A Dynamic Bandwidth Adjustment Approach for QoS Optimization in Mobile Network

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Abstract

Bandwidth estimation and optimization is one of effective approach for bandwidth adjustment. But most of the analysis is generally performed based on current communication analysis. But in this present work, a two stage analysis approach is defined for requirement analysis for bandwidth optimization. In first stage, the dynamic analysis on current communication is performed whereas in second stage, the long term aggregative communication analysis is performed. The work is here defined to the network QoS by adjusting the network bandwidth. The obtained results shows that the work has improved the communication throughput and communication delay.

Keywords – Bandwidth Optimization, Communication analysis, Dynamic Adjustment

1. INTRODUCTION

To optimize the network throughput as well as to improve the network reliability one of the major approach is to apply the traffic engineering. Traffic engineering is about to control the network traffic by adjusting the bandwidth so that the packet communication on a particular route will be restricted. As the communication is performed to multiple links, it cannot utilize its whole bandwidth at a particular instance of time. In such case, the load at some points is very low whereas some points are overloaded. This kind of load unbalancing results the degradation in communication quality and the QoS degrades. While defining the communication over these networks, a stepwise procedure is required. This procedure is defined and analyzed respective to control flow network with the specification of a bottleneck point, so that the network provider can analyze the communication over the specific path. This kind of analysis can be considered by observing the connecting path and to provide the detailed communication analysis over that path. This kind of flow can be observed along with the specifications of connecting networks or the path. The communication over the network is observed in critical situations like congestion. In this present work, a bandwidth estimation and adjustment approach are defined to generate the effective communication path over the network. The work is here about to handle the block node as well as congested node's situation. The analysis in this work is defined at each node while generating the path. As the path being generated, the list of neighboring nodes is generated and from this list effective next hop is identified. The communication analysis is performed to identify the sequential next hops so till the destination node doesn't occur. The work is here defined to generate the optimized and low cost path.

While working with any data network, the capacity estimation and the bandwidth estimation depends on physical as well communicaitoin parameters. The physical parameters basically defines the capacity and the dynamic parameters includes the load estimation. This kind of estimation can be applied for traffic analysis and network flow analysis. The available bandwidth analysis and maximum bandwidth analysis is here performed under the traffic parameters such as communication delay, packet transmission etc. This kind of measurement need to generate the network traces under the communication path analysis with active probing techniques. The QoS is yet a challenge for the network because of following reasons

1. The QoS optimization requires the support and knowledge of the end host of the network. But the mobile communication is not restricted to the area and it is able to perform worldwide communication. Because of this scalability

sometimes it becomes defficult to extract the communication or the parameteric details of end node. The dynamic and moving nature of nodes also make it difficult to extract such information. The decision in mobile network can be taken for the next neighbor rather than recieving end.

2. Another challenge with mobile QoS optimization is the cooperation betwen the neighboring nodes to determine and trasmit the schedule under the packet delivery with centralized control specification. This kind of host based transmission with communicate with neighboring host so that the transmission over the network will be controlled.
3. The wireless channel based communication comes under network deficiency analysis with the specification of unreliability that can occur because of various reasons and fading under interference.

To estimate the accurate bandwidth, it is required to take the optimal decision regarding the data transmission in the network. This kind of estimation can be done under available bandwidth specification and bandwidth estimation. This kind of bandwidth estimation improves the network QoS in all kinds of data networks. One of the basic ways of this estimation is using hello message. This kind of association analyzes the bandwidth consumption using piggybacked "hello" message. The estiamtion to the available bandwidth is performed to provide the information and to reuse the extracted information. The neighbor host information is analyzed under hop relay to propagate. This kind of estimation includes the host address specification and to monitor the communicating packets supplied over the network or the network route. This estimation is generally done periodically.

