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Aware Routing in Spatial Reusability by Multi –Hop Wireless Network

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ABSTRACT

In the problem of routing in multi-hop wireless networks, to achieve high end-to-end throughput, it is crucial to find the "best" path from the source node to the destination node. Although a large number of routing protocols have been proposed to find the path with minimum total transmission count/time for delivering a single packet, such transmission count/time minimizing protocols cannot be guaranteed to achieve maximum end-to-end throughput. In this paper, we argue that by carefully considering spatial reusability of the wireless communication media, we can tremendously improve the end-to-end throughput in multi-hop wireless networks. To support our argument, we propose spatial reusability-aware single-path routing (SASR) and anypath routing (SAAR) protocols, and compare them with existing single-path routing and anypath routing protocols, respectively. Our evaluation results show that our protocols significantly improve the end-to-end throughput compared with existing protocols. Specifically, for single-path routing, the median throughput gain is up to 60 percent, and for each source-destination pair, the throughput gain is as high as 5:3, for anypath routing, the maximum per-flow throughput gain is 71.6 percent, while the median gain is up to 13.2 percent.

Index Terms—*Routing, wireless network, protocol design*

1. INTRODUCTION

Due to limited capacity of wireless communication media and lossy wireless links [1], it is extremely important to carefully select the route that can maximize the end-to-end throughput, especially in multi-hop wireless networks. In recent years, a large number of routing protocols have been proposed for multihop wireless networks [2-5]. However, a fundamental problem with existing wireless routing protocols is that minimizing the overall number (or time) of transmissions to deliver a single packet from a source node to a destination node does not necessarily maximize the end-to-end throughput.

1.1 EXISTING SYSTEM

- Most of existing routing protocols, no matter single path routing protocols or any path routing protocols, rely on link-quality aware routing metrics, such as link transmission count-based metrics and link transmission time-based metrics (e.g., ETT and EATT) [7]. They simply select the (any) path that minimizes the overall transmission counts or transmission time for delivering a packet.
- Zhang et al. formulated joint routing and scheduling into an optimization problem, and solved the problem with a column generation method.
- Pan et al. dealt with the joint problem in cognitive radio networks considering the vacancy of licensed bands.
- Jones et al. implemented k-tuple network coding and proved throughput optimality of their policy.

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1.2 DISADVANTAGES OF EXISTING SYSTEM

- A fundamental problem with existing wireless routing protocols is that minimizing the overall number (or time) of transmissions to deliver a single packet from a source node to a destination node does not necessarily maximize the end-to-end throughput.
- Most of the existing routing protocols do not take spatial reusability of the wireless communication media into account.
- They need centralized control to realize MAC-layer scheduling, and to eliminate transmission contention [9].

1.3 PROPOSED SYSTEM

- In this paper, we investigate two kinds of routing protocols, including single-path routing and anypath routing. The task of a single-path routing protocol is to select a cost minimizing path, along which the packets are delivered from the source node to the destination node [3].
- In this primer work, we argue that by carefully considering spatial reusability of the wireless communication media, we can tremendously improve the end-to-end throughput in Multihop wireless networks [2].
- The algorithms proposed in this work do not require any scheduling, and the SASR algorithms can be implemented in a distributed manner.

1.4 ADVANTAGES OF PROPOSED SYSTEM

- To the best of our knowledge, we are the first to explicitly consider spatial reusability of the wireless communication media in routing, and design practical spatial reusability-aware single-path routing (SASR) and anypath routing (SAAR) protocols [4].
- We formulate the problem of spatial reusability aware single-path routing as a binary program, and propose two complementary categories of algorithms for path selection. While one category (SASR-MIN and SASR-FF) tends to exploit the best performance of the paths, the other category (SASR-MAX) [6] evaluates the performance of the paths in the worst case.
- We further investigate the spectrum spatial reusability in any path routing, and propose SAAR algorithm for participating node selection, cost calculation, and forwarding list determination.
- We have evaluated SASR algorithms and SAAR algorithm with different data rates [8].
- The evaluation results show that our algorithms significantly improve the end-to-end throughput compared with existing ones.

