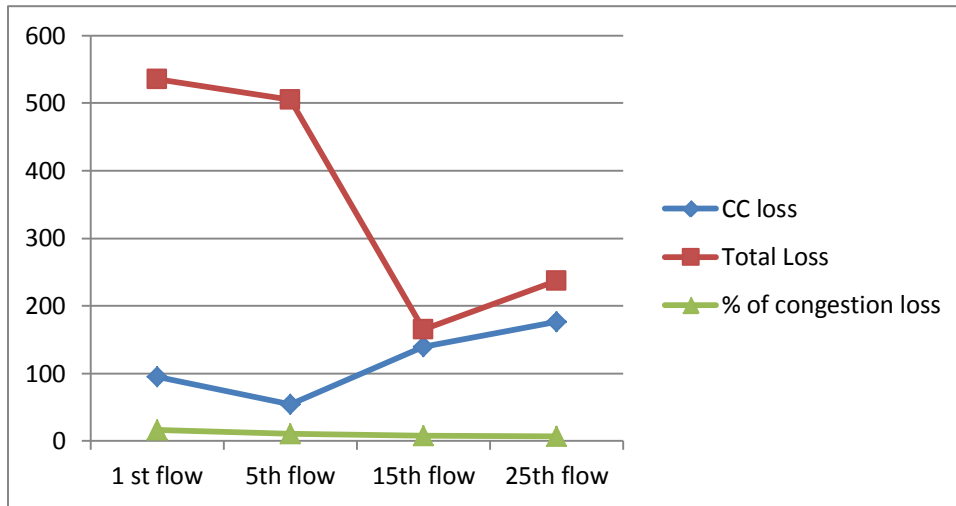
Fig : 3



Congestion Loss Ratio- Table 1

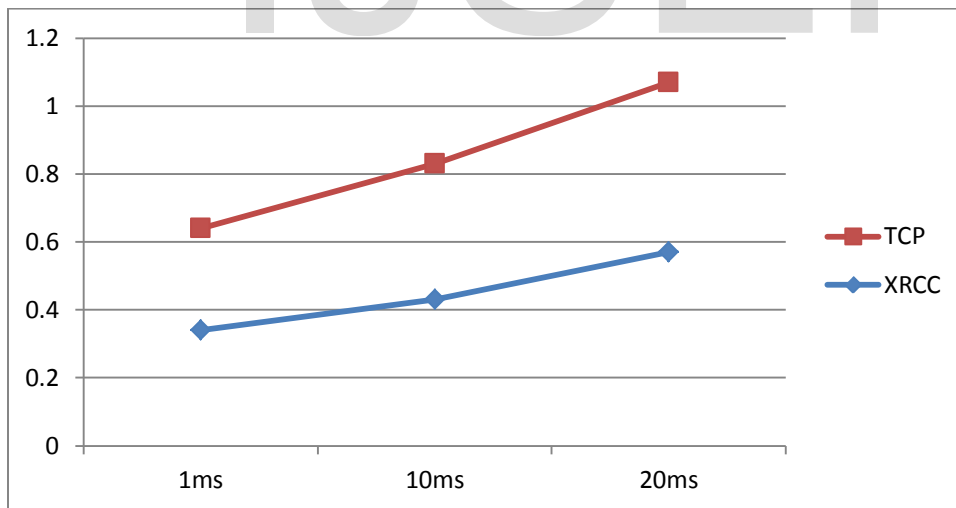
Number of flows	CC loss	Total Loss	% of congestion loss
1 st flow	95	535	17
5th flow	54	505	11
15th flow	140	165	8

25 th flow	177	237	7
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Performance Degradation table-2