II. RELATED WORK

Lot of work is already defined by different researchers on QoS Optimizaiton and bandwidth estimation. Some of the work defined by these researchers is defined in this section. Axel Krings[1] has defined a work on the neighborhood monitoring in mobile adhoc network. Author analyzed the nodes for the abnormal behavior and identify the effective k-hop. The monitoring approach defined here to analyze the network communication under different assumption so that the bad or the block node will be identified. Author defined the work on identification of misrouting and neighborhood analysis. Author also exploses the associated overhead by analyzing the neighbors under detection and correction threshold specifications. Ying Li[1] defined a work on component based tracking applied using machine vision technology. Author defined a work on research engagement with vision technology to analyze and monitoring the tracks. Author defned the analytical work to generae the building blocks for the analysis. Author presented the mathematical model to generate the probabilistic estimation to analyze the neighbor nodes. Bogdan Carbunar[3] has defined a work on malicious and bad node detection and to generate the reliable route for hybrid networks. Author defined a work on security threats analysis and context analysis with cellular base station and mobile devices equipped network. Author analyzed the cellular network under adhoc terminology. Author also provided the attack effective communication to save the nework communication under insider and outsider attack. Author defined the communication mount under well behaved communication over the network. Johann Schlamp[4] has defined a work to prevent the network from hijacking attack. Author defined a case study based work for hijacking the work under the specification and identification of spam nodes over the network. Author defined a case study based work on identifying the spam communication over the network. Author efined the IP prefix based communication to gain the long term benefit along with effective communication analysis. Author defined a through investigation along with incident analysis so that the live data and control plane based estimation will be obtained. Joshua Goodman[5] has defined a work to prevent the communication over the network by preventing the spam communication. This kind of communication is performed under conventional techniques with limiting spam outgoing methods with ineffective communication analysis. Author analyze the communication by imposing the message cost with annoying the communicatin cost. The average cost analysis is performed by the spammer so that the network life time will be exceed and the maximum communication profit will be achieved.

Danny Dhillon[6] has defined a work on improving the communication integrity in mobile network incase of OLSR protocol. Author defined a quantification approach to improve the network network effectiveness in terms of identification of false positive and false negative detection rates. Author defined a discussioin and implementation for OLSR techniques under link state routing protocols. Ahmed Khurshid[7] has presented a work on varifyign the communication in invariant real time network. Author designed a preliminary design to achieve the required goals by analyzing the communication flow over the network layer and by applying the software network controller between the network nodes and controller devices. Author has identified the network violation condition so that the forwarding rules over the network will be identified and applied. Author analyzed the network under the specification of the invariant violation with specification of forwarding rule. Evan Cooke[8] has defined a work to improve the network communication by

generating the block based analysis under block hole infected network. Author defined an effective global observation scheme for internet traffic analysis. Author observe the network communication traffic and generate the communication evidence with distributed address block specification under traffic pattern specification. Author defined the motion sensor based communication analysis with collection infrastructure specification. Umair Sadiq[9] has defined collusion resistant incentive based compatible routing for opportunistic network. Author defined the credit scheme under the specification of routing and forwarding rule generation for opportunistic network. Author defined the work under optimal condition specification with flow maximization with optimial relay behavior analysis. Mauro Conti[10] has defined a work on efficient, randomized and distributed protocol specification with detection of attack in sensor network. Author defined a work against node replication attack for sensor network with the specification of fundamental problem. Author defined a work on energy and memory demanding approach with the specification of resource constraint environment. Author defined a model specification approach for effective route generation. Garima Gupta[11] has defined a work on attack mitigation approach for blackhole network as well as to generate the data packet s and dropping attack with the specification of network performance degradation. Author defined the behavior analysis for social network with probabilistic network specification under worward decision analysis. Abhijit Das[12] has defined a work on energy effective topology specific energy effective security scheme for mobile network. Author analyze the network under topology threats and provided the effective solution.

III. RESEARCH METHODOLOGY

The presented research work is about to improve the network communication by optimizing the network bandwidth. The work is here applied by analyzing and adjusting the bandwidth dynamically. The presented work is divided into two main stages. In the first stage, the bandwidth analysis and the requirement of the bandwidth adjustment will be identified. This analysis will be done under different communication parameters such as loss rate analysis, communication delay analysis. The work will be here analyzed under critical conditions such as congestion situation. As the work is defined for a mobile network, the algorithmic approach will be applied to each node. The analysis will be performed for next hop selection. The work will identify the neighboring nodes and perform the analysis under different physical and dynamic parameters. Once the estimation will be done, the requirement of bandwidth optimization or adjustment will be identified. Based on these parameters, the effective and reliable next neighbor will be identified. This analysis will be done in two stages. In first stage, the current communication analysis will be done and in second stage, the aggregative communication analysis will be performed. The aggregative analysis is identified as a long term analysis approach. The parameters considered for the analysis are communication rate analysis, communication delay analysis and lossrate analysis. Based on these parameters, in second phase of work, the bandwidth adjustment to the optimimal neighbor will be done. If some bandwidth gets free, it will be adjusted to the other required node or route. The basic flow of the presented work is shown in figure 1.

