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Adaptive Routing Based On Back Pressure Algorithm in Wireless Communication Network

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Abstract— Back pressure based routing algorithms leads packets to travel through different paths. This results in poor performance and even has computational complexity. We propose new modified adaptive back pressure algorithm by employing and modifying traditional algorithm. In which a routing table is maintained and nodes discover its neighboring nodes with shortest path to reach destination. These discovered neighboring nodes reduces the delay and improves the throughput. In this, the scheduling and routing decisions are made using control message, shadow queue, routing table and neighbor discovery. Our simulation results depict that, our proposed method has better performance than the existing methods.

***Index Terms*— Adaptive Routing algorithm, Back pressure algorithm, PARN algorithm, Shadow Queue algorithm.**

I. INTRODUCTION

The introduction of the paper should explain the nature of the problem, previous work, purpose, and the Back Pressure algorithm can be used to transmit the packet. This algorithm results in delay as it may take longer paths to reach the destination and as it needs to maintain queues for destination. Due to more number of queues, network faces difficulty in maintaining those many queues. To overcome this problem we are proposing a new modified algorithm by designing the probabilistic routing table and ability to discover the neighbor node through which transmission can be faster. We present solutions to poor delay performance and implementation complexity. Propose to improve the delay performance of the back-pressure algorithm. This solution also decreases the complexity of the queuing data structures to be maintained at each node. We have proposed new shadow architecture to improve the delay performance of back-pressure scheduling algorithm. The shadow queuing system allows each node to maintain a single FIFO queues for each of its outgoing links, instead of keeping a separate queue for each flow in the network. This architecture not only reduces the queue backlog but also reduces the number of actual physical queues that each node has to maintain. We also proposed an algorithm that forces the back-pressure algorithm to use the minimum amount of network resources. The shadow algorithm can also be used in the case of adaptive routing, but a node cannot use just one FIFO queue for each neighbor[3].The solution for multi-rate multicast is based on scheduling virtual (shadow) "traffic" that "moves" in reverse direction from destinations to sources. This shadow scheduling algorithm can also be used to control delays in wireless networks. First, we extend the results from the existing theory for unicast flows to consider single-rate multicast sessions. However, such an extension is not straightforward in case of multi-rate multicast. Therefore, we introduce the concept of shadow queues, and propose a shadow algorithm which can achieve the optimal solution for multi-rate multicast. It turns out that our approach can also be used to exercise some degree of control over QoS (packet delays) delivered to the users of the network [4]. We extend recent results on fair and stable resource allocation in wireless networks to include multicast sessions. The solution for multi-rate multicast is based on scheduling virtual (shadow) "traffic" that "moves" in reverse direction from destinations to sources. This shadow scheduling algorithm can also -be used to control delays in wireless networks [5]. Back-pressure-type algorithms based on the algorithm by Tassiulas and Ephremides have recently received much attention for jointly routing and scheduling over multihop wireless networks.. This paper proposes a new routing/scheduling back-pressure algorithm that not only guarantees network stability (throughput optimality), but also adaptively selects a set of optimal routes based on shortest-path information in order to minimize average path between source and destination. Our result indicates that under the traditional back pressure algorithms the end-to-end packet delay first decreases and then increases as a function of the network load . Proposed algorithm adaptively selects a set of routes according to the traffic load so that long paths are used only when necessary, thus resulting in much smaller end-to-end packet delays as compared to the traditional back-pressure algorithm[6]. Network coding has been recently applied to wireless networks to increase throughput. It is typically implemented as a thin layer between MAC and IP, transparently to higher layers. In this paper, we study rate control and scheduling over wireless networks with intersession network coding. There is benefit from making rate control and scheduling aware of the underlying network coding. The key intuition is that network coding introduces new network coded flows and eventually new conflicts between nodes, which should be taken into account both in rate control and in scheduling.[9]

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II. PARN: PACKET BY PACKET ADAPTIVE ROUTING FOR NETWORK

In the traditional back-pressure algorithm, each node has to maintain a queue for each destination. There may be many numbers of nodes and destination within the network ,as each node has to maintain the queue for its destination there will be large number of queues in the network .Nodes can perform the transmission along the long paths through which those nodes are connected .As maintenance of the more number of queues will be difficult we can have smaller number of queue by making the each node to have the queue for its next neighbor and is called as Shadow queue. The number of queues will be smaller as compared to the traditional Back pressure algorithm. This even supports larger network. It In additional to real queues, each node also maintains a counter, which is called shadow queue for each of the destination .

