Study of Congestion Issues during Highly Loaded Traffic Network

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ABSTRACT
Congestion occurs when traffic gets higher beyond the capacity of node and bandwidth of available channel, as per the study of all previous traditional congestion control algorithm, policies and implemented technology, one can understands network should be stable, reliable, and efficient and should enough to work well in high congested area.

In this paper author proposed an algorithm and simulate them for performance analysis, where they take care the underline specification as low buffer size problem, bandwidth utilization, and data loss problems, proposed algorithm comfortable with real time application environment in the network, which gets demand for higher bandwidth communication architecture, where traffic should be managed with proper fault tolerance, proposed distributed session object allows the network to works in distributed synchronized fashion to support run time real application environment. It also help them to provide transmission link available dedicatedly by P to P connection so that one can get stability, efficiency, portability and optimal path for routing process with minimum delay spam not only in limited area network but also in infrastructure network .

General Terms
Congestion Control, High Traffic load , Network Stability.

Keywords
P to P connection, congestion, efficiency, portability.

1. INTRODUCTION
According to the study of network transmission scenario processing time for any request at router level highly impacts congestion when traffic gets higher with channel capacity. When congestion occurred and data packet lost network resent redundant packet to fulfill lost data packets that exacerbates the congestion problem. In order to avoid congestion network need few components like router takes the responsibility of managing receiving rate of data packets when channel get critical level , there is also an flow control mechanism that performed positively when data packet flow control rate reaches its critical level[1].
Network engineers address the solution of handling control over congestion problem, two term as congestion detection and avoidance both are the part of investigation where one has proposed congestion control that can be defined as any one router in network has been overloaded that causes Congestion because here router are not performing proper synchronization due to this it receiving faster than sending packet result data loss such situation happen when one the thing will be happen like , Router are continuously receiving data packets ,they need to be prevent that time when they reach to its high congested rate ,one more region to happen this is when Router not performing proper synchronization at both sending and arriving station, in both case network suffer. Congested network problem, it need to be covered at control level scheme so that error and flow control can achieved at both end , routing operation also need to be analyzed at every operation because router are the device that dealing with heavy traffic and many processes [2].

Protocol and devices need to be intelligent enough to address the solution so that network first detect and then protect the network state, so that network can be easily recovered from problem state and network can be performed operation in congestion free environment. Flow and Error control techniques is only the solution of eliminating affect of congested network because congested network reduces the quality of communication so that to achieve QoS services in network there are already so many techniques are used to perform flow control and error avoidance from highly engaged traffic network [03].

2. RELATED WORK
Every new invention comes due to the limitations and drawback of previously proposed and implemented work , that week point are the factors that motivate to author to research in this area , the proposal are designed for improving the network services at broad level , present time is the time of paper less online data transmission services that suppose to be more efficient and accurate enough in order to achieve reliability and quality in communication ,before to research in proposed area author analyses many traditional and newly proposed techniques and algorithm that motivate us to work on this research proposal.

2.1 Drop Tail Approach to Control Congestion
It is very famous technique to control congestion error form the network due to its simple working and less complex technique it has been implemented mostly for present internet scenario, the conceptual idea behind the Drop Tail proposal was it drops the data packets incoming from the network, as network buffer gets over flow, in which it drops the packets from its tail that‘s why one called it Drop Tail[4].

It is good for due to less complex working architecture but apart from complexity and simplicity, author found there are some big limitations as below

2.1.1 Limitations
1. Technique is not fair in during the dropping tail function, every packets drops that come after getting buffer overflowed or rising congestion event.

2. Lack of Buffer optimization.
3. Uncontrolled flow rate causes congestion.
4. Lack of Quality of Services regarding protection and data integrity.

2.2 DECbit Approach to control Congestion Error

This approach focused on avoiding rather than controlling congestion event to make it possible, it implements the concept of indication bit therefore one called it DECbit, that plays role to avoid congestion when buffer window size gets causes effect of rising congestion error, the associate DECbit is providing message as a feedback message after every possible time session, feedback message has been comes into the role to give the position of buffer congestion window size, if buffer queue length size gets exist its congestion level , DECbit gets broadcast the feedback message regarding the possibility of congestion happenings [05].

2.2.1 *Limitations*

1. Concept leads the opportunity to get accuracy during the calculation of averaging queue size computation value for very short time periods that is not possible in dynamic communication scenario to compute accurate value.
2. DECbit perform indication for possibility of congestion event that one can say detection not avoidance; this means that approach performing detection instead of avoidance.