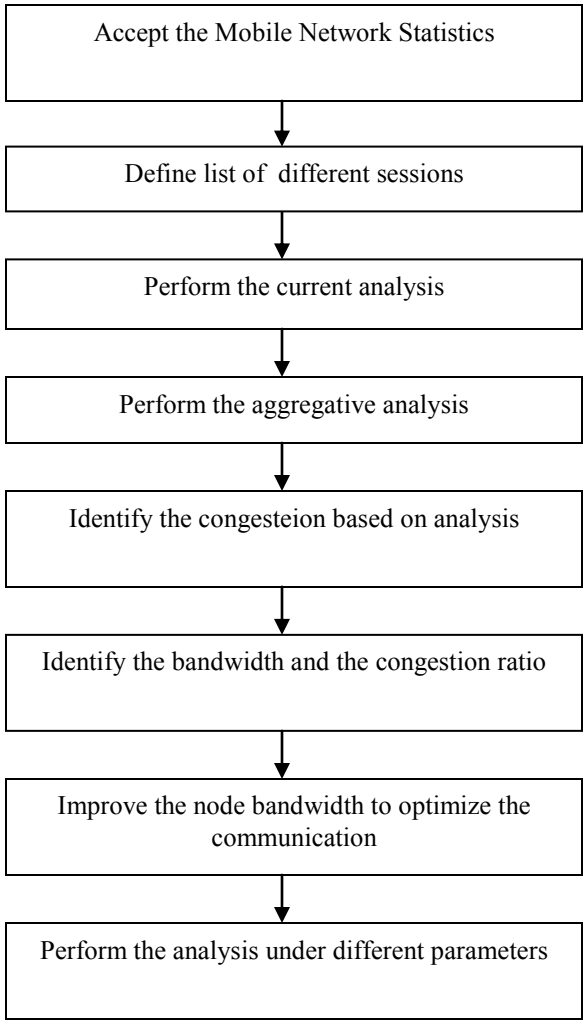

Figure 1 : Flow of Work

As shown in the figure, the presented work is defined as the set of stages where each stage includes either the estimation or the adjustment stage. The algorithmic approach considered in this work is shown in table 1.

Table 1 : Proposed Algorithm

```
Algorithm()
{
1. Generate a Mobile network with N Number of Nodes with Random Mobility Model
2. Infect Some Random Nodes under Selfish Node Characteristics
3. Define the Source Src and Destination Node Dst over the Network.
4. Set CurNode=Src
5. [Set Source Node as Current Node]
6. While (CurNode<>Dst)
7. /*Idenitfy the Next Effective Neighbor till Destination Node not Found*/
8. {
9. Generate the NeighborList of Current Node called Ne(1),Ne(2)…Ne(N)
10. For J=1 to N
11. /* Process All Neighbor Nodes*/
12. {
13. Perform Analysis of Ne(j) Under Delay, LossRate and ResponseTimeParameters
14. If(CurTime<SessionThreshold)
15. {
16. Set AggregativeDelay=AggregativeDelay+Delay
17. Set AggrgativeResponseTime=AggregativeResponseTime+ResponseTime
18. Set AggregativeLossRate=AggregativeLossRate+LossRate
19. Count=Count+1
20. }
21. }
22. If(CurrentTime>SessionThreshold)
23. {
24. Set AvgDelay=AggregativeDelay/Count
25. Set AvgResponseTime=AggregativeResponseTime/Count
26. Set AvgLossRate=AggregativeLossRate/Count
27. If (AvgLossRate<Loss_Threshold and AvgResponseTime< Response_Threshold And AvgDelay<Delay_Threshold)
28. {
29. Update Loss_Threshold, Response_Threshold And Delay_Threshold with Lesser Average Communication Parameters
30. Set Bandwidth=Bandwidth+Threshold
31. }
32. Else If (AvgLossRate<Loss_Threshold And AvgDelay<Delay_Threshold)
33. {
34. Update Loss_Threshold, And Delay_Threshold with Lesser Average Communication Parameters
35. Set Bandwidth=Bandwidth+Threshold
36. Set K=J
37. }
38. Else If (AvgLossRate<Loss_Threshold_
39. {
40. Update Loss_Threshold with Lesser Average Communication Parameters
41. Set Bandwidth=Bandwidth+Threshold
42. Set K=J
43. }
44. }
45. Else
46. {
47. If (LossRate<Loss_Threshold and ResponseTime< Response_Threshold And Delay<Delay_Threshold)
48. {
49. Update Loss_Threshold, Response_Threshold And Delay_Threshold with Lesser Average Communication Parameters
50. Set Bandwidth=Bandwidth+Threshold
51. Set K=J
52. }
53. Else If (LossRate<Loss_Threshold And Delay<Delay_Threshold)
54. {
55. Update Loss_Threshold, And Delay_Threshold with Lesser Average Communication Parameters
56. Set Bandwidth=Bandwidth+Threshold
57. Set K=J
58. }
59. Else If (LossRate<Loss_Threshold)
60. {
61. Update Loss_Threshold with Lesser Communication Parameters
62. Set Bandwidth=Bandwidth+Threshold
63. Set K=J
64. }
65. }
66. Set CurNode=K
67. /*Move to next Effective Hop*/
    }
```

IV. RESULTS

The presented work is here defined to optimize the network communication by adjusting the network bandwidth. The work is here implemented in NS2 environment. The communication parameters considered in this work are shown in table 2.

