International Journal of Computer Applications (0975 – 8887)
Volume 173 – No.1, September 2017

Optimistic Algorithmic Approaches for Traffic Engineering Policies of Congestion and Traffic Distribution in the Networks

G. Rakesh
Research Scholar
Part Time (Category B),
Bharathiar University, Coimbatore
Tamilnadu, India

K. Thangadurai
Assistant Professor and Head
Department of Computer Science
Government Arts College (Autonomous)
Karur, Tamilnadu, India

ABSTRACT
In digital era of technological revolution internet usage is rapidly increasing because of its need and usage to the society is unavoidable. As a result internet backbone facing traffic fueling issues in global perspective. To overcome this Traffic Engineering is an essential consideration in designing and operation of large internet backbone. Internet Traffic Engineering addresses the performance optimization of operational networks. Therefore constructing an effective optimistic algorithm for Traffic Engineering is a primary job to tackle the traffic fueling issues at internet backbones. This research article proposing an optimistic algorithmic approach for Congestion identification, avoidance and Traffic Distribution to Traffic Engineering mechanism better than existing conventional approach in execution.

Keywords
Traffic engineering, Quality of Service, Congestion, Traffic Distribution, Node Reputation approach, Link analysis Approach.

1. INTRODUCTION
Internet in worldwide surpasses congestion because of increasing number of users are in a high ratio. As a result traffic occurrences is unavoidable and also hurdle in control over managing heavy network loads, individual connections used flow controls between sender and receiver for preventing sender from overwhelming the receiver. The Figure [1] forecasting the existing internet penetration that occurs in the Asian Continent taken from the world internet statistics report. IETF classify the congestion control process in to Congestion recovery and congestion avoidance [3]. Today congestion avoidance is an important tool for improving the performance and Quality of Service to internet environment. So there is a need of new optimized algorithmic approach to overcome the existing penetration for traffic fueling issues [1].

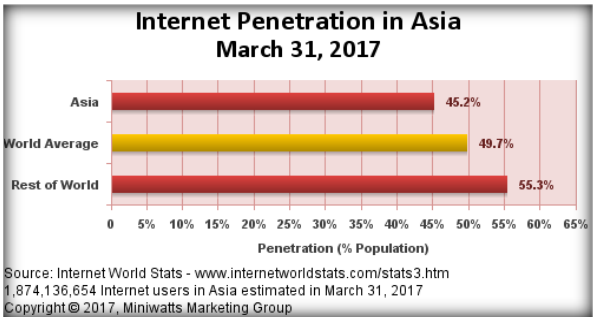

Fig.1 Internet Penetration in Asian Continent

2. TRAFFIC ENGINEERING MECHANISM FOR TRAFFIC ISSUES
To eradicate traffic issues the best way is to construct optimistic Traffic Engineering process at internet backbone. Traffic Engineering mechanism consists of various iterative processing states [2]. It starts with formulation of control policy, observation of network state, Traffic analysis and optimization of network performance. Formulation of control policy construction depends on the network context, cost, structure, revenue or utility model, operating constraint and success criteria. Observation of network state built with set of monitoring functions that acts as a feedback of Traffic Engineering process. Traffic analysis of network state gives out the network performance for Traffic Engineering mechanism. The optimization of network performance is accomplished by applying control actions to drive the network to a desired state corresponding to the control policy [15].

3. OPTIMISTIC ALGORITHMIC APPROACHES FOR TRAFFIC ENGINEERING
Traffic Engineering mainly concerned with performance optimization of operational IP networks. The optimization objectives are minimizing congestion and packet losses in the network, improving link utilization, minimizing the total delay experienced by packets, increasing the number of customers with the current assets. The Proposed optimistic approach constructs on considering major three issue for traffic occurrences to the Traffic Engineering mechanism.

Issue1: congestion identification in networks.

Issue2: congestion avoidance in networks.

Issue3: Traffic distribution in networks.

