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Modeling and Performance Simulation of Source Initiative Routing Protocol in Wireless Network

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Abstract: Opportunistic data forwarding represents a promising solution to utilize the broadcast nature of wireless communication links. The opportunistic data forwarding has drawn much attention in the research community of multi-hop wireless networking, with most research conducted for stationary wireless networks. One of the reasons why opportunistic data forwarding has not been widely utilized in mobile ad hoc networks (MANETs) is the lack of an efficient, light-weight proactive routing scheme with strong source routing capability. A new routing protocol named PSR for ODF in mobile ad-hoc networks. PSR is featured by proactive source routing, loop free, and extremely small routing overhead but energy efficient or not that not focused and evaluated by researchers. The link quality variation of wireless channels has been a challenging issue in data communications until recent explicit exploration in utilizing this characteristic. It is also challenging issue for ODF, because due to link quality variation neighbor discovery overhead increased that affect the performance of routing protocol. Widely hello messages use to discover the neighbor, in PSR also use hello message to discover neighbor but in double quantity, number of hello message increased in PSR and it is directly proportional to energy consumption metric, so that energy consumption also increase in PSR. This paper proposes the use of currently introduced scheme "an Adaptive Hello Messaging Scheme for Neighbor Discovery in On-Demand MANET Routing Protocols" in PSR to reduce the suppression of unnecessary Hello messaging based on the event interval of a node. That reduces the energy consumption of node and enhances the performance of ODF in MANET.

I. INTRODUCTION

A mobile ad hoc network is a wireless communication network, where nodes that are not within direct transmission range of each other will require other nodes to forward data. It can operate without existing infrastructure, supports mobile users, and falls under the general scope of multi-hop wireless networking. The link quality variation of wireless channels has been a challenging issue in data communications until recent explicit exploration in utilizing this characteristic. The broadcast nature effectively utilize in wireless communication networks has drawn much attention in the research community in recent years. Opportunistic data forwarding (ODF) represents one of the most promising solutions to this initiative. Opportunistic data forwarding (ODF) has more attention in research community of wireless networking.

The effectiveness of ODF in wireless networks is heavily depended on the choice of proper routing protocols which can provide effective source routing services. Effectiveness of Opportunistic data forwarding (ODF) in wireless networks is depending on proper routing protocols selection. Choice of routing protocol affects the ODF performance which can't provide effective source routing services. Traditional routing protocol in MANET AODV, DSDV and DSR studied for opportunistic data forwarding in [3], AODV and DSDV were not design for source routing hence not suited for opportunistic data forwarding, DSR have log bootstrap delay therefore it not efficient for data exchange. In [1, 3], proposed new routing protocol specially design for opportunistic data forwarding is PSR: Proactive source routing protocol; In PSR, each node maintains a breadth-first search spanning tree of the network rooted at itself. Such information is periodically exchanged among neighboring nodes for updated network topology information. Thus, PSR allows a node to have full-path information to all other nodes in the network, while the communication cost is only linear to the number of the nodes. This allows it to support both source routing and conventional IP forwarding. It is a loop free routing protocol. PSR: effectively reduce the routing overhead in opportunistic data forwarding than tradition routing protocol AODV, DSDV, OLSR and DSR [1]. Most challenging issue link variation also affects the PSR performance, CORMAN in [2]: Cooperative Opportunistic Routing Scheme in Mobile Ad Hoc Networks solution for link variation challenge in PSR. Nodes in the network use a lightweight proactive source routing protocol to determine a list of intermediate nodes that the data packets should follow en route to the destination. Here, when a data packet is broadcast by an upstream node and has happened to be received by a downstream node further along the route, it continues its way from there and thus will arrive at the destination node sooner. This is achieved through cooperative data communication at the link and network layers.