Table 2: Communication Parameters

Parameters	Values
Number of Nodes	25

Protocol	AODV
Simulation Time	10 sec
Packet Size	512
MAC Protocol	802.11
Topology	Random

The analysis of the work is here defined under different parametesr. The analysis is here defined in terms of packet communication, packet loss and communication delay.

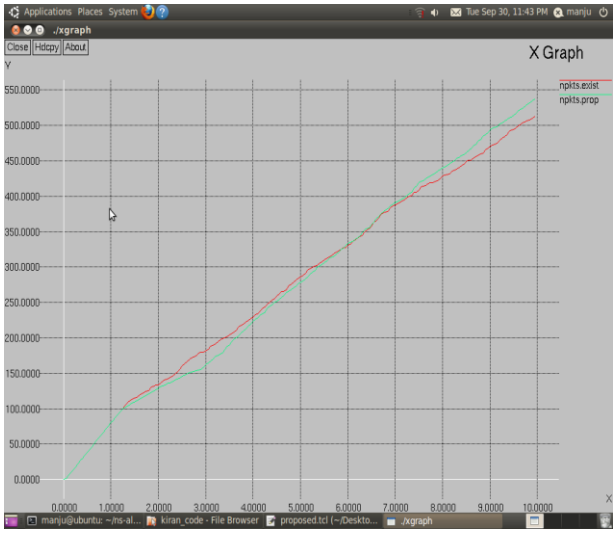

Figure 2 : Packet communication Analysis

Here figure 2 shows the analysis of presented work in terms of packet communication. The results shows that the work has improved the packet communication over the network.

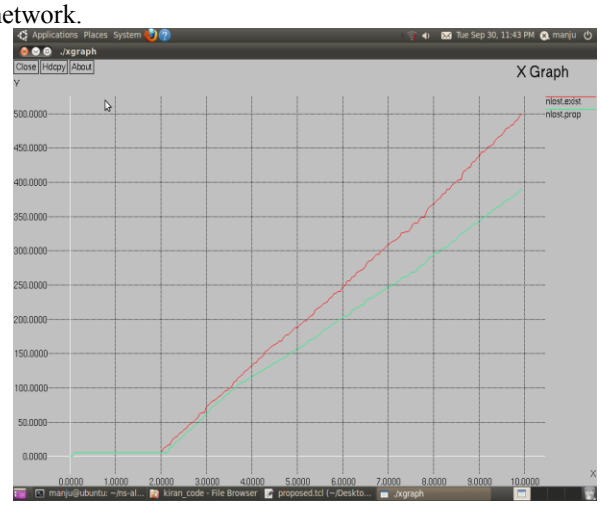

Figure 3 : Packet Loss Analysis

Here figure 3 shows that the presented work has reduced the packet loss. Here green line shows that the presented two phase analysis approach has reduced the packet loss over the network.

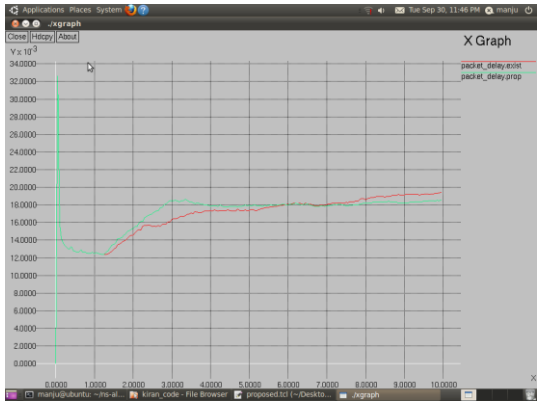

Figure 4 : Packet Delay Analysis

The analysis of presented work is also defined here for packet delay. The figure shows, that the work has increased the delay during the analysis time but later on the overall delay is reduced.

IV. CONCLUSION

In this paper, an effective bandwidth analysis and adjustment approach is defined to improve the network communication. The work is here defined under two stage analysis approach. The results obtained from the work shows that the packet communication is improved whereas the packet loss and packet delay is reduced in this work.

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