OPTIMAL SCHEDULING ALGORITHM FOR THROUGHPUT MAXIMIZATION IN MULTIHOP WIRELESS NETWORKS

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Abstract

In this paper, focus on designing a scheduling scheme for achieve maximum throughput. Although, it does not require per-flow or per-destination information and also, this paper consider the problem of link scheduling in Multihop Wireless Networks under general interference constraints. The main goal is to achieve maximum throughput and better delay performance at low complexity. Previously, we use Max Weight Scheduling Algorithm (Per-Hop Queue and Per-Link Queue Scheduling) for Throughput maximization. These algorithms does not require per-flow information but it need local hop count information and use simple data Queue for each link in the network. Some time occurring buffer overflow (that is data queue overflow) because each link maintain simple data Queue. Our proposed scheme overcomes this problem and produces better delay performance and throughput at low complexity. Our proposed scheme combines MaxWeightScheduling and Greedy Algorithm, which reduce buffer overflow and achieve maximum throughput at low complexity. The performance of the proposed scheme is analyzed by various setting NS2 simulation. Prove that proposed scheme is optimal one and produce efficient throughput at low complexity.

Keywords: *Max Weight Scheduling, Throughput, Scheduling, Per-Hop Queue Scheduling, Per-Link Queue Scheduling, Greedy Algorithm, hop count information, buffer overflow, without per-flow information.*

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1. INTRODUCTION

Link Scheduling is the major problem in Multihop Wireless Networks. In existing system use MaxWeight Scheduler for maximizing throughput without per-flow or per-destination information. The MaxWeight Scheduler includes queue based algorithms as follows, one is per-Hop Queue based MaxWeight Scheduler, another one is per-Link Queue based MaxWeight Scheduler. These algorithms do not require any per-flow information and do not exchange queue length information among neighboring nodes[1]. These algorithms maintain simple queue structure in every node. The major drawback is buffer over flow. To solve this problem using Greedy algorithm.

The remainder of the paper is organized as follows. In Section 2, we present a detailed description of our system model. In Section 3, we prove throughput optimality of HQ-MWS. We show throughput optimality of PLQ-MWS and FLQ-MWS in Section 4. We show that better Throughput of Greedy techniques in Section 5. In Section 6, we combine Max Weight Scheduling and Greedy Techniques. Furthermore, we evaluate different scheduling schemes through simulations in Section 7. Finally, we conclude our paper in Section 8.

2. SYSTEM MODEL

We consider a multihop wireless network described by a directed graph G=(V,E), where V denotes the set of nodes and E denotes the set of links. Nodes are wireless transmitters/receivers, and links are wireless channels between two nodes if they can directly communicate with each other. Let b(l) and e(l) denote the transmitting node and receiving node of link $l = (b(l),e(l)) \varepsilon E$, respectively. Note that we distinguish links (i,j) and (j,i). We assume a time-slotted system with a single frequency channel. Let c_l denote the link capacity of link l , i.e., link l can transmit at most c_l packets during a time-slot if none of the links that interfere with l is transmitting at the same time. We assume unit capacity links, i.e.c_l =1 for all $l \varepsilon E$. A flow is a stream of packets from a source node to a destination node. Packets are injected at the source and traverse multiple links to the destination via multihop communications. Let S denote the set of flows in the network.

3. SCHEDULING WITH PER-HOP QUEUES

In this scheduling, first discover routes between source and destination nodes. Then, to determine the hop count values for every routes. After that, select the small hop count value

path for transmitting data packets to their corresponding destination. Data packets are reach destination successfully.

From the Fig 1, Per-Hop Queue Scheduling first discovers the route between source to destination and also determines the length of the queue. Higher Priority to small queue length link and forward the data packets to corresponding destination through that link.

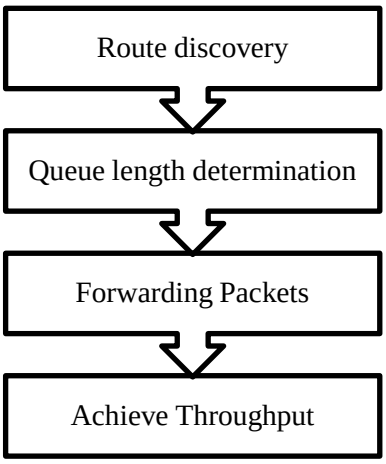

Fig -1: Procedure for Scheduling with Per-Hop Queues

4. SCHEDULING WITH PER-LINK QUEUES

4.1 LQ-MWS with Priority Discipline

In this section we discuss about per-Link queue scheduling with priority discipline. This algorithm working based on the hop count value that is, number of hop present in between source node to destination node. It gives higher priority to less hop count value path.