The proposed work in [2] is a powerful extension to the pioneering work of ExOR. All the work proposed in [1, 2 and 3] were used the performance metrics Routing overhead, Throughput and End –to- end delay to evaluate performance. The most important metric on which the all proposed work in [1, 2, and 3] not focused, that extremely affected by link failure and mobility is Energy Consumption. Hence is a scope to extend the study of opportunistic data forwarding with PSR routing protocol in direction to reduce the energy consumption. Various approach available to reduce energy consumption in MANET, one of them proposed in [4]; an Adaptive Hello Messaging Scheme for Neighbor Discovery in On-Demand MANET Routing Protocols. As usual in traditional routing protocols like AODV, PSR also used same scheme for neighbor discovery. For neighbor discovery periodically

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broadcast routing messages in PSR also double as "Hello" messages for a node to identify which other nodes are its neighbors. When a neighbor is deemed lost, its contribution to the network connectivity should be removed, called "neighbor trimming". Due to neighbor trimming and double Hello packet in PSR than traditional routing protocol increase energy consumption in MANET.

II. BACKGROUND

Opportunistic data forwarding (ODF) in wireless networks selection of proper routing protocols is major challenge. Choice of routing protocol affects the ODF performance which can't provide effective source routing services. Traditional routing protocol AODV, DSDV, DSR and OLSR were tested [1 and 3] for OFD; in review result of simulation found traditional protocols not fulfills the expectation of OFD. In [3] to overcome the problem of routing protocol in OFD proposed; PSR: a Light-Weight Proactive Source Routing Protocol for Mobile Ad Hoc Networks. PSR can maintain more network topology information than distance vector routing to facilitate source routing, while, it has a much smaller overhead than traditional routing protocol AODV, DSDV, DSR and OLSR. In PSR, each node maintains a breadth first search spanning tree of the network rooted at it. Adopted combine route update strategy that takes advantage of both "event-driven" and "timer-driven" approaches. Link quality variation of wireless channels has been a challenging issue in data communications until recent explicit exploration in utilizing this characteristic. The same broadcast transmission may be perceived significantly differently, and usually independently, by receivers at different geographic locations. Furthermore, even the same stationary receiver may experience drastic link quality fluctuation over time.

The challenge is to ensure that exactly one of the listed forwarders should relay the packet that is likely to be the closest to the destination at the same time. This is addressed by prioritized scheduling among the listed forwarders according to their priority indicated in the forwarder list. Most part of the previous proposed work in history, overhearing a packet not intended for the receiving node had been considered as completely negative, i.e., interference. To face these challenge in [2] Cooperative Opportunistic Routing in Mobile Ad hoc Networks proposed. In CORMAN; nodes in the network use a lightweight proactive source routing protocol to determine a list of intermediate nodes that the data packets should follow en route to the destination. Here, when a data packet is broadcast by an upstream node and has happened to be received by a downstream node further along the route, it continues its way from there and thus will arrive at the destination node sooner. This is achieved through cooperative data communication at the link and network layers.

The proposed work is a powerful extension to the pioneering work of ExOR. In a mobile ad-hoc network (MANET) energy efficiency is a major concern. Discovery of neighbor nodes can also be a hidden energy drain in ad-hoc mode. Energy consumption and network overhead increased in Hello messaging approach because the unnecessary Hello messaging can drain batteries while mobile devices are not in use. The reactive Hello protocol enables Hello messaging only when it is demanded using a Hello request-reply mechanism, but increases delay due to additional packet exchange before communication. The event-based Hello protocol enables only active nodes (i.e., those either sending or receiving data packets) to broadcast Hello packets based on a threshold called an activity timer. However, a threshold that is set too high rarely reduces the Hello messaging overhead, whereas a low threshold results in local connectivity information loss. Thus, there is an outstanding need to effectively suppress unnecessary Hello messaging while minimizing the risk of losing local connectivity information [4]. An adaptive Hello messaging scheme for neighbor discovery by effectively suppressing unnecessary Hello messages [4]. This framework reduces battery drain through practical suppression of unnecessary Hello messaging. Based on the event interval of a node, the Hello interval can be enlarged without reduced detestability of a broken link, which decreases network overhead and hidden energy consumption.

