Volume No:4, Issue No:6 (November-2018) ISSN No : 2454-423X (Online)
International Journal of Research in Advanced Computer Science Engineering
A Peer Reviewed Open Access International Journal
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An Efficient Spatial Aware Routing Protocol in Multi-Hop Networks

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ABSTRACT:
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. By carefully considering spatial reusability of the wireless communication, we can tremendously improve the end-to-end throughput in multi-hop wireless networks by the spatial reusability-aware single-path routing (SASR) and any path routing (SAAR) protocols. The evaluation results show that the proposed protocols significantly improve the end-to-end throughput.

Keywords:
Routing, SASR, SAAR Protocol.

1. INTRODUCTION

In wireless multi-hop networks, nodes communicate with each other using wireless channels and do not have the need for common infrastructure or centralized control. Nodes may cooperate with each other by forwarding or relaying each other's packets, possibly involving many intermediate relay nodes. This enables nodes that cannot hear each other directly to communicate over intermediate relays without increasing transmission power. Such multi-hop relaying is a very promising solution for increasing throughput and providing coverage for a large physical area.

By using several intermediate nodes, the sender can reduce transmission power thus limiting interference effects and enabling spatial reuse of frequency bands. In ad-hoc networks, the medium is shared and nodes arrange access to the medium in a distributed way independent of their current traffic demand. In particular given standard ad-hoc routing protocols that try to minimize relaying nodes on the path, nodes closer to the network centre are more likely to become a relay node.

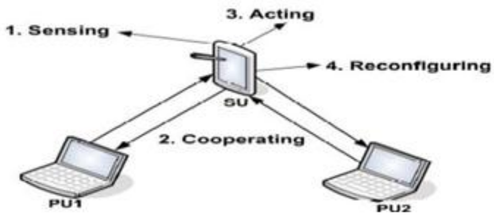

Figure 1.1 Ad-hoc network scenario

Wireless ad-hoc networks can be further classified by their applications:

Mobile ad hoc networks (MANETs)

A mobile ad hoc network (MANET) is a continuously self-configuring, self-organizing, infrastructure-less network of mobile devices connected without wires. It is sometimes known as "on-the-fly" networks or "spontaneous networks".

Vehicular ad hoc networks (VANETs)

VANETs are used for communication between vehicles and roadside equipment.

Cite this article as: N.Aruna Sindhu & P.Satish Kumar, "An Efficient Spatial Aware Routing Protocol in Multi-Hop Networ", International Journal of Research in Advanced Computer Science Engineering, Volume 4, Issue 6, 2018, Page 1-6.

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Intelligent vehicular ad hoc networks (InVANETs) are a kind of artificial intelligence that helps vehicles to behave in intelligent manners during vehicle-to-vehicle collisions, accidents. Vehicles are using radio waves to communicate with each other, creating communication networks instantly on-the-fly while vehicles are moving on the roads.

Wireless sensor networks

Sensors are useful devices that collect information related to a specific parameter, such as noise, temperature, humidity, pressure, etc. Sensors are increasingly connected via wireless to allow large scale collection of sensor data. With a large sample of sensor data, analytics processing can be used to make sense out of these data.

Advantages:

- Highly performing network.
- No expensive infrastructure must be installed
- Use of unlicensed frequency spectrum
- Quick distribution of information around sender
- No single point of failure.

2.RELATED WORK

A. Adyta[1] presents a link layer protocol called the Multi-radio Unification Protocol or MUP. On a single node, MUP coordinates the operation of multiple wireless network cards tuned to non-overlapping frequency channels. The goal of MUP is to optimize local spectrum usage via intelligent channel selection in a multi hop wireless network. It describes the design and implementation of MUP, and analyze its performance using both simulations and measurements based on implementation. Results show that under dynamic traffic patterns with realistic topologies, MUP significantly improves both TCP throughput and user perceived latency for realistic workloads. They plan to investigate other metrics for channel quality, a more scalable method for sending probes using broadcasts, and the impact of mobile nodes on MUP.

D. Aguayo[3] compare performance of different multi-hop routing protocols. They gives the results of a detailed packet-level simulation comparing four multi-hop wireless ad hoc network routing protocols that cover a range of design choices: DSDV, TORA, DSR, and AODV. When comparing the number of routing overhead packets sent by each of the protocols, DSR clearly has the lowest overhead. AODV-LL uses a Route Discovery mechanism based on DSR's, but it creates hop-by-hop routing state in each node along a path in order to eliminate the overhead of source routing from data packets. They have extended network simulator to accurately model the MAC and physical-layer behavior of the IEEE 802.11 wireless LAN standard, including a realistic wireless transmission channel model, and present the results of simulations of networks of 50 mobile nodes. Opportunistic routing and network coding are two powerful ideas which may at first sight appear unrelated.