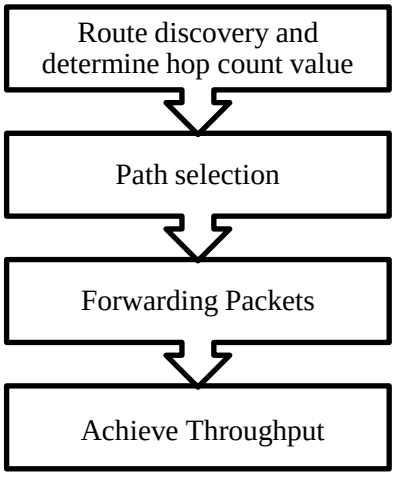

Fig -2: Procedure for LQ-MWS With Priority Discipline

From the Fig 2, Per-Link Queue Scheduling with Priority discipline first discovers the routes between source to destination and also determine the hop count value that is, number of hop between source to destination. Path selection is based on hop count information. Forward the data packets to corresponding destination.

4.2 LQ-MWS with FIFO Discipline:

In this section we discuss about per-Link queue scheduling with FIFO discipline. This algorithm does not requires hop count information that is, number of hop present in between source node to destination node and per-flow information.

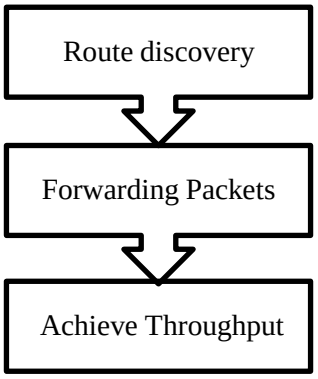

Fig -3: Procedure for LQ-MWS With FIFO Discipline

From the Fig 3, Per-Link Queue Scheduling with FIFO discipline first discovers the route between source to destination. Forward the data packets to corresponding destination through activate link.

5. GREEDY TECHNIQUE

In this section we discuss about Greedy Technique. In Greedy manner, the current node always forwards a data packet to its neighbour nodes that is closest to the destination node. The other name of Greedy Maximal Scheduling (GMS) is Longest-Queue-First (LQF) Scheduling. It is another natural low-complexity alternative to MWS which has been observed to achieve very good throughput and delay performance in a variety of wireless network. It satisfies the local-pooling condition for achieve.

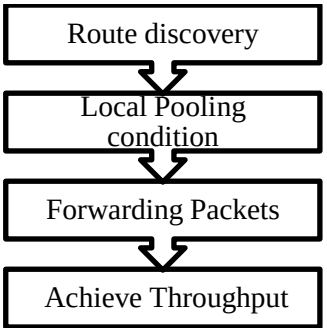

Fig -4: Procedure for Greedy Technique

From the Fig 4, Greedy Technique first discovers the route between source to destination. To generate Local pooling condition and satisfied it. Forward the data packets to corresponding destination through that link.

6. COMBINED SCHEDULING SCHEMES

In this Section, we discuss about combined scheduling scheme that is, Per-Hop Queue and Per-Link Queue scheduling combined with Greedy algorithm. In these Queue based Scheduling schemes has buffer overflow performance and high complexity. So, to combine greedy techniques with these Queue based Scheduling we achieve small buffer overflow performance and more throughput at low complexity.

This combined scheduling scheme has the following advantages. They are,

- Small buffer overflow
- Does not requires per-flow information
- Reduce complexity
- Better delay performance
- And maximum throughput

From the Fig 5, Combined scheduling schemes first discovers the route between source to destination. To determines the length of the queue and shortest path between source to destination. Forward the data packets to corresponding destination through that shortest path i.e optimum path.

