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Opportunistically Identify and Routing Packets Using D-ORCD Method in Wireless Ad Hoc Networks

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Abstract:

We consider the problem of routing packets across a multi-hop network consisting of multiple sources of traffic and wireless links while ensuring bounded expected delay. Each packet transmission can be overheard by a random subset of receiver nodes among which the next relay is selected opportunistically. The main challenge in the design of minimum-delay routing policies is balancing the trade-off between routing the packets along the shortest paths to the destination and distributing the traffic according to the maximum backpressure.

Combining important aspects of shortest path and backpressure routing, this paper provides a systematic development of a distributed opportunistic routing policy with congestion diversity (D-ORCD). D-ORCD uses a measure of draining time to opportunistically identify and route packets along the paths with an expected low overall congestion. D-ORCD with single destination is proved to ensure a bounded expected delay for all networks and under any admissible traffic, so long as the rate of computations is sufficiently fast relative to traffic statistics.

Furthermore, this paper proposes a practical implementation of D-ORCD which empirically optimizes critical algorithm parameters and their effects on delay as well as protocol overhead. Realistic QualNet simulations for 802.11-based networks demonstrate a significant improvement in the average delay over comparable solutions in the literature.

INTRODUCTION:

Opportunistic routing for multi-hop wireless ad hoc networks has long been proposed to overcome the deficiencies of conventional routing. Opportunistic routing mitigates the impact of poor wireless links by exploiting the broadcast nature of wireless transmissions and the path diversity. More precisely, the opportunistic routing decisions are made in an online manner by choosing the next relay based on the actual transmission outcomes as well as a rank ordering of neighboring nodes [1]. The authors in provided a Markov decision theoretic formulation for opportunistic routing and a unified framework for many versions of opportunistic routing, with the variations due to the authors' choices of costs. In particular, it is shown that for any packet, the optimal routing decision, in the sense of minimum cost or hop-count, is to select the next relay node based on an index. This index is equal to the expected cost or hop-count of relaying the packet along the least costly or the shortest feasible path to the destination. When multiple streams of packets are to traverse the network, however, it might be desirable to route some packets along longer or more costly paths, if these paths eventually lead to links that are less congested [2]. More precisely, as noted in the opportunistic routing schemes in can potentially cause severe congestion and unbounded delay (see the examples given in).

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In contrast, it is known that an opportunistic variant of backpressure, diversity backpressure routing (DIVBAR) ensures bounded expected total backlog for all stabilizable arrival rates. To ensure throughput optimality (bounded expected total backlog for all stabilizable arrival rates), backpressure-based algorithms do something very different from: rather than using any metric of closeness (or cost) to the destination, they choose the receiver with the largest positive differential backlog (routing responsibility is retained by the transmitter if no such receiver exists) [3]. This very property of ignoring the cost to the destination, however, becomes the bane of this approach, leading to poor delay performance in low to moderate traffic (see). Other existing provably throughput optimal routing policies distribute the traffic locally in a manner similar to DIVBAR and hence, result in large delay[9].

EXISTING SYSTEM:

- The opportunistic routing schemes can potentially cause severe congestion and unbounded delay. In contrast, it is known that an opportunistic variant of backpressure, diversity backpressure routing (DIVBAR) ensures bounded expected total backlog for all stabilizable arrival rates. To ensure throughput optimality (bounded expected total backlog for all stabilizable arrival rates), backpressure-based algorithms do something very different: rather than using any metric of closeness (or cost) to the destination, they choose the receiver with the largest positive differential backlog (routing responsibility is retained by the transmitter if no such receiver exists).
- E-DIVBAR is proposed: when choosing the next relay among the set of potential forwarders, E-DIVBAR considers the sum of the differential backlog and the expected hop-count to the destination (also known as ETX).

DISADVANTAGES OF EXISTING SYSTEM:

- The existing property of ignoring the cost to the destination, however, becomes the bane of this approach, leading to poor delay performance in low to moderate traffic.
- Other existing provably throughput optimal routing policies distribute the traffic locally in a manner similar to DIVBAR and hence, result in large delay.
- E-DIVBAR does not necessarily result in a better delay performance than DIVBAR.