2.3 RED Approach to Control Congestion Error

RED proposed more advance queuing techniques in order to overcome from the drawback of DECbit algorithm which had studies in previous section, to perform more exact calculations RED usages exponential weighted moving average function that compares the newly computed queuing value within minimum and maximum threshold that gives more accuracy in the computed result, so that queuing techniques can easily get the acknowledgment regarding the congestion errors [06], so to know about the decision of congestion can be find more accurately.

2.3.1 Limitations

1. This approach is struggling due to the its sensitiveness regarding the parameters settings, so that the parameter configuration impact bad result over the performance of RED that reflect bad computation compare to previously discussed DECbit.
2. The RED queue length gives very little information about the number of competing connections in a shared link.

2.4 Flow RED Algorithm

To overcome from the problem of flow control, in [07] one proposed a new approach to control congestion by getting controlling over flow that‘s why one called it Flow based Random Early Detection Technique, this approach takes the week point of RED that is ―REDs unfair behavior regarding the different types of traffic patterns to due to the lack of flow control‖, FRED proposed Flow controlling mechanism to get control over fair treatments with different pattern of flow incoming from different sources. To maintain flow FRED uses the fact that if any flow get occupied large amount of buffer space then it gets detected by FRED that takes action and assign limited amount of buffer space to that in this way flow can be manage with multiple, so we can say if node belongs to the same network area where intercommunication in between the subject nodes are higher can be easily accommodate as per the need of network management protocols.

2.4.1 Limitations

1. One of limitations of FRED is the higher queue sampling frequency.
2. Terminal indicates congestion variations.

2.5 ChoKe Packets Approach to ControlCongestion Error

As its name implies that the basic idea behind the working of this approach is to control the flow at congestion gateway router position as a firewall system used in network to get filter the data then gets reject and accept the packets similarly to get control over flow this technique perform a comparison analysis at the time of congestion event between different traffic pattern as per the availability of buffer size[08], it accept incoming packets otherwise admitted into buffer that will be proceeded based on the probability of congestion status .

2.5.1 Limitations

However this algorithm is not likely to perform well when the number of flows is large compared to the buffer space.

2.6 BLUE Algorithm

The RED queue length gives very little information about the number of competing connections in a shared link that causes big drawback regarding the controlling of congestion events , a more advance approach is proposed named BLUE algorithm [09] to address the solution of this problem by taking two factors like packets loss and link idle frequency to protect TCP flows against non utilize , non responsive flows , this technique uses network state information to find and limits the non responsive flows.

2.6.1 Limitations

This is simple and less complex technique for controlling flow and congestion error by identifying non responsive flow but it is not better performing when the flowing pattern are coming with multiple large number of interface but again this technique is not appropriate in finding the exact number of non responsive flows and unfair selection of flows when congestion happened.

2.7 Virtual Queue Algorithm

This technique is uses two queue one as virtual and second as real queue that manage different flow patterns, the packets arrival rates same in both queue but the size are different as virtual are much smaller than real queue[10] to get control over congestion error, to make this possible as the engagement status of virtual queue are gets complete[11], Virtual queue drops the incoming packets, these packets are en queued in real queue with new arrival packets, these packets are waits for its chance get in to virtual queue in FIFO fashion until the virtual queue will not empty again [12].

2.7.1 Limitation

The fixed size virtual queue seems to be weakness of this algorithm for the point of view of low performance efficiency at the time of heavy traffic load [12]. Delay gets higher frequently as the traffic gets higher. In this case one

can realize that without optimistic simulation of current congestion requirements its not possible to track the congestion error prior to the happening of congestion events[13,14] , such methodology is tuff to implement due the requirements of future knowledge of congestion bit is not easier ask ,as what we have been consider here.

3. METHEMETICAL CONSTRUCT TO REDUCE CONGESTION

To get identify the region suffering from large overflow problem following mathematical construct has been implemented to get fix the overflow and minimize the congestion level at first stage.

1. In the code R referred as Region parameter with A_x and B_y used as a programming parameters to get congestion analysis.
2. T_1, T_2, $T_3 \ldots T_n$ is used as a parameter to represent terminals in network where T_j is a root of the captured network region.
3. Network node T_i is routed by scaling parameters as N_i, here T belongs to t∈T where every terminal node is to be connected with root node as per the design of the associated region.
4. Having binary decision parameter for the routing decision is Xi which is equal to 1∈Ti, T∈t.

In order to route quickly and get indicate for overflow point code will be initialized like as following.