S. Chachulski[2] combines these ideas in a natural fashion to provide opportunistic routing without node coordination. This paper presents MORE, a MAC-independent opportunistic routing protocol. MORE randomly mixes packets before forwarding them .Authors find opportunistic routing which is recent technique that achieves high throughput in the face of lossy wireless links. The current opportunistic routing protocol, ExOR, ties the MAC with routing, imposing a strict schedule on routers access to the medium. Although the scheduler delivers opportunistic gains, it misses some of the inherent features of the 802.11 MAC. For example, it prevents spatial reuse and thus may underutilize the wireless medium. It also eliminates the layering abstraction, making the protocol less amenable to alternate traffic types such as multicast. An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration.

D. B. Johnson[5] presents a protocol for routing in ad hoc networks that uses dynamic source routing. Unlike routing protocols using distance vector or link state algorithms, this protocol uses dynamic source routing which adapts quickly to routing changes when host movement is frequent, yet requires little or no overhead during periods in which hosts move less frequently. Dynamic source routing protocol is similar in approach to some source routing protocols used in wired networks, such as in the IEEE 802 SRT bridge standard, in FLIP and in SDRP. This paper does not address the security concerns inherent in wireless networks or packet routing.

3. PROBLEM STATEMENT

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. 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.
- Jones et al. implemented k-tuple network coding and proved throughput optimality of their policy.

Disadvantages of Existing System:

- ➢ A fundamental problem amidst extant mobile routing protocols is which minimizing the final product (or future) of gearboxes to launch a sole wrapper starting with an authority burl to a station nodule doesn't automatically overestimate the end-to-end throughput .
- ➢ Most of your current routing protocols don't like dimensional reusability of your mobile verbal exchange publishing with in account.
- ➢ They require centralized regulate to attain MAC-layer scheduling, and to get rid of automatic transmission contention.

PROPOSED SYSTEM

- In this paper, investigating 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.
- 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.
- The algorithms proposed in this work do not require any scheduling, and the SASR algorithms can be implemented in a distributed manner.

4 IMPLEMENTATION

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) 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

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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. 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 any path routing protocols in most of the cases.

4.1 ARCHITECURE:

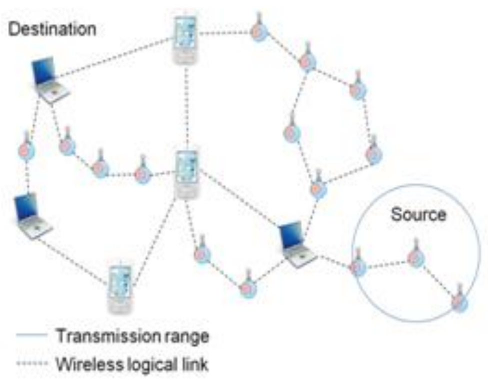
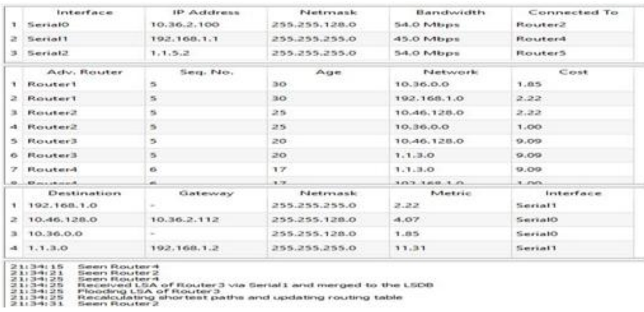