III. PREVIOUS WORK DONE

Effectiveness of Opportunistic data forwarding (ODF) in wireless networks is on proper routing protocols selection. Choice of routing protocol affects the ODF performance which can't provide effective source routing services. Routing protocols in mobile ad hoc networks can be categorized using an array of criteria. The most fundamental among these is the timing of routing information exchange. Basically considered proactive (table driven) reactive (on demand) routing protocol approach DSDV, OLSR, DSR, AODV fall in this category respectively. Opportunistic data forwarding refers to a way that data packets are handled in a multi-hop wireless network. Unlike traditional IP forwarding, where an intermediate node looks up a forwarding table for a dedicated next hop, opportunistic data forwarding allows potentially multiple downstream nodes to act on the broadcast data packet. One of the initial works on opportunistic data forwarding is the selective diversity forwarding (SDF), in SDF proposed a transmitter picks the best forwarder from the multiple receivers which successfully received its data, and explicitly requests the selected node to forward data. However, its overhead needs to be significantly reduced before it can be implemented in practical networks.

This issue was successfully addressed in ExOR approach, outlining a solution at the link and network layers. In ExOR, nodes are enabled to overhear all packets on the air, so a multitude of nodes can potentially forward a packet as long as they are included in the forwarder list carried by the packet. In order to support opportunistic data forwarding in a mobile wireless network as in ExOR, an IP packet needs to be enhanced such that it lists the addresses of the nodes that lead to the packet's destination. This entails a routing protocol where nodes see beyond merely the next hop leading to the destination. Therefore, a link-state routing (e.g. OLSR) or source routing (e.g. DSR) would seem to be good candidates. Opportunistic data forwarding in a MANET with constantly active data communication between many node pairs, the reactive nature of DSR by renders it unsuitable.

The source routing is able to tightly control data forwarding paths. Thus, it is not only of interest in opportunistic data forwarding but also in a wider scope such as avoiding congestions, bypassing malicious nodes, and

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allocating network resources. PFA: Path Finding Algorithm and WRP: Wireless Routing Protocol used to overcome the drawback of DSDV and OLSR respectively but they not reduce much more routing overhead [1, 2 and 3]. Link quality variation of wireless channels has been a challenging issue in opportunistic data forwarding. This problem of opportunistic data transfer in mobile ad hoc networks solve by Cooperative Opportunistic Routing in Mobile Ad hoc Networks (i.e. CORMAN) [2]. CORMAN extended the pioneering work of ExOR powerfully. In [4], used only traditional routing protocol for performance evaluation and not declare clear winner of the compressions. only it overcome the previous performance evaluation by evaluating the performance of traditional routing protocol on basis of effect of unvarying pause time and effect of varying number of nodes. This work may be extending with different new than traditional routing protocol and evaluate the performance with existing scenario. Many Hello messaging schemes focus on figuring out dynamic network topology or discovering live neighbors with an energy saving scheme, which requires all network nodes to continuously exchange Hello messages or beacons while they are awake.

In such traditional Hello messaging schemes no start/end condition proposed. This can cause unnecessary bandwidth usage and hidden energy consumption if an on-demand MANET routing protocol AODV, or DYMO used, where a new path is discovered through Route Request (RREQ) and Route Response (RREP) packet exchanges. Two approaches for suppressing Hello messages when they are not required proposed an on-demand mechanism (reactive Hello protocol), and a monitoring activity mechanism (event-based Hello protocol). An adaptive Hello interval scheme in [4] used to reduce battery drain through practical suppression of unnecessary Hello messaging. Based on the event interval of a node, the Hello interval can be enlarged without reduced detestability of a broken link, which decreases network overhead and hidden energy consumption.

IV. EXISTING METHODOLOGY

A new routing protocol named PSR for ODF in mobile ad-hoc networks. PSR is featured by proactive source routing, loop free, and extremely small routing overhead. PSR utilizes the hop count information as a metrics to better explore the broadcast nature of the wireless medium, and enhance the efficiency and spatial use in ODF. Network topology information is efficiently maintained and exchanged by using the tree structure, hence the overhead get greatly reduced. As compared to existing routing protocols, there is no need to timestamp routing updates in PSR and the update messages are harmoniously integrated into the tree structure, so that the overhead can be significantly reduced [1]. Link quality variation of wireless channels has been a challenging issue in opportunistic data forwarding. This problem of opportunistic data transfer in mobile ad hoc networks solve by Cooperative Opportunistic Routing in Mobile Ad hoc Networks (i.e. CORMAN) [2]. CORMAN extended the pioneering work of ExOR powerfully. A light-weight Proactive Source Routing protocol (PSR) to facilitate opportunistic data forwarding in MANETs. In PSR, each node maintains a breadth first search spanning tree of the network rooted at it. Such information is periodically exchanged among neighboring nodes for updated network topology information.

