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ADAPTIVE PROBABILISTIC ROUTING ALGORITHM FOR WIRELESS COMMUNICATION NETWORKS: A CASE STUDY OF NETWORK ROUTING PROBLEM.

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Abstract — *The back-pressure algorithm cannot be efficient for adaptive routing as the delay performance is very common problem. In this paper, an attempt has been made to design an probabilistic algorithm that is modified version of back-pressure algorithm. By maintaining a probabilistic routing table that changes slowly over time, real packets do not have to explore long paths to improve throughput; this functionality is performed by the shadow "packets." The proposed algorithm also allows extra link activation to reduce delays. The algorithm has also been shown to reduce the queueing complexity at each node and can be extended to optimally tradeoff between routing and network coding.*

Keywords*-Microcontroller; probabilistic algorithm; back-pressure algorithm; Network routing*

I. INTRODUCTION

Large-scale, are a part of today's global communication infrastructure In the recent global communication networks involve wide area data networks with large scale.. In the areas of different fields such as electronic commerce and entertainment, Networks, internet is a significant social medium. The demand and services from such networks keeps on increasing [1]. Delivering data and transforming the information from one network node to another is basic feature of the network. Huge graph with routers assumed with vertices and transmission lines as edges is treated as data networks. A logical connection established between nodes in a network is modeled as routing for transmission of data packets.[2] The task of developing efficient network is with the leveling of scale and capacity of distribution of the physical network. Routing algorithms play a vital role in the functioning designing of appropriate scalable distribution network. Moreover, necessity of routing algorithms is calculation of paths in for distribution of data in the global network of higher efficiency[3]. A global data network with millions of hosts is an internet. Logical Internet connectivity is dependent of inter- and intra-domain routing algorithms.

II. PROPOSED SYSTEM AND METHOD

In the earlier attempted studies of network routing problems, a poor delay performance and involve high implementation complexity is observed in the back-pressure algorithm. The minor modifications are made in the back-pressure algorithm of present proposal. This algorithm is proposed as a solution to the problems faced by existing routing using backpressure algorithm [4]. As opposed to existing routing which decides in favor of single path, it assigns probabilities multiple paths between a source destination. The modified backpressure algorithm using probabilistic routing table will reduce the delay performance and low complexity solution. Additionally, the implementation of the back-pressure algorithm requires each node to maintain per-destination queues that can be burdensome for a wired or wireless router [5]. In the present study a new adaptive routing algorithm is developed which is built upon back-pressure algorithm. The technique of de-coupling the routing and scheduling components of the algorithm by a method of a probabilistic routing table used to route packets to per-destination queues [6]. The Scheduling decisions in the case of wireless networks are made using counters called shadow queues. The results are also extended to the case of networks that employ simple forms of network coding. In that case, our algorithm provides a low-complexity solution to optimally exploit the routing-coding tradeoff [7].An Adaptive Probabilistic routing Algorithm is modified backpressure algorithm using probabilistic routing table. The advantage of this approach is that buildup of the shadow queues can take place to provide a routing "gradient" for the back-pressure algorithm without corresponding build up of the real queues, but at the cost of compact network capacity [8]. So we brought a new idea which allows the reduction in the number of real queues by routing via probabilistic splitting. One more important observation in the present attempt is reducing delays in routing case because of partial decoupling of shadow back-pressure and real packet transmit allows us to activate more links as compare to regular back-pressure algorithm [9].

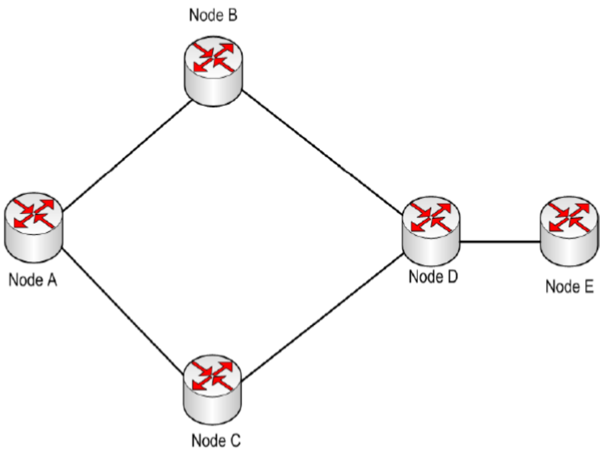

Fig.1. Schematic diagram network

After receiving an update Ljk from neighbor j, node i updates its cost estimate Lik(j) i.e. estimated cost to destination k via neighbor j using equation 1. This procedure is repeated for every neighbor.