3.1 Congestion identification algorithm for Traffic Engineering Mechanism
Node Reputation Approach algorithmic approach proposed to congestion identification issues for Traffic Engineering mechanism. The principle of this approach set to identify the congestion corners with the physical topology instead of fully relaying on Conditional probability distribution. In Node Reputation Approach the congestion corner is obtained with help of a numeric Value. The value obtained when one node links to other node in the network. When node linking it effectively cast a vote for the other node. The most voted node contained with high numeric value. So the high Numeric value forecasting congestion occurrences in the network. Therefore congestion corners are easily identified and traffic

is routed to alternate path to overcome congestion identification issues in the network.

Algorithmic presentation of Node Reputation approach:

Node Reputation Approach consist of two phases for congestion issues.

Phase I: Node Reputation Approach for identifying congestion in the networks.

Input: Graph G= (V, E) representing the IP network, where V is the set of nodes and E is the set if links. Input (i) and Output (i), the number of edges in and out of node irrespectively.

Output: Numeric value for the nodes in the network.

Algorithm steps:

Step 1: initialize elements of the matrix Numeric value to 1.

Step 2: for each k value varies from 1 to step up by 1.

Step 3: set g=0

Step 4: for all nodes j if edges (j, i) = 1 repeat

Add Numeric value (j)/Output (j) to g

Next j

Step 5: Set Numeric value (i) = (1-del) + del * g, Go to step 2

Step 6: return.

PhaseII: Path identification for data transfer between source and destination using Node Reputation Approach

Step 1: Start the process by simulating graph.

Step 2: Initialize the process by obtaining Numeric Value of the node.

Step 3: Then simulate the node in the network for finding the Feasible Route FRT between the source and destination i.e. STi to DTi.

Step 4: The next stage is of Route selection fit with all feasible Route ∈ FRT.

Step 5: After feasible path allocation calculate ∑k Numeric value (k) for that k ∉STi & DTi.

Step 6: A check needed weather k ∈Route, Numeric value (k) > 0.

Step 7: If the stated condition for Numeric value (k) value is greater than go to Step 4.

Step 8: The last stage of the processing is of using selected the path with minimum ∑k Numeric value (k) value given by Computing Congest index (route) = ∑k Numeric value (k) where k is a node that present in Route and Numeric value (k)>0 and k ∉STi & DTi.

Step 9: Stop the process.

Hence Node reputation Approach identifies the congestion in operational IP networks. Node Reputation approach identifies the congestion with no knowledge of link weights and shortest paths, but with the help of network topology alone. Using this approach for any networks, the congestion identify with minimum efforts and data been routed to alternate path early.

3.2 Congestion avoidance algorithm for Traffic Engineering Mechanism

Link Analysis Approach is constructed to Congestion avoidance algorithm for optimistic Traffic Engineering objectives. This approach finds the congested path and provides a reactive route by selecting alternate path for traffic demand. Link Analysis Approach uses Hyperlink-Induced Topic search algorithmic approach. Congested routes are obtained by hub and authority values for each node in the network. The HITS measure used for Reactive routing to the congestion avoidance issues. Link Analysis Algorithmic Approach facilitates congestion avoidance in a dynamic activity for Traffic Engineering mechanism.

Algorithmic presentation of Link Analysis Approach:

Input : Graph G=(V,E) representing the IP networks, point to point demands k, where for each k∈K,let Sk ,Dk be the source and Destination node respectively, v- authority weight vector and u- the hub weight vector.

Output: Reactive routing for congestion avoidance purposes from source to destination.

Algorithm steps:

Step 1: Start the process by deriving hub and authority weight using HITS algorithm

Step 2: Find the set of feasible possible paths FP between source S and Destination D

Step 3: for all path ∈ FP and I as an intermediate node present in the path, calculate Cong_ind (path) =∑i (ai + hi)

Step 4: check a (i) >0, h (i)>0 and go to step 3

Step 5: Select the path with minimum Cong index.

Step 6: Return.