2.1 Shadow queue algorithm

Each node maintains a separate queue of packets for each destination d its length is denoted Qnd. Each link is assigned a weight

$$W = Max(nd\ )[Q(nd)-Q(jd)-1 \ldots (1)$$

Scheduling /routing : Scheduling and Routing is performed according to the information present in routing table. The shadow algorithm works using the concept of shadow queuing. Every nodes in the network has its own queue. Queue will be updated as the transmission takes place. Packets are used as the control messages for routing and scheduling. When packets arrive at node in the network for the transmission to reach the destination queue will be incremented by 1 and when that packet is added to the queue then that queue will be once again incremented by1. The shadow queue algorithm is can support the transmission of many number of packets. Queue will be incremented upon arrival of the packets and decremented when packets are delivered.

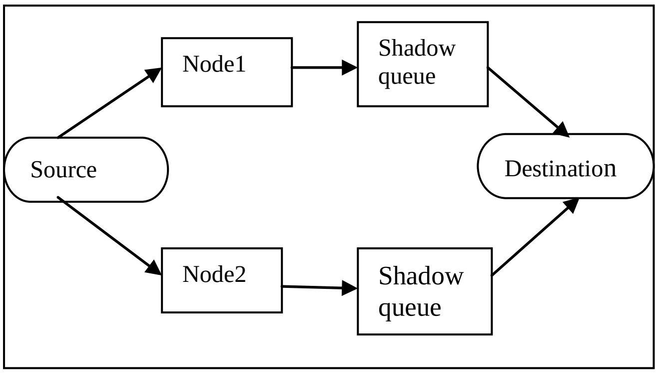

Fig 1: Shadow queue algorithm

Review Stage In above Fig we have showed how the transmission takes place. Source is sending the packets to destination while this process packets selects suitable node, it selects a node such that it has shortest path to reach the destination, in this case it may select node1 or node2 according to its path to the destination, each node maintains the queues, when packets arrives for delivery queue will be updated and packets are transmitted.

2.2 Adaptive Routing Algorithm

Packets are transmitted to the destination using the information available in routing table and neighbour nodes. As packets arrives for a transmission to destination are passed through the neighbor node which has shortest path to the destination. A packet which are to be transmitted to destination at the node are inserted into queue maintained by that node for next neighbor node.

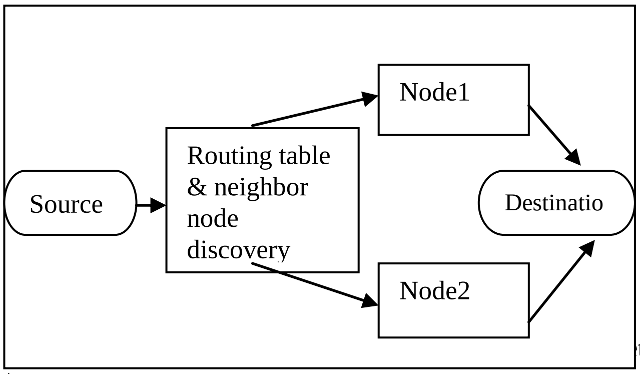

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Fig 1: Adaptive routing algorithm

destination during the transmission it checks the routing table for the information required for transmission and also discovers the neighbor node through which packets can reach destination optimally and pass through the shortest path.

III. FLOWCHART

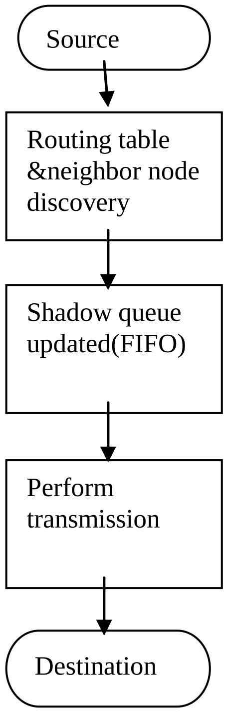

Fig3. Combination of shadow queue algorithm and adaptive routing algorithm.

We can have single source or multiple sources when packets are transmitting it checks the information available in routing table which is required for the transmission and selects the node which has shortest path to reach destination. Then after getting required information transmission takes place ,when packets arrives for transmission at the node shadow queue will be updated this shadow queue will be maintained by that node and packets are transmitted in first in first out fashion then after transmission takes place, finally packets reach the destination.

IV. PERFORMANCE EVALUATION

We have compared delay of Modified Routing algorithm (PARN) with Traditional Back Pressure algorithm:
Delay in Traditional back pressure algorithm is more compared to Modified Routing algorithm.