In Proactive Source Routing (PSR) protocol were uses tree-based routing as in PFA and WRP. To make PSR more suitable for the MANETs, the proposed work was adopted a combine route update strategy that takes advantage of both “event-driven” and “timer-driven” approaches. Specifically, nodes would hold their broadcast after receiving a route update for a period of time. Comparisons were done in the performance of PSR with OLSR, DSDV, and DSR protocols. OLSR and DSDV are both proactive routing protocols and PSR is also in this category. OLSR makes complete topological structure available at each node, whereas in DSDV, nodes only have distance estimates to other nodes via a neighbor. PSR sits in the middle ground, where each node maintains a spanning tree of the network. Furthermore, DSR is a well accepted reactive source routing scheme and, as with PSR, it support source routing, which does not require other nodes to maintain forwarding lookup tables [4]. The unnecessary Hello messaging can drain batteries while mobile devices are not in use. The reactive Hello protocol enables Hello messaging only when it is demanded using a Hello request-reply mechanism, but increases delay due to additional packet exchange before communication. The event-based Hello protocol enables only active nodes (i.e., those either sending or receiving data packets) to broadcast Hello packets based on a threshold called an activity timer. However, a threshold that is set too high rarely reduces the Hello messaging overhead, whereas a low threshold results in local connectivity information loss. Thus, there is an outstanding need to effectively suppress unnecessary Hello messaging while minimizing the risk of losing local connectivity information [4].

V. ANALYSIS AND DISCUSSION

The major challenges of ad ad-hoc network are mobility and link failure that affect the protocol performance that studied here and also studied effectiveness of the Opportunistic data forwarding (ODF) in wireless ad-hoc networks is on proper routing protocols selection. Choice of routing protocol affects the ODF performance which can’t provide effective source routing services. Although many routing protocols have been proposed for MANETs, e.g., DSDV and OLSR, ODF in mobile ad-hoc networks (MANETs), proposed to use position information for the routing module. Reactive source routing protocols, e.g., DSR and SASR, are not suitable for ODF because longer delay will be experienced and the route reply messages may be lost. WRP and STAR could provide source routing with less overhead. Optimal choices are not available because they need additional information in routing update to avoid loops which must be prevented in ODF. Moreover, because only differential update is considered in both schemes, the topology may become inaccurate or even unusable over time. Hence, more appropriate routing protocols are required to support ODF in MANETs.PSR best option for OFD, it specially proposed for OFD used in MANET. PSR is featured by proactive source routing, loop free, and extremely small routing overhead. PSR utilizes the hop count information as a metrics to better explore the broadcast nature of the wireless medium, and enhance the efficiency and spatial use in ODF. Network topology information is efficiently maintained and exchanged by

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using the tree structure, hence the overhead get greatly reduced. As compared to existing routing protocols, there is no need to timestamp routing updates in PSR and the update messages are harmoniously integrated into the tree structure, so that the overhead can be significantly reduced. Thus in [1 and 3] were proposed, evaluated the performance of PSR for ODF and compare with existing routing protocol that assume to use for ODF. Link quality variation of wireless channels has been a challenging issue in opportunistic data forwarding. This problem of opportunistic data transfer in mobile ad hoc networks solve by Cooperative Opportunistic Routing in Mobile Ad hoc Networks (i.e. CORMAN) [2].