Link Analysis Approach algorithm of congestion avoidance and route selection offers better performance when compared to that of existing conventional approach. This approach uses Hubs and authority score from the existing network link. So the major cause for delay in data transmission due to congested links is measured and reactive routing taken efficiently using this algorithmic approach. In this approach when a route is used by more than one, it will inject congestion in to the network. Once the congestion hot spots are identified in network using Link Analysis Approach it route the demands based on HITS measure. The observed results of simulation for the above algorithm also indicate positive signs towards the time take for data transmission is reduced compared to the existing conventional approach in existence. By this results congestion avoidance in Traffic Engineering mechanism handled effectively.

3.3 Traffic Distribution algorithm for Traffic Engineering Mechanism

The effective traffic flow mechanism for sharing traffic in the network routing and resource sharing availability for operational demands is unavoidable in the network environment for data communication in recent scenario to Traffic Engineering mechanism. In existing mechanism routing depends on choice of weights and it not flexible for providing optimal traffic distribution. Traffic Distribution Approach algorithm proposed is for optimal traffic distribution computation based on existing traffic flow in the network and maximum unused capacity available for feasible paths [16].

Algorithmic Presentation of Traffic Distribution Approach:

Algorithm Steps:

Step 1: Start the process by inputting the network graph.

Step 2: Derive the path from source to destination from the inputted graph.

Step 3: Initialize the arrays I, O and L to zero and T to 1 (Where I represent IN, O represent OUT, L represent Load, T represent Traffic index).

Step 4: Discover the set of possible path i.e.) Possible _path(S, D) with minimum traffic index T of link in paths (Where S represent source, D is destination).

Step 5: Let considering all possible path is as PathZ∈ all possible path

Step 6: Calculate the minimum unused PathZ i.e. Minz = Min [∑ (N(x, y) - L(x, y))]

Step 7: If there is one path between S to D then allot traffic necessity to path.

Step 8: Calculate PO, ZE, NE if there is more than one path from source to destination (where PO, ZE, NE are no of path with positive, zero & negative of unused path Minz).

Step 9: Enumerate if PO > 0 &$\sum_{\mathrm{min}_z>0}(\mathrm{min}_z)$>= necessity, then allocate traffic necessity to the path having positive Minz Flow allotted (Pathz) = necessity * $\frac{\mathrm{Minz}}{\sum_{\mathrm{min}_z>0}(\mathrm{min}_z)}$ then Go to Step14

Step 11: Enumerate if PO > 0 &$\sum_{\mathrm{min}_z>0}(\mathrm{min}_z)$< necessity, then allocate traffic necessity to the path having positive Minz Flow allotted (Pathz) = necessity * $\frac{1}{\mathrm{PO}}$ then Go to Step14

Step 12: Enumerate if ZE > 0 &$\sum_{\mathrm{min}_z>0}(\mathrm{min}_z)$>= necessity, then allocate traffic necessity to the path having zero Minz Flow allotted (Pathz) = necessity * $\frac{1}{\mathrm{ZE}}$ then Go to Step14

Step 13: Assign the traffic necessity to the path having negative min_z as follows

Flow allotted (Pathz) = necessity * $\frac{1}{NE}$

Step 14: Then update {Congestion index, I, O, T, and L}

Step 15: Return.

In Traffic Distribution approach demands are placed over the link in such way that the nodes in the network are neither over utilized nor under-utilized. This algorithm avoid congestion corners and redirects the traffic towards the links with minimum link load and the resource is utilized efficiently. So proper balanced traffic to the existing resources accomplished by Traffic Distribution Approach.

4. SIMULATION OF PROPOSED ALGORTHMIC APPROACH

The efficiency of the proposed algorithm approach is simulated to prove the proposed approach effectively handled all the stated issues for Traffic Engineering mechanism [10]. The network topology taken for simulation is a Bidirectional network graph with link capacity of 5Mbps and demand size of 4Mbps (shown in Figure [2]). Simulating the stated network topology with needed demand size for congestion corners are identified in the form of traffic occurrence (shown in Figure [3]). The simulation results of proposed approaches (shown in Figure [4]) clearly representing the congestion corners are averted and traffic are distributed evenly by using the existing resources efficiently.