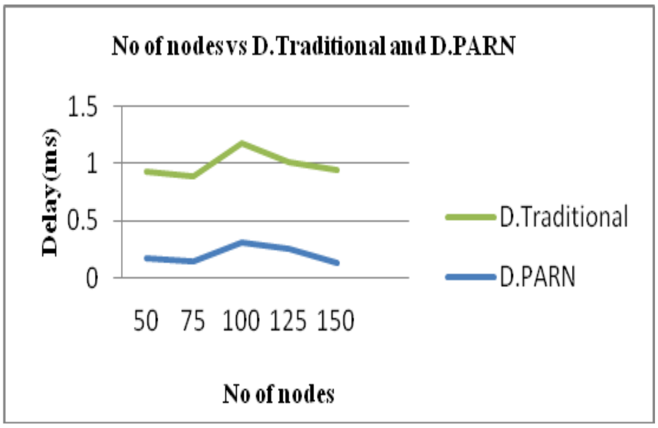

Fig 4. Number of nodes versus delay

We have compared Throughput of Modified Routing algorithm with Traditional Back Pressure algorithm

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Throughput of Modified Routing algorithm is more than Traditional Back Pressure algorithm

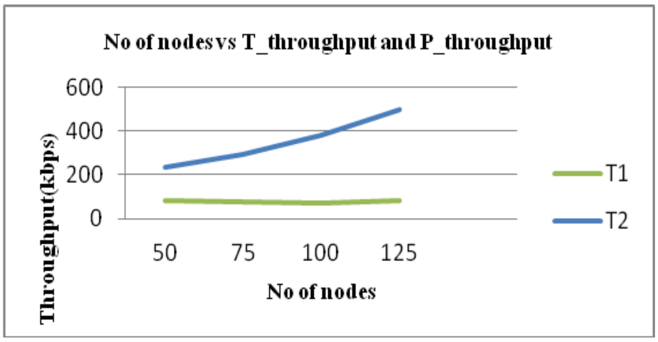

Fig 5 : Number of nodes versus throughput of parn and traditional algorithm.

V. CONCLUSION

The traditional back-pressure algorithm takes longer paths to reach the destination from source and may also take loops hence there will delay in performance and provides less throughput. Now we have proposed modified algorithm that takes the shortest paths to reach the destination .Modified adaptive algorithm uses default adaptive routing table and discovers the neighbors node which has the shortest path to reach the destination is used for the transmission hence we can reduce the delay and get better performance compare to traditional algorithm

VI. REFERENCES

[1] L. Tassiulas and A. Ephremides, "Stability properties of constrained queueing systems and scheduling policies for maximum throughput in multihop radio networks," IEEE Trans. Autom. Control, vol. 37, no. 12, Dec. 1992.pp. 1936–1948
[2] M. J. Neely, E. Modiano, and C. E. Rohrs, "Dynamic power allocation and routing for time varying wireless networks," IEEE J. Sel. Areas Commun., vol. 23, no. 1, pp. 89–103, Jan. 2005.
[3] L. Bui, R. Srikant, and A. L. Stolyar, "Novel architectures and algorithms for delay reduction in back-pressure scheduling and routing," in Proc. IEEE INFOCOM Mini-Conf., Apr. 2009, pp. 2936–2940.
[4] L. Bui, R. Srikant, and A. L. Stolyar, "A novel architecture for delay reduction in the back-pressure scheduling algorithm," IEEE/ACM Trans. Netw., vol. 19, no. 6, pp. 1597–1609, Dec. 2011.
[5] L. Bui, R. Srikant, and A. L. Stolyar, "Optimal resource allocation for multicast flows in multihop wireless networks," Phil. Trans. Roy. Soc., Ser. A, vol. 366, pp. 2059–2074, 2008.[6] L. Ying, S. Shakkottai, and A. Reddy, "On combining shortest-path and back-pressure routing over multihop wireless networks," in Proc. IEEE INFOCOM, Apr. 2009, pp. 1674–1682.
[7] S. Katti, H. Rahul, W. Hu, D. Katabi, M. Medard, and J. Crowcroft, "XORs in the air: Practical wireless network coding," Comput. Commun. Rev., vol. 36, pp. 243–254, 2006.
[8] M. Effros, T. Ho, and S. Kim, "A tiling approach to network code design for wireless networks," in Proc. Inf. Theory Workshop, 2006, pp. 62–66.
[9] H. Seferoglu, A. Markopoulou, and U. Kozat, "Network coding-aware rate control and scheduling in wireless networks," in Proc. ICME Special Session Netw. Coding Multimedia Streaming, Cancun, Mexico, Jun. 2009, pp. 1496–1499.
[10] S. B. S. Sengupta and S. Rayanchu, "An analysis of wireless network coding for unicast sessions: The case for coding-aware routing," in Proc. IEEE INFOCOM, Anchorage, AK, May 2007, pp. 1028–1036.