5. All network zones has been initialized with it initial values cases to active network for transmission. min (1-R)x,i,j ΣTi……Tin+ RTi..
6. To get interconnect all the root node Axi with interconnected network with having the decision service to choose the required root node it may bi as Σ t∈Ti when Axi = 1 where ∀i ∈ N getting the regions with totality as overall network to be capture with its initial state .
7. In order to detect overflow node, process the request with the region that will be the source to classify the congested network area, here Terminals t represent the volume level of network zone belonging to A and B as decision tree network frame work to proceeds it as Σ i=1 Σ t∈Tj may occurred as the position of network optimality i.e. At exit ≤ AxBy + Xij ∀i ∈ R.
8. Make decision on the basis of the parameter value to proceed next node request to fulfill the aspect of capturing the process with highly interconnected node that is represented as Xi=1,j=i-1 , it will integrate it over the edges , Σ i∈N(r) Xij ≤ E, where the parameter can belongs to ∀r ∈ R, e= edges.
9. X belonging to the region R to perform operation for the part of network sub tree with the initialization of Minimum r ≥ Xij ∀r ∈ R, proceed the function that seems like transmitting the packet without overflow, and over passing all the edges as ∀e∈N(r), in the very next process round trip aspect to be consider through the process where it gaining manageable throughput and round trip time ratio by , getting Bj = {0, 1} ∀i = 1, . . . , N, gets location of entire network which belongs to every terminal T, ∀ t ∈ Ti.
10. At last terminal X has got the parameter value as Xij ≥ 0 ,∀ i ∈ X every address of local node has been passing over the region R, root nodes taking the position again for the next transmission with the new initial value as ij ≥ 0 ,r ≥ 0 , where all sub region follow the root Node ∀r ∈ R.
11. Here the first group of node represent the selection for the one root node for all I from the set of root terminal Tn second set of nodes are Ax and Bj get capture the highly engaged area belonging to the overflow error, according to the computation all terminals has been initialized with its regions as R and terminals as Ti to Tn.

4. SIMULATION STUDY

Author present the proposed work here with simulation part that describes how the approach are much more effective compare to the previously discussed methodology , in this section author graphically defines the idea behind the algorithm presentation in last section , below graphs are showing the traffic pattern against the number of nodes moving around the network area.

The threshold ratio also take more impression over research work at different time the computation scenario are showing different variation that are necessary to know network stability, efficiency and consistency by having implementation of proposed algorithm one can find that at MAC layer each and every node are eligible to response and deliver the required transmission even ,in very high congested network , as per the traditional approach we analyzed that performance of algorithm degrades as the traffic gets higher , data loss also account so that here one can see algorithm has maintain its accountability with performance , when traffic gets higher suddenly.

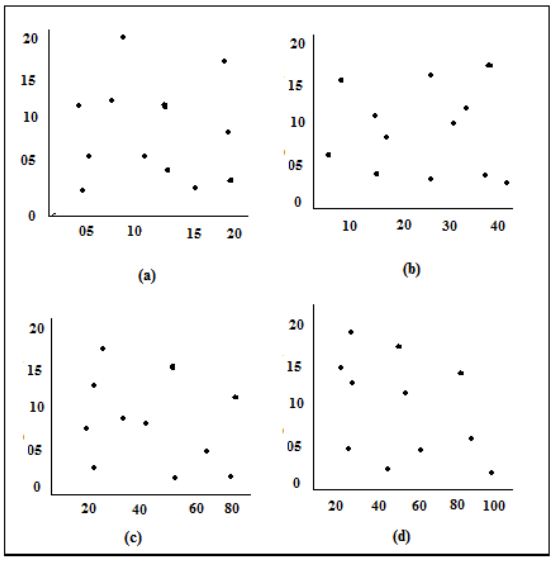

Fig 1: Experimental analysis on proposed algorithm over increasing number of nodes

Paper experiments the increasing number of node that getting heavy traffic during the data transmission process causes high possibility to loss reliability as well as security from the working network but what one can get from the (see figure 1) each and every session of group of 20, 40, 80,100 nodes that show network has worked smoothly over the high loaded

traffic network with accountability and reliability measurement.

Table1. Experimental observation of increasing nodes

No. of Nodes	Time	Threshold Value
05	.002565456	.000451236
10	.014523354	.001245789
20	.245466354	.021556658
30	.114525566	.145678455
40	.122536654	.122365566
50	.101235565	.121025456
60	.101245666	.024556445
70	.452211334	.021456565
80	.456221333	.147523646
90	.101224566	.214567844
100	.211156566	.121145566

5. CONCLUSION

At the end of this session author of the article has been concluding the contribution of the research article here, in this article at the very begging author presented the analytical aspect to understand the actual problem and to analyses the limitation regarding the congestion control issues , that motivated the author to resolve and present the new logic that reduces congestion from the network , therefore in the last session author proposed a mathematical construct to define the problem and its solution , this implementation should be effective for the TCP construct at TCP layer of network system , in this way network always go through the congestion less procedure to make networking easy and less complex that could be the major object behind the presented paper.

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