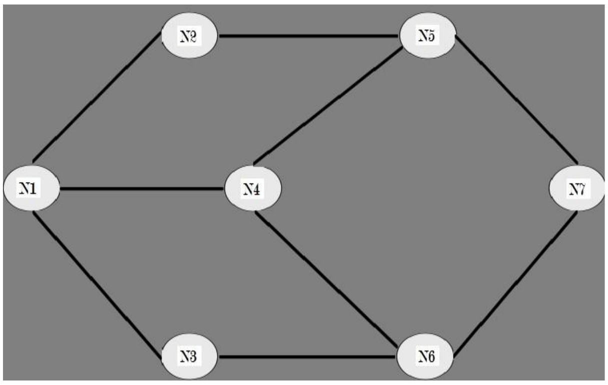

Fig.2 Network Topology Used for Simulation

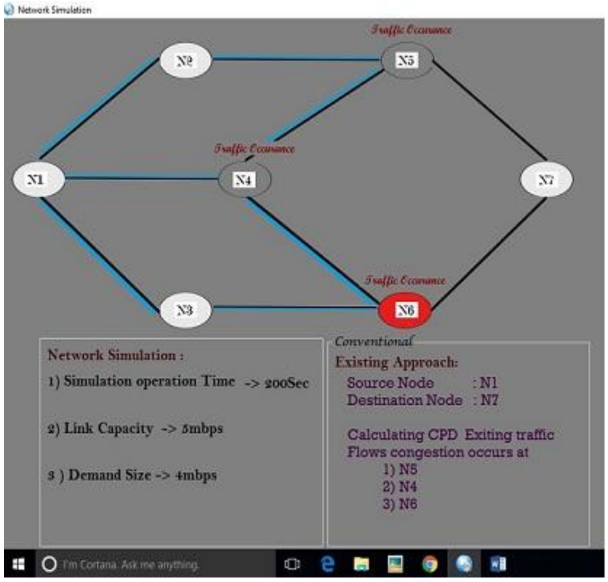

Fig.3 Congestion Identification

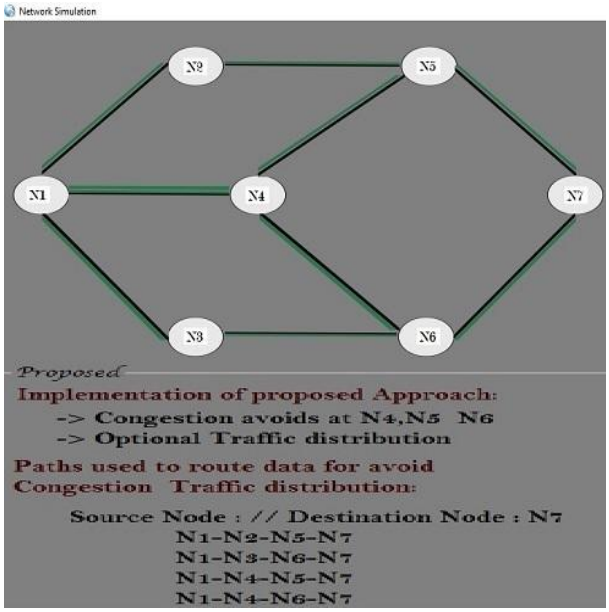

Fig.4 Congestion Avoidance and Traffic Distribution

5. COMPARISION RESULTS OF PROPODED APPROACH

The Comparison results discussed to state the efficiency of proposed algorithmic approach better than the conventional approach in existence. Node Reputation Approach comparison to existing Conventional approach [14] (shown in Figure [5])for Congestion identification test observation gives a reduction of data transmission time by 10 to 20%.The Link Analysis Approach simulation comparison test results show a positive reduction of data transmission time from 7 to 12% (shown in Figure [6])for congestion avoidance. Traffic Distribution algorithmic approach eradicates imbalanced traffic distribution in the network [11]. As a result of imbalanced traffic distribution, some of the links in the network may be over utilized and some others may be underutilized. The simulation result for this approach taken in terms of Link Load percentage to a various number of Traffic flows (shown in Figure [7])gives out average Link Load reduced by 20 to50% and effectively facilitate Traffic Distribution in the networks.