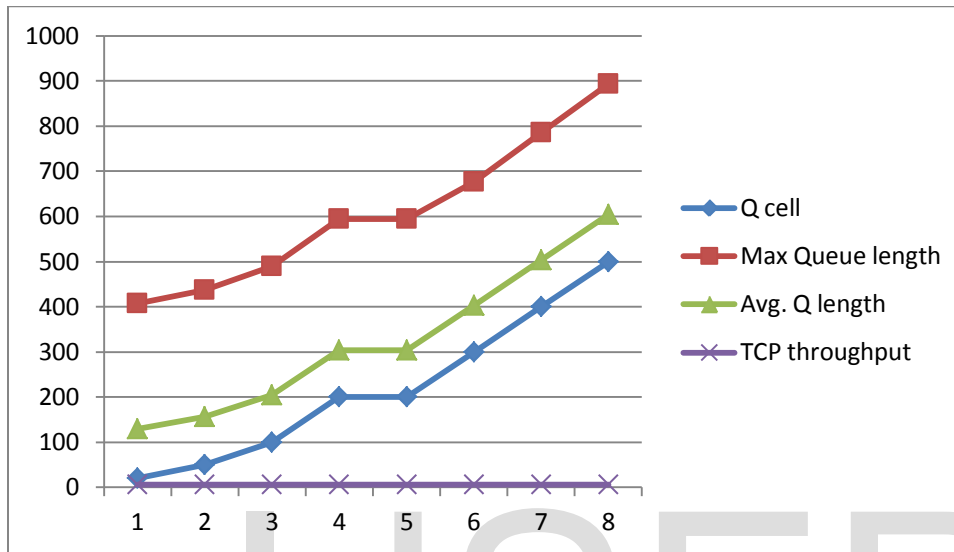
Speed	XRCC	TCP
1ms	0.34	0.3
10ms	0.43	0.4
20ms	0.57	0.5



Cell performance table-3

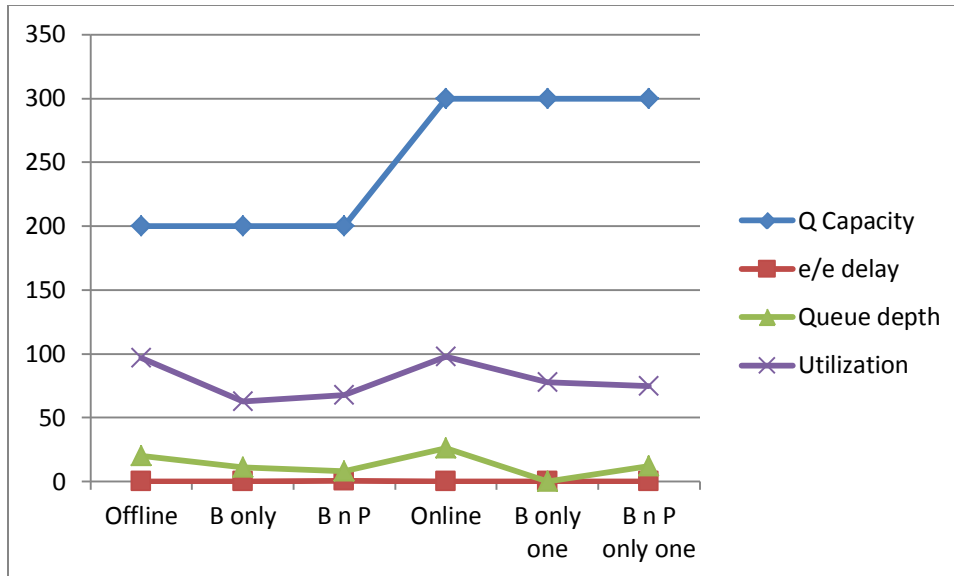
Q cell	Max Queue length	Avg. Q length	TCP throughput
20	407	129	6.1
50	437	156	6.2
100	489	205	6.3