Figure 4.a

4.2 RESULTS



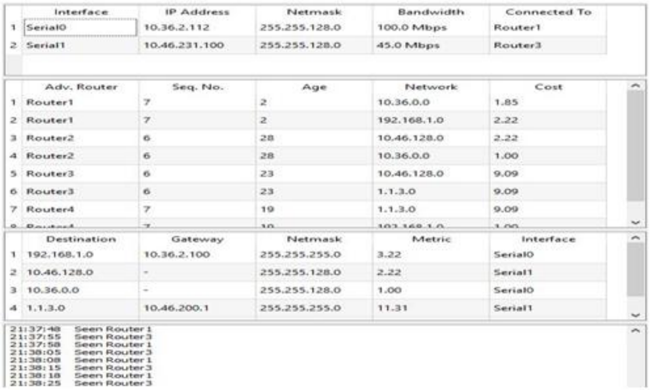
	Interface	IP Address	Netmask	Bandwidth	Connected To
1	Serial0	10.36.2.100	255.255.128.0	54.0 Mbps	Router2
2	Serial1	192.168.1.1	255.255.255.0	45.0 Mbps	Router4
3	Serial2	1.1.5.2	255.255.255.0	54.0 Mbps	Router5

	Adv. Router	Seq. No.	Age	Network	Cost
1	Router1	5	30	10.36.0.0	1.85
2	Router1	5	30	192.168.1.0	2.22
3	Router2	5	25	10.46.128.0	2.22
4	Router2	5	25	10.36.0.0	1.00
5	Router3	5	20	10.46.128.0	9.09
6	Router3	5	20	1.1.3.0	9.09
7	Router4	6	17	1.1.3.0	9.09

	Destination	Gateway	Netmask	Metric	Interface
1	192.168.1.0	-	255.255.255.0	2.22	Serial1
2	10.46.128.0	10.36.2.112	255.255.128.0	4.07	Serial0
3	10.36.0.0	-	255.255.128.0	1.85	Serial0
4	1.1.3.0	192.168.1.2	255.255.255.0	11.31	Serial1

21:34:15 Seen Router4
21:34:21 Seen Router2
21:34:25 Seen Router4
21:34:25 Received LSA of Router3 via Serial1 and merged to the LSDB
21:34:25 Flooding LSA of Router3
21:34:25 Recalculating shortest paths and updating routing table
21:34:31 Seen Router2

ROUTER 1



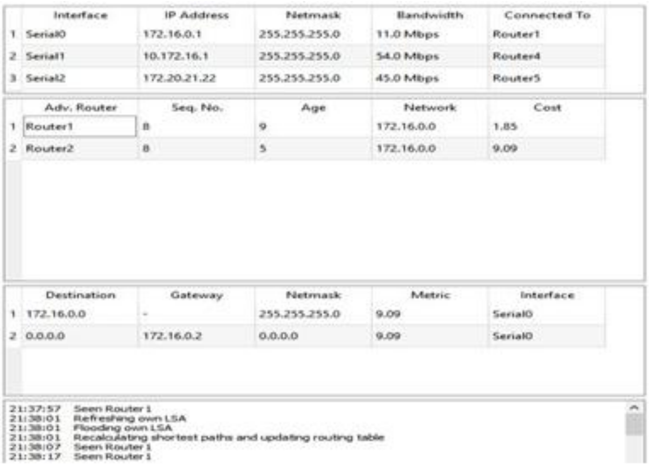
	Interface	IP Address	Netmask	Bandwidth	Connected To
1	Serial0	10.36.2.112	255.255.128.0	100.0 Mbps	Router1
2	Serial1	10.46.231.100	255.255.128.0	45.0 Mbps	Router3

	Adv. Router	Seq. No.	Age	Network	Cost
1	Router1	7	2	10.36.0.0	1.85
2	Router1	7	2	192.168.1.0	2.22
3	Router2	6	28	10.46.128.0	2.22
4	Router2	6	28	10.36.0.0	1.00
5	Router3	6	23	10.46.128.0	9.09
6	Router3	6	23	1.1.3.0	9.09
7	Router4	7	19	1.1.3.0	9.09

	Destination	Gateway	Netmask	Metric	Interface
1	192.168.1.0	10.36.2.100	255.255.255.0	3.22	Serial0
2	10.46.128.0	-	255.255.128.0	2.22	Serial1
3	10.36.0.0	-	255.255.128.0	1.00	Serial0
4	1.1.3.0	10.46.200.1	255.255.255.0	11.31	Serial1

21:37:48 Seen Router1
21:37:55 Seen Router3
21:37:58 Seen Router1
21:38:05 Seen Router3
21:38:08 Seen Router1
21:38:15 Seen Router3
21:38:18 Seen Router1
21:38:25 Seen Router3

ROUTER2



	Interface	IP Address	Netmask	Bandwidth	Connected To
1	Serial0	172.16.0.1	255.255.255.0	11.0 Mbps	Router1
2	Serial1	10.172.16.1	255.255.255.0	54.0 Mbps	Router4
3	Serial2	172.20.21.22	255.255.255.0	45.0 Mbps	Router5