2. SYSTEM ARCHITECTURE

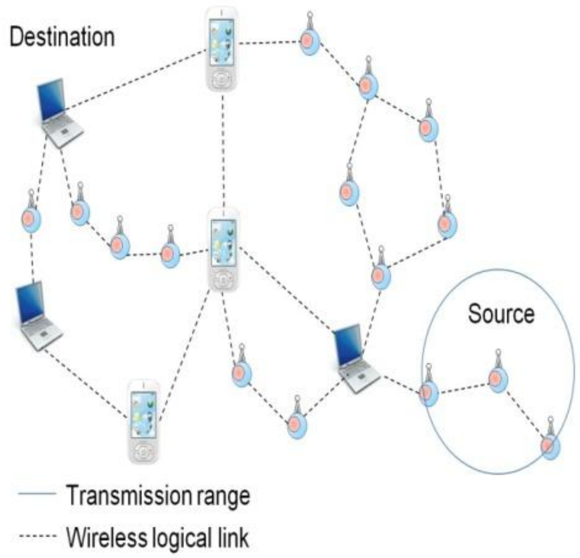

Fig 1: System Architecture

3. MODULES

- System Construction Module
- Cost Minimizing
- Shortest path
- Cost Maximizing Fusion

3.1 MODULES DESCRIPTION

System Construction Module

- We consider a static multi-hop wireless network with a set of N nodes. For clarity, we assume that the nodes use the same transmission rate, and do not employ any power control scheme in this work.

- Since wireless signal fades in the process of propagation, two wireless (hyper-links) [11] can work simultaneously, if they are spatially far away enough from each other.
- We define non-interfering set I, in which any pair of (hyper-) links are out of the interference range of each other, i.e., the (hyper-)links in the same non-interfering set can work at the same time.

Cost Minimizing

- In this module is used to users for minimizing the cost of file transferring process from sender to recover. Path cost minimizing collection reflects the best possible performance of the path. SASR algorithm calculates the spatial reusability aware path cost of it. Then, the path with the smallest cost can be selected.
- In a spatial reusability-aware path cost evaluation for single-path routing a given each of the paths found by an existing source routing protocol (e.g., DSR), our SASR algorithm [6] calculates the spatial reusability aware path cost of it. Then, the path with the smallest cost can be selected.
- In a Spatial Reusability-Aware Single-Path Routing we propose the First-Fit Algorithm for Min-Cost Fusion all the maximal non-interfering set on path P needs time, which is still inefficient when the path P is long. Therefore, we propose a first-fit algorithm, namely SASR-FF, which can achieve good performance in most of the cases.
- In a Spatial Reusability-Aware Anypath Routing we present the spatial reusability-aware anypath routing algorithm. Since finding the minimized end to-end cost considering the spatial reusability is NP-hard, our algorithm SAAR is designed to calculate a suboptimal route, which can achieve superior performance to existing anypath routing protocols in most of the cases.

Shortest path

In this module is used for choose a shortest path in spatial reusability aware single-path routing as a binary program and propose two complementary categories of algorithms for path selection.

SASR-MINtends to exploit the best performance of the paths, the other category (SASR-MAX) [4] evaluates the performance of the paths in the worst case. Given each of the paths found by an existing source routing protocol (e.g., DSR, our SASR algorithm calculates the spatial reusability aware path cost of it. Then, the path with the smallest cost can be selected.

Here we use approximation algorithm for finding the path delivery time minimizing collection of non-interfering sets, namely SASRMIN algorithm, when the collection of all the maximal non interfering sets on path P can be calculated efficiently.

Cost Maximizing Fusion

In this module is used for finding a maximizing path of cost. It helps to avoid maximizing path. It the path cost maximizing collection indicates how bad the path can be in the worst case [10].

The cost maximizing collection of non-interfering sets is just the inverse version of the cost minimizing fusion, we can design a similar approximation algorithm as that in previous section, by iteratively picking the least cost-effective maximal non interfering set.

Cost maximizing fusion does not show superior performance to cost minimizing fusion, we mainly use it as a benchmark or reference in path selection. So in this work, we only consider the pseudo-polynomial time approximation algorithm SASR-MAX, and do not investigate its corresponding fully polynomial greedy algorithm.