Lik(j) = lj + Ljk (1)

Node i then computes overall cost estimate to destination k using equation 2.
This overall cost estimates is used for assigning probabilistic weights to each path and is sent as an update to every neighbor of node i.

E[Lik] = Σj pprevik (j)Lik(j) (2)

Initially when routing table does not exists the algorithm uses equal probabilities for computing the estimated cost. The equal probabilities are only for paths through those neighbors from which update for the destination is received. All the following computations use previous values of probabilities.
Using the estimated costs node i then computes the probabilistic weights for each path using equation 3.
qik(j)=qikprev(j)+ qikprev(j)(E[Lik]−Lik(j))ω (3)

Initially when the routing table does not exists all $qikprev$(j) are

Initially when the routing table does not exists all $qikprev$(j) are assigned equal weights.
1. For all further computations previous values of qik(j) are used. ω is a weighing factor used to deal with negative values of E[Lik] − Lik(j).

If the cost of path to destination k via neighbor j satisfies
Lik(j) < E[Lik]

i.e. the path through neighbor j has less cost than the estimated cost then
qik(j) > qprevik (j)

the probabilistic weight of the path through neighbor j increases. If the cost of path to destination k via neighbor j satisfies 15
Lik(j) > E[Lik]

i.e. the path through neighbor j has more cost than the estimated cost then
qik(j) < qprevik (j)

the probabilistic weight of the path through neighbor j decreases. This ensures that paths with low cost have high probabilistic weights and paths with high cost will have low probabilistic weights.
As the desired relationship between cost of the paths and probabilistic weights has been established node i uses equation 2.4 to compute the probabilities.
$pik(j)= qik(j)\Sigma qik(j)j$ (4)

Node i uses the values of pik(j) to update the routing table.

Dest	(NextHop, Probability)
2	(2, 1)
3	(3, 1)
4	(4, 1)
5	(2, 0.3), (3, 0.4), (4, 0.3)

Table

Network simulator

When a user creates a link using a duplex-link member function of a Simulator object, two simplex links in both directions.

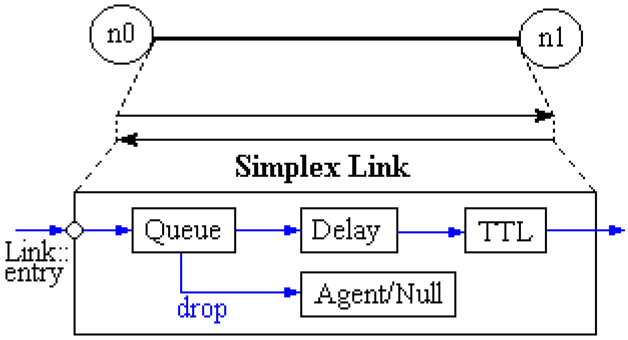

Fig.2: A Link in Network Simulator

One thing to note is that an output queue of a node is actually implemented as a part of simplex link object. Packets dequeued from a queue are passed to the Delay object that simulates the link delay, and packets dropped at a queue are sent to a Null Agent and are freed there. Finally, the TTL object calculates Time To Live parameters for each packet received and updates the TTL field of the packet.

2.1. Parameters for measuring parameters

The following performance metrics are measured in all the above network scenarios:

Average Throughput(Kbps): The throughput is calculated using the following formula:

$throughput = Nbr\ ReceieivedBytes*8SimulationTime*1024Kbps$

Average delay(ms) : Average delay is the summation of the delay of all packets divided by the number of generated packets. Average Delay = $\Sigma delay[n]nbr\ Packets-1n=0nbrPackets-1$

III. SUMULATION RESULTS AND CONCLUSIONS

Simulation is carried out as described above. The entire simulation is carried out in NS 2.34 by using debian linux operating system.