	Adv. Router	Seq. No.	Age	Network	Cost
1	Router1	8	9	172.16.0.0	1.85
2	Router2	8	5	172.16.0.0	9.09

	Destination	Gateway	Netmask	Metric	Interface
1	172.16.0.0	-	255.255.255.0	9.09	Serial0
2	0.0.0.0	172.16.0.2	0.0.0.0	9.09	Serial0

21:37:57 Seen Router1
21:38:01 Refreshing own LSA
21:38:01 Flooding own LSA
21:38:01 Recalculating shortest paths and updating routing table
21:38:07 Seen Router1
21:38:17 Seen Router1

HOP1

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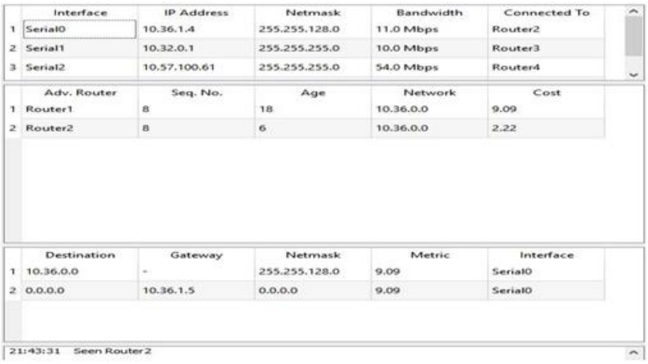


	Interface	IP Address	Netmask	Bandwidth	Connected To
1	Serial0	10.36.1.4	255.255.128.0	11.0 Mbps	Router2
2	Serial1	10.32.0.1	255.255.255.0	10.0 Mbps	Router3
3	Serial2	10.57.100.61	255.255.255.0	54.0 Mbps	Router4

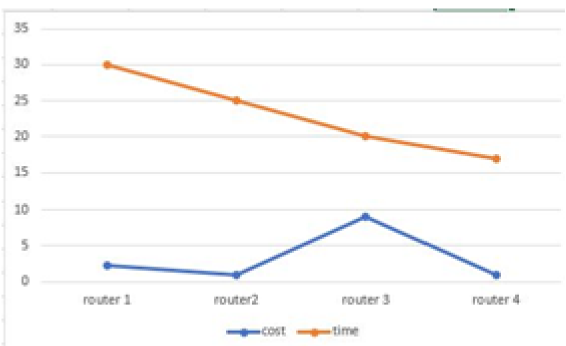
	Adv. Router	Seq. No.	Age	Network	Cost
1	Router1	8	18	10.36.0.0	9.09
2	Router2	8	6	10.36.0.0	2.22

	Destination	Gateway	Netmask	Metric	Interface
1	10.36.0.0	-	255.255.128.0	9.09	Serial0
2	0.0.0.0	10.36.1.5	0.0.0.0	9.09	Serial0

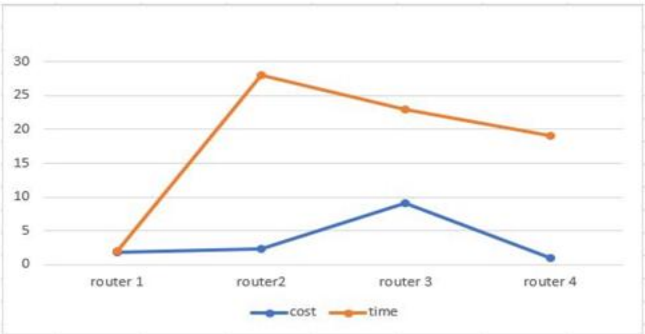
21:43:31 Seen Router2

LINK1

GRAPHS:



ROUTER1



ROUTER 2

5 CONCLUSION

In this paper, demonstrated that we can significantly improve the end-to-end throughput in multi-hop networks, by carefully considering the spatial reusability of the wireless communication media. Presented two protocols SASR and SAAR for spatial reusability aware single-path routing and anypath routing, respectively.

Spatial reusability aware routing can efficiently improve the source to destination communication with high end throughput in multi-hop wireless networks, by carefully considering spatial reusability of the wireless communication media. This is done by the protocols, SASR and SAAR, for spatial reusability-aware single-path routing and anypath routing, respectively. Secure node to node communication and reduces the packet drop attack with trust based active source routing.

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