4. RESULTS

Initially we have to create ‘n’ number of nodes. We have to give the input for range and distance.

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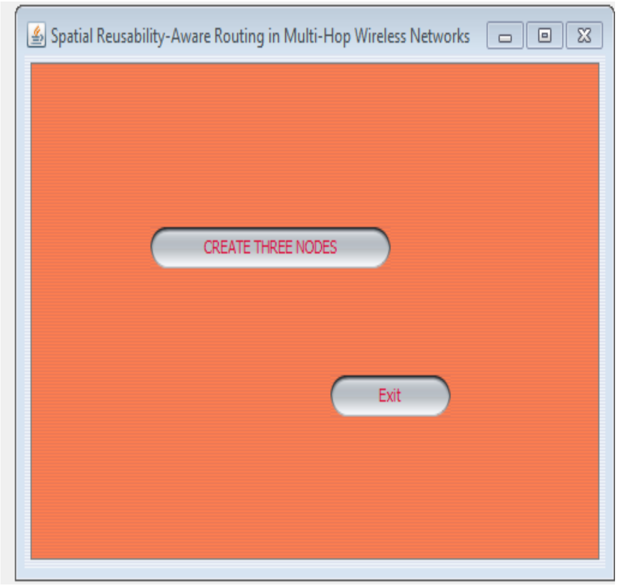

Fig 2: Creation of Nodes

a. It displays the neighbouring node. We have to give the destination address based on neighbouring nodes.

It displays the path address based on path created and multihop created. Now we have to provide the source details, browse the file and then it displays the data sending.

Fig 3: Displaying Neighbouring Nodes

b. It will ask for cost calculation and perfect path. It sends the information from source node to destination node.

Fig 4: Cost Calculation

c. Finally we can download the file received in destination node and save it.

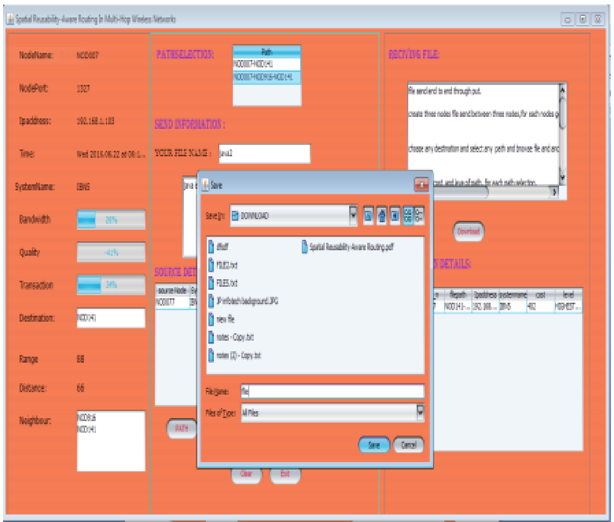

Fig 5: Saving Received File

5. CONCLUSION

In this paper, we have demonstrated that we can significantly improve the end-to-end throughput in multi-hop wireless networks, by carefully considering spatial reusability of the wireless communication media. We have presented two protocols, SASR and SAAR, for spatial reusability-aware single-path routing and anypath routing, respectively. We have also implemented our protocols, and compared them with existing routing protocols with the data rates of 11 and 54 Mbps. Evaluation results show that SASR and SAAR algorithms can achieve more significant end-to-end throughput gains under higher data rates. For the case of single-flow, SASR achieves a throughput gain of as high as 5:3 under 54 Mbps, while for SAAR, the maximum gain can reach 71:6 percent. Furthermore, in multi-flow case, SASR can also improve the per-flow average throughputs by more than 20 percent. Meanwhile, the tremendous throughput gains only require acceptable additional transmission overheads. The extra transmission overheads of route request are less than 10 percent in our evaluation. In 80 percent cases, the overall transmission counts are increased by no more than two with SASR, while for SAAR, most of the increments are below. As for the future work, one direction is to further explore opportunities to improve the performance of our routing algorithms by analyzing special underperforming cases identified in the evaluation. Another direction is to investigate inter-flow spatial reusability, and to optimize system wide performance.

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