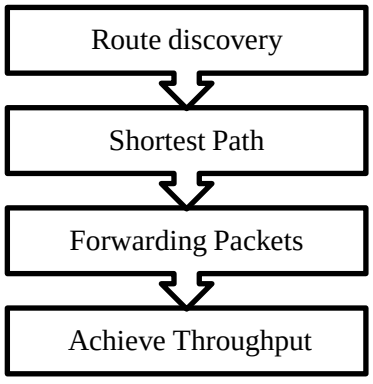

Fig -5: Procedure for Combined Scheduling scheme

7 SIMULATION RESULT

To shows Fig 6: Grid network topology with 16 nodes. Each and every node adjacent to their neighboring node. In this simulation, source and destination nodes are fixed one. To apply various scheduling scheme for analysis their throughput performance. Applying Per-Hop Queue, Per-Link Queue scheduling, Greedy Algorithm and Combined scheduling i.e. Queue based Scheduling with Greedy algorithm.

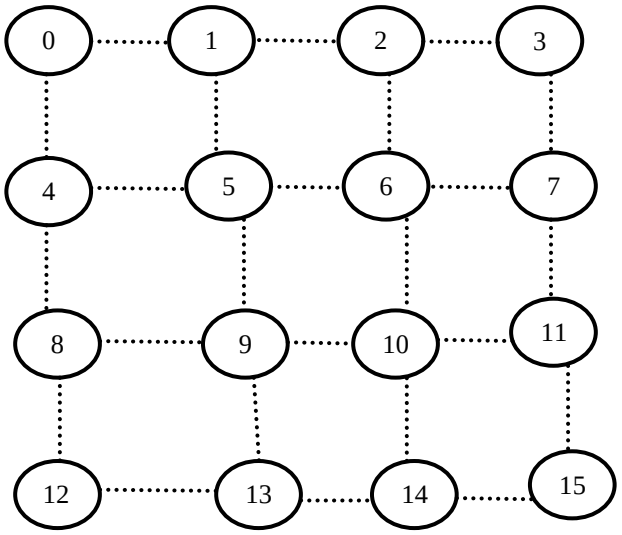

Fig -6: Grid Network Topology

For example, the node 9 has the following adjacent neighboring nodes. they are node 5, node 8, node 10, node13.

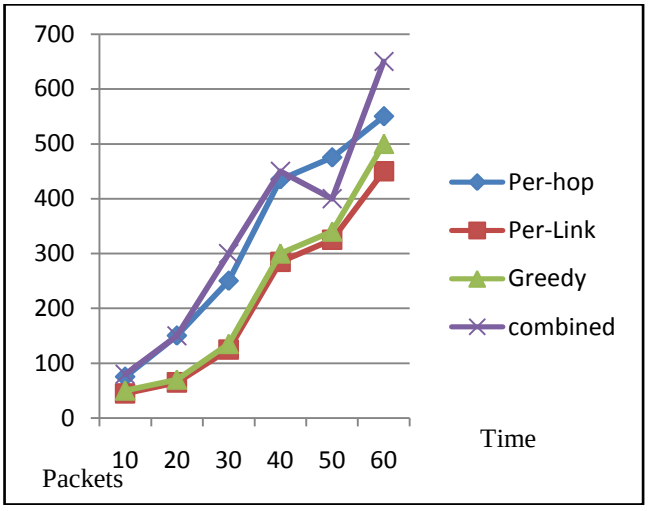

Fig -7: Graph Analysis for Various Scheduling schemes

All the scheduling schemes are analyzed by this graph (Fig-7). In this graph, X-axis represents the Time and Y-axis represents the delivered data Packets. The blue color curve represents the Per-Hop Queue Scheduling scheme performance. The red color curve represents the Per-Link Queue scheduling schemes. The Greedy Algorithm is represented by green color. Finally, violet color indicates the combine scheduling scheme.

From the graph analysis, the combined scheduling scheme has more throughputs compared to all algorithms. The combined scheduling achieves more throughput and good delay performance at low complexity.

8. CONCLUSIONS

In this paper developed combined scheduling policies per-hop/per-link queue with Greedy algorithm. This combine scheduling algorithm achieve maximum throughput without per-flow information and good delay performance at low complexity. It reduce buffer overflow that is queue overflow for improve throughput efficiency. This greedy algorithm satisfies the local pooling condition for improve the throughput. Further, to generate sufficient local pooling condition for achieve 100% throughput.

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BIOGRAPHIES

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