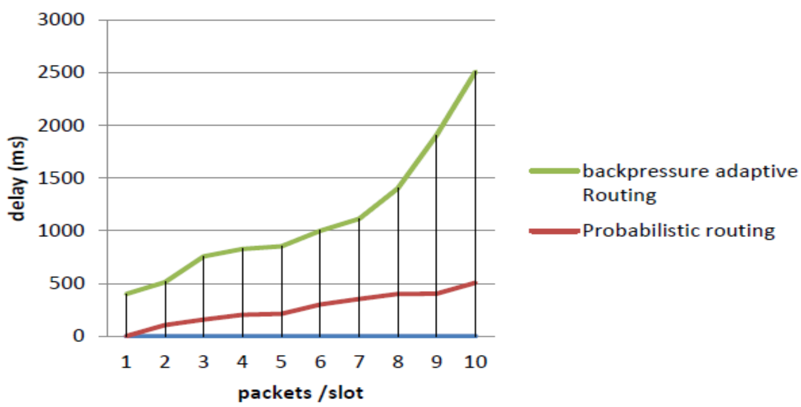

FIG.3. Peformanance Graph of probabilistic routing

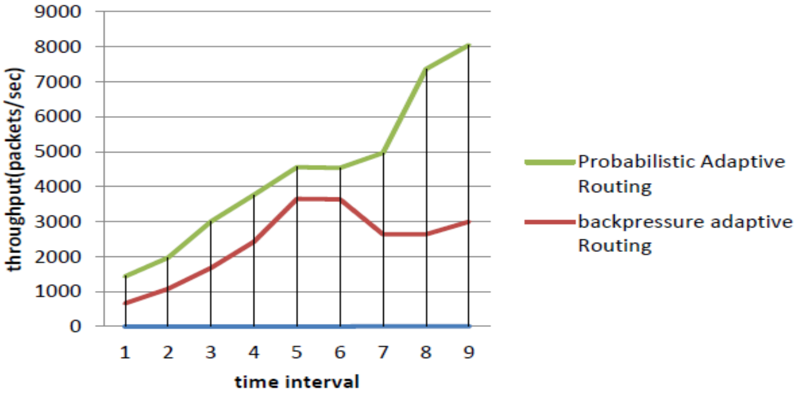

FIG.4. Peformanance Graph of adaptive routing

The back-pressure algorithm, while being throughput-optimal, is not useful in practice for adaptive routing since the delay performance can be really bad. In this paper, we have presented an algorithm that routes packets on shortest hops when possible and decouples routing and scheduling using a probabilistic splitting algorithm built on the concept of shadow queues . By maintaining a probabilistic routing table that changes slowly over time, real packets do not have to explore long paths to improve throughput; this functionality is performed by the shadow "packets." Our algorithm also allows extra link activation to reduce delays. The algorithm has also been shown to reduce the queueing complexity at each node and can be extended to optimally tradeoff between routing and network coding.

REFERENCES

[1] Altman, E. and Jimenez, T. NS Simulator for Beginners.
[2] Altman, E. Boulogne, T. Azouzi, R.E. and Jimenez, T. A survey on networking games.   unication Systems. Nov 2000.
[3] Apostolopoulos, G. Guerin, R. Kamat, S.K. and Tripathi, S.K. "Quality of Service routing: A performance perspective". Proceedings of ACM SIGCOMM, pp. 1728, September 1998.
[4] Bertsekas, D. and Gallager R. Data Networks. Prentice Hall of India, 1997.
[5] Cerf, V. and Kahn, R. "A protocol for packet network intercommunication". IEEE Transactions on Communications, 22(5), pp. 637648, May 1974.
[6] Chen, S. and Nahrsted, K. "An overview of Quality of Service Routing for next generation high-speed networks: problems and solutions." IEEE Networks, pp. 6479, November/December 1998.
[7] Cheng, C. Kumar, S.P.R. and Garcia-Luna-Aceves, J.J. "A distributed algorithm for finding K disjoint paths of minimum total length." Proceedings of the 28th Annual Allerton Conference on Communication, Control, and Computing, Urbana, Illinois, Oct. 1990.
[8] Eleftheria Athanasopoulou, LocX.Bui, Tianxiong Ji, R. Srikant and Alexander Stolyar, "Back-Pressure-Based Packet by Packet Adaptive Routing in communication network" IEEE/ACM Transactions on networking, VOL.21, NO.1,FEBRUARY 2013
[9] IanD.ChakeresandElizabethM.Belding-Royer."AODV Routing Protocol Implementation Design." Proceedings of the International Workshop on Wireless Ad Hoc Networking (WWAN), Tokyo, Japan, March 2004.