200	595	304	6.4
200	595	304	6.4
300	676	403	6.5
400	785	504	6.6
500	893	604	6.7



Cell Statistics table-4

Drop mode	Q Capacity	e/e delay	Queue depth	Utilization
Offline	200	0.35	20	97
B only	200	0.011	11	63
B n P	200	0.52	8	68
Online	300	0.013	26	98
B only one	300	0.011	0.17	78
B n P only one	300	0.12	12	75



$$Q_{\min} = P_{cr} + K \times Q / K \text{ cells}$$

$$Q_{\max} = Q_{\min} + BT / 8 * 53$$

$$= P_{cr} + K * Q / Q + BT / 8 * 48 \text{ cells}$$

$$U_m = \text{length of our } R_n \text{ message in bits} / T \text{ bps}$$

$$L_f = \text{Input Rate} / \text{Target rate}$$

$$\text{Fair share} = \text{Target Rate} / N$$

$$EQB = \text{Available Bandwidth} / \text{Total number of Connections}$$

Algorithm used:

1. Data transfer rate is adjusted at the source
2. Group node makes source that the buffer occupancy stabilizes and never overflows the buffer capacity
3. These are active and effective methods to adjust the different study rates to different receiver and reduce the packet loss
4. The main proposed scheme in terms of system stability and fast response to the buffer occupancy as well as controlled sending rates low packet loss and high stability.

$$Pd = 2N^2 / (Ct p + Qc)^2$$

$$\text{Invalid Route Ratio} = \text{Number of invalid routers} / \text{Number of valid routers}$$

$$\text{Overhead} = \text{Number of start control packet by source} / \text{Number of received data by destination}$$

$$Lf = \text{ABR input rate} / \text{ABR Capacity}$$

$$\text{ABR Capacity} = \text{LCR} - \text{VBR} - \text{CBR Traffic}$$

$$Fs = \text{ABR Capacity} / \text{Number of active services}$$

Conclusion

A fuzzy logic controller that regulate data flow in one source single bottleneck common system which are characterized by important channel time delay that are uncertain and positively time varying. The proposed controller not only stabilizes the system but also insure some derived performances. One of which is to asymptotically regulate the queue length to a desired steady state value. Further work is needed to incorporate the stability and performance requirements in the fuzzy inference rules and quantitatively access the fuzzy controller parameter settings on the overall performances of the system. The result is independent of the actual number of sources as long as it holds because the upper bound on the number of sources can be made arbitrarily large. Reference [8], that if the delays in the forward path are time varying. The congestion control system does not have an equivalent point. A detailed model of a class is congestion control system term is considered. For the considered system simply put state that for most computer congestion system. The stability of the system with a single source is equivalent to the stability of the system with multiple sources. The proof is based on well known result on the stability of CS with the variant delays. Integrating of network resources such as available bandwidth available query delay and jitter to estimate fair share of network resources among competing technique. Allowing possible intension of LAN and WAN together to provide end to end QOS for application by allowing the mapping of LAN request to appropriate QOS of WAN supported by feedback control mechanism. Permitting an admission control mechanism to make use of the feedback information to provide adequate level of control. The type and amount of feedback required from the network loss delay single bit or multi bit explicit signals. By incremental deploy ability on the current internet only sender needs notification sender and receiver need modification only router needs modification i.e. sender and receiver and router needs modifications. The aspect of performance it aims to improve high bandwidth delay product network lossy links, fairness advantage to short flows and variable bit links. The fairness criterion it uses maximum minimum potential and minimum potential delay.

Acronyms

MCR – MINIMUM CELL RATE

PCR – PEAK CELL RATE

ACR – AVAILABLE CELL RATE

LAN – LOCAL AREA NETWORKS

WAN – WIDE AREA NETWORKS

ATM – ASYNCHRONOUS TRANSFER MODE

ABR – AVAILABLE BIT RATE

TCP – TRANSMISSION CONTROL PROTOCOL

CBR – CONSTANT BIT RATE

QOS – QUALITY OF SERVICE

UBR – UNSPECIFIED BIT RATE

MAC – MEDIUM ACCESS CONTROL

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