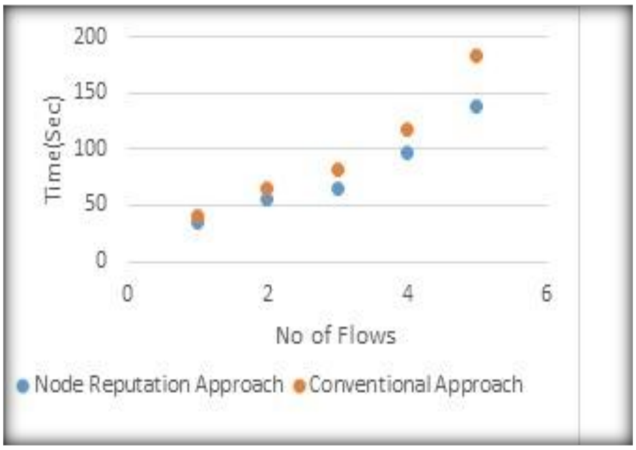

Fig.5 Comparison Results of Node Reputation Approach

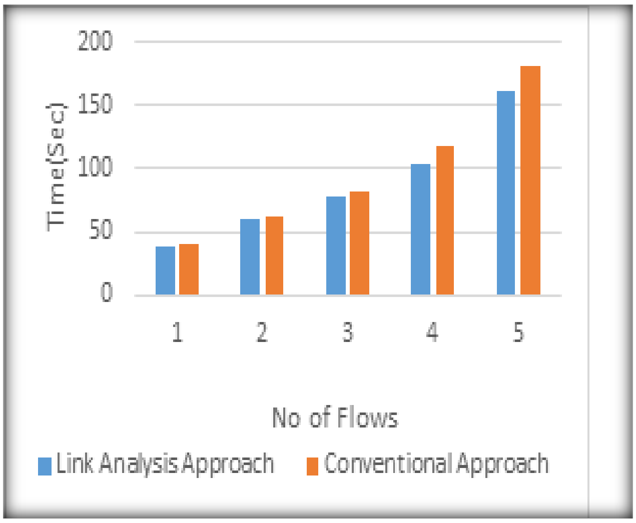

Fig.6 Comparison of Link Analysis Approach

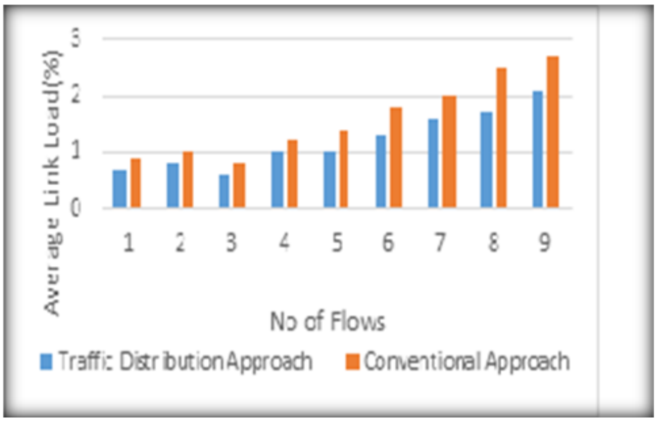

Fig.7 Comparison of Traffic Distribution Approach

6. CONCLUSION

This research work investigate three issues in Traffic Engineering mechanism. There are enormous approaches to investigate traffic issues in the networks but these approaches are designed to manage the congestion window efficiently during data transmission and congestions are managed at gateway level. The issue of congestion avoidance addressed well with the routing decision itself. Traffic Distribution algorithm approach handles the traffic distribution by using existing resource efficiently. The future scope of this algorithmic approach can be extended or simply modified for mobile AdHoc networks. Furthermore, the performance of the proposed approach can be adopted in new algorithms in future to avoid congestion and traffic distribution for wireless networks. The algorithm can be extended for capacity planning of large IP networks to handling the Traffic Issues.