CORMAN extended the pioneering work of ExOR powerfully. All the work proposed in [1, 2 and 3] were used the performance metrics Routing overhead, Throughput and End –to- end delay to evaluate performance. One of the most important metric on which all proposed work in [1, 2, and 3] not focused, that extremely affected by link failure and mobility is Energy Consumption. So many different reasons here to increase the energy consumption in MANET, one of them is neighbor discovery. Traditional routing protocol widely uses the Hello messages scheme to discover the neighbor. To maintain the information in on demand routing periodically generate continuously, the unnecessary Hello packet increased the routing overhead and energy consumption in MANET analysis by [4]. Here analyzed an adaptive Hello messaging scheme for neighbor discovery by effectively suppressing unnecessary Hello messages in [4], so that to reduce battery drain through practical suppression of unnecessary Hello messaging. Based on the event interval of a node, the Hello interval can be enlarged without reduced detestability of a broken link, which decreases network overhead and hidden energy consumption. As general theoretical analysis, for neighbor discovery periodically broadcast routing messages in PSR also double as “Hello” messages for a node to identify which other nodes are its neighbors. When a neighbor is deemed lost, its contribution to the network connectivity should be removed, called “neighbor trimming”. Due to neighbor trimming and double Hello packet in PSR than traditional routing protocol increases energy consumption in MANET. Hence is a scope to extend the study of opportunistic data forwarding with PSR routing protocol and aim directed toward to used or design approach for analyze and the performance metric energy consumption in MANET .

VI. PROPOSED METHODOLOGY

The Energy constraint is important factor for any routing protocol; in proactive source routing protocol (PSR) analysis this work found that researches not focused on performance of PSR over energy metric. In study of PSR also found that, PSR use Hello messages for neighbor’s discovery and it is double that traditional routing protocol. As theoretical assumption, energy consumption and routing overhead both are directly proportional to the “Hello packet”. As the Hello packet increases the energy consumption and routing overhead also increases. The PSR use double hello packet stated in [3] hence, hidden energy consumption in MANET increased when PSR use for OFD. In this paper propose that first concentrate on investigate the energy consumption of PSR routing protocol then second use a novel approach “An Adaptive Hello Messaging Scheme for Neighbor Discovery in On-Demand MANET Routing Protocols” proposed in [4] to suppression of unnecessary Hello messaging based on the event interval of a node, the Hello interval can be enlarged without reduced detestability of a broken link, which decreases network overhead and hidden energy consumption. For simulation use ns-2 simulator for performance evaluation`.

VII. POSSIBLE OUTCOME AND RESULT

The major possible outcomes are as follows:

a. PSR power consumption investigates without suppressing Hello packet. On theoretical assumption it is more energy consume in MANET.
b. After suppressing Hello packet by suing [4], energy consummation and routing over head decreases effectively.
c. Investigation add one more mile stone to prove PSR is effective routing protocol for ODF, by evaluating and reducing energy consumption in MANET.

VIII. CONCLUSION

Through analytical study of ODF and routing protocol for ODF, found that with traditional routing protocol in MANET ODF cannot explore performance of it. ODF need special routing protocol design for ODF and then here found PSR; that specially design for ODF. PSR good choice for ODF, but when focused on the energy consumption performance metric that have not been evaluate it could not be become better choice for ODF. That’s this paper motivation to investigate and evaluate performance of the PSR on energy consummation metric. As theoretical assumption energy consumption and routing overhead both are directly proportional to the “Hello packet”. As the Hello packet increases the energy consumption and routing overhead also increases. Hence predict that the PSR consume more energy due to double hello packet used in PSR for neighbor discovery. In this work used “An Adaptive Hello Messaging Scheme for Neighbor Discovery in On-Demand MANET Routing Protocols” novel approach to reduce the hidden energy consumption in PSR by suppression of unnecessary Hello messaging based on the event interval of a node. That reduces the energy consumption of node and enhances the performance of ODF in MANET. Ns-2 used for simulating and evaluating the performance evaluation.Use the PSR in Opportunistic data forwarding in wireless network that enhance the performance of ODF.

IX. FUTURE SCOPE

Investigate the PSR on different performance metric and used the novel approaches to remove the drawback from that PSR for enhance the performance to become better choice for ODF.

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