PROPOSED SYSTEM:

- The main contribution of this paper is to provide a distributed opportunistic routing policy with congestion diversity (D-ORCD) under which, instead of a simple addition used in E-DIVBAR, the congestion information is integrated with the distributed shortest path computations .
- A comprehensive investigation of the performance of D-ORCD is provided in two directions:
- We provide detailed simulation study of delay performance of D-ORCD. We also tackle some of the system-level issues observed in realistic settings via detailed simulations.
- In addition to the simulation studies, we prove that D-ORCD is throughput optimal when there is a single destination (single commodity) and the network operates in stationary regime. While characterizing delay performance is often not analytically tractable, many variants of backpressure algorithm are known to achieve throughput optimality.

ADVANTAGES OF PROPOSED SYSTEM:

- We show that D-ORCD exhibits better delay performance than state-of-the-art routing policies with similar complexity, namely, ExOR, DIVBAR, and E-DIVBAR. We also show that the relative performance improvement over existing solutions, in general, depends on the network topology but is often significant in practice, where perfectly symmetric network deployment and traffic conditions are uncommon.
- We show that a similar analytic guarantee can be obtained regarding the throughput optimality of D-ORCD. In particular, we prove the throughput

optimality of D-ORCD by looking at the convergence of D-ORCD to a centralized version of the algorithm. The optimality of the centralized solution is established via a class of Lyapunov functions proposed.

IMPLEMENTATION:

- **Service provider:**

In this module, the service provider will browse the data file path and then send to the particular receivers. Service provider will send their data file to Adhoc router and router will connect to networks, in a network smallest distance node will be activated and send to particular receiver (A, B, C…). And if any jammer node will found, then service provider will reassign the energy for node [4].

- **Adhoc Router**

The **Adhoc** Router manages a multiple networks (network1, network2, network3, and network4) to provide data storage service. In network n-number of nodes (n1, n2, n3, n4…) are present, in networks every node consists of distance and energy. In a network shortest distance node will communicate first. The service provider can assign energy for node, view energy for all networks and node history details (view routing path, view boundary nodes, view jamming nodes & view total time delay) in router. Router will accept the file from the service provider and then it will connect to different networks; the all networks are communicates and then send to particular receiver. In a router we can view time delay, jammed nodes and also routing path [7].

- **Network**

In this module the networks (network 1, network 2, network 3 and network 4) consists of n-number nodes. In networks every node consists of distance and energy. In a network shortest distance node will communicate first. The node consists of lesser energy then that node will be jammed by the jammers. And then it will forward to next lesser distance node within the network. In a network last node will be considered as boundary node [6].

- **Receiver (End User)**

In this module, the receiver can receive the data file from the service provider via Adhoc router. The receivers receive the file by without changing the File Contents. Users may receive particular data files within the network only [5].

- **Node Failures**

In this system, the lesser energy node will be considered as a failure node. Once the failure became active, affected nodes lost their neighbors partially or completely, lost all of their neighbors and became failure nodes[8].

Conclusion:

In this paper, we provided a distributed opportunistic routing policy with congestion diversity (D-ORCD) by combining the important aspects of shortest path routing with those of backpressure routing. Under this policy packets are routed according to a rank ordering of the nodes based on a congestion measure. Furthermore, we proposed a practical distributed and asynchronous 802.11 compatible implementation of D-ORCD, whose performance was investigated via a detailed set of QualNet simulations for practical and realistic networks. Simulations showed that D-ORCD consistently outperforms existing routing algorithms.

We also provided theoretical throughput optimality proof of D-ORCD. In D-ORCD, we do not model the interference from the nodes in the network, but instead leave that issue to a classical MAC operation. The generalization to the networks with inter-channel interference seem to follow directly from, where, the price of this generalization is shown to be the centralization of the routing/scheduling globally across the network or a constant factor performance loss of the distributed variants. In future, we are interested in generalizing D-ORCD for joint routing and scheduling optimizations as well considering the system-level implications. Incorporating throughput optimal CSMA based MAC scheduler with congestion aware routing is also promising area of research.

The design of D-ORCD requires knowledge of channel statistics. Designing congestion control routing algorithms to minimizeexpected delay without the topology and the channel statistics knowledge is an area of future research.

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