7. REFERENCES

[1] Muhlberger, S.Uhlig, A.Feldmann, O. Maennel, B.Quoitin, & B. Fu., "Impact of routing parameters on route diversity and pathination," Computer Networks, Vol.54, pp.2506-2518, 2010.

[2] Faiz Ahmed, Dr. Irfan Zafar, "Analysis of traffic engineering parameters while using multi-protocol label switching (MPLS) and traditional IP networks," Asian Transaction on Engineering, Vol. 01, issue 3, July 2011.

[3] D.Awduche, Angela chiu, Anwar Elwalid, IndraWidjaja, Xipeng Xiao, "Overview and Principles of Internet Traffic engineering," IETF, Internet draft, January 2002.

[4] DahaiXu, Mung Chiang, Jennifer Rexford," Link- state routing with hop-by-hop forwarding can achieve optimal traffic engineering, "IEEE/ACM Transactions on Networking, Vol.09, Issue 6, pp. 1717-1730, December 2011.

[5] KhanMohsin, "MPLS Traffic Engineering in ISP Networks," International Journal of Computer Applications, Vol. 59, Issue 4, December 2012.

[6] RohitJain, Ram Prasad, Kumawat, Sandeep, Mandalay, Mukeshpatidar, 'Performance Evaluation of Table Driven Multipath Routing Protocols in MANET under varying Nodes, Traffic load & Pause time'', Ijreeice. Vol.2, 2014.

[7] AysegulAltin, B.Fortz and HakanUmit, 'Oblivious OSPF routing with weight optimization under polyhedral demand Uncertainty'', Vol.60, Issue 2, 2012, pp.132-139.

[8] IanF.Akyildiz, AhyoungLee, PuWang, MinLuo and WuChou,''A Roadmap for traffic engineering in SDN-Open Flow networks'', Elsevier, Vol.71, 2014, pp.1-30.

[9] Yuemei Xu, YangLi, TaoLin, Zihou Wang, WejinaNiu, Hui Tangand, Song Ci," A Novel Cache size optimization scheme based on manifold learning in content centric networking," Journal of Network and Computer Applications, Vol.137, 2014, pp.273-281.

[10] Chaudhary.ASachdev.S, Pradhan, Kamath.S, 'Improving Performance of MANET via Cooperative Communication with selective Cooperation method considering dynamic traffic pattern using NS2'', High Performance Computing & Application, International conference, IEEE, December 2014, pp.1-5.

[11] Jens Domke, TorsteinHoefler, Staoshi Matsuoka,'' Fall-in-place network design: interaction between topology, routing algorithm and failures", International Conference for High-Performance Computing,Networking,Storage&Analysis,ACM Digital Library pp. 597-608.

[12] PengLi, Song Guo, Shui Yu, Vasilakos,''Reliable Multicast with Pipelined Network Coding Using Opportunistic Feeding &Routing'', Parallel& Distributed Systems, IEE Transaction, Vol. 25, Issue 12, January 2014, pp. 3264-3273.

[13] Sanjeev Mahajan, 'Performance comparison of Dynamic Source Routing under Varying Traffic Patterns'', Ciit Network and Communication Engineering, Vol.6, 2014.

[14] Raj P.H and SVK Raja, "Identifying Congestion hot spots in MPLS using Bayesian network", Asian J. Inform. Technology, Vol. 6, 2007, pp.854-858.

[15] G.Rakesh and Dr.K.Thangadurai, "A Short study on Routing & Traffic Engineering Design for Global internetworking, Vol.4,Feb.2014,pp.382-387

[16] G.Rakesh and Dr.K.Thangadurai, "Tda Routing for Internet Backbones to Ensure Optimized Computing in Networks, Vol.16, Feb.2016, pp 42-45.