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Enhancing the Ability of the Hybrid Wireless Network Using Distributed Multipath Routing Protocol

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ABSTRACT: A Hybrid wireless network is the combination of both mobile ad-hoc networks and infrastructure wireless networkswhich is used to improve the performance of our network. The routing protocols are used to combine the ad-hoc transmission mode with the cellular transmission mode. This paper describes a Distributed Multipath Routing Protocol for hybrid wireless networks which establishes multiple paths between source and destination. This protocol divides a message into segments and transmits the segments in a distributed manner. Furthermore, it sends the message segments to a number of base stations to increases the throughput and makes the use of base stations. It reduces overhead and path loss. It also has a congestion control algorithm to avoid traffic among the base stations. The analysis results show that this protocol can able to increase the ability in terms of throughput.

KEYWORDS: Hybrid wireless networks, Routing algorithm, Multipath Routing Protocol, Congestion control algorithm

I.INTRODUCTION

Wireless networks include infrastructure wireless networks and mobile ad-hoc networks which are most widely used today. The increase in wireless network capacity for high performance applications has been developed for hybrid wireless networks. Wireless devices such as smart-phones, tablets and laptops which are used to transmit the data and have both an infrastructure and ad-hoc networks.The multi-hop routing needs route discovery or route maintenance. The messages are transmitted through wireless medium. The multi-hop transmission uses ad-hoc networks are only suitable for local area.

The cellular network provides the major use of wireless communication in our daily today lives. It also provides inter-cell communication and Internet access. It has a ubiquitous computing and used world-wide. In an infrastructure network, nodes communicate with each other through base stations. The long distance one-hop transmission and mobile nodes, the infrastructure wireless networks provides faster message transmission and channel access efficiency and suffer from more power consumption on each mobile nodes and the single point of failure problem.

A hybrid wireless network is an integrated infrastructure which combines an infrastructure wireless network and a mobile ad-hoc network, and it improves the throughput capacity of a wide area wireless network. A routing protocol is a component that affects the throughput capacity of a wireless network in data transmission. The current routing protocols in hybrid wireless networks combine the infrastructure wireless networks and the ad-hoc transmission mode in mobile ad-hoc networks routing to forward a message to the mobile nodes which are close to the Base stations or have the high bandwidth to the Base stations. The bandwidth of a channel is the maximum throughput that can be achieved. The long routing path is eliminated by using the multipath routing.

The mobile nodes then forward the messages to the Base stations that act as bridges to connect the ad-hoc network and the infrastructure network. The infrastructure network uses some intermediate (base station) to transmit the data i.e., it doesn't directly transmit the data whereas the adhoc network directly transmit the data i.e., doesn't use intermediate.The multipath routing protocol uses multiple paths to transmit the data from source to destination. This performed in order to improve the throughput and packet delivery rate. The routing protocol specifies how the routes

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are established between source and destination.It determines the specific routes for transmission of data and improves the reliability, scalability and throughput for data transmission.

II. RELATED WORK

In order to improve the ability of hybrid wireless net-works, various routing methods with different features have been proposed. One method integrates the ad-hoc transmission mode and the cellular transmission mode built a Poisson Boolean model to study how a BS increases the capacity of a MANET.H Luo et al proposed a UCAN: a unified cell and ad-hoc network architecture which is used for prevention of poor channel quality by using the UCAN and improve the user's throughput[2].It also reduces the complexity and overhead and increases the reliability.

H. Wu et al proposed an integrated cell and ad hoc relaying systems: ICAR for dynamically balancing the traffic among the cell and divert excess traffic from one cell to another [3].V. D. Park et al proposed a highly adaptive distributed routing algorithm for mobile wireless networks to create and maintain the loop-free path [4].H. Y. Hsieh proposed a on using the ad-hoc network model in wireless packet data networks to improve the performance in terms of both throughput and energy [5].J. Cho et al proposed on the throughput enhancement of the downstream channel in cellular radio networks through multi hop relaying used to improve the throughput and QOS [6]. HaiyingShen et al proposed a Distributed Three-hop Routing Protocol to Increase the Capacity of Hybrid Wireless Networks to eliminate the route discovery [1].

These methods are used to help intra-cell ad-hoc transmission rather than inter-cell transmission. In inter-cell transmission [2], a message is send through the ad-hoc network to the mobile node. The mobile node then forwards the message to the BS using the cellular network. These routing protocols simply combine the ad-hoc networks and infrastructure networks. DTR is same as the Two-hop transmission protocol [1] which the routing length is limited to three. The two hop concept is used when the node has lower bandwidth. It select the node with higher bandwidth and balances the traffic.

There are some other methods to improve the efficiency of our network. X. J. Li et al proposed a Multi hop cellular networks: Technology and economics[7] used to reduce the cost. B. Bengfort et al proposed a Efficient resource allocation in hybrid wireless networks [8] which is used to increase the performance. B. Liu et al proposed aCapacity Of a Wireless Ad Hoc Network With Infrastructure[9] is used to find that the different capacity scaling behaviours. D. M. Shila et al proposed a Throughput and Delay Analysis of Hybrid Wireless Networks with Multi-Hop Uplinks which establish bounds on capacity [10].

III. PROPOSED SYSTEM

A. *Distributed Multipath Routing Protocol*

Since BSes are connected with a wired backbone, we assumethat there are not any bandwidth and power constraintson transmissions between BSes. We tend to use intermediate nodesto denote relay nodes that operate as gatewaysconnecting associate infrastructure wireless network and amobile ad-hoc network. We assume each mobile node isdual-mode; that is, it has ad-hoc network interface suchas WiFiradio interface and infrastructure networkinterface equivalent to a 3G cellular interface.

Distributed multipath routing protocol aims to shift the routing burden from the adhocnetwork to the infrastructure network by takingadvantage of widespread base stations in an exceedingly hybrid wirelessnetwork. Instead of exploitation one multi-hop path toforward a message to at least one BS, distributed multipath routing protocoluses multiple pathto relay the segments of a message to totally different BSes ina distributed manner, and depends on BSes to mix thesegments. We tend to modify the routings inthe infrastructure network for clarity. Uponreceiving a phase from the source node, a neighbornode domesticallydecidesbetween direct transmission mechanism andrelay transmission supported the QoS demand of theapplication.

The neighbor nodes forward these segmentsin a distributed manner .In the infrastructure network routing, the BSes more transmit the segments to the BS wherever the destination noderesides. The ultimate BS rearranges the segments into theoriginal order and forwards the segments to the destination. Our algorithm avoids the shortcomings of ad-hoctransmission within the previous routing algorithms thatdirectly mix associate ad-hoc transmission mode and acellular transmission mode which is shown in fig.1.

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Instead of exploitation the multi hopad-hoc transmission, Distributed multipath routing protocol uses multiple paths to forwarding a data and widespread base stations.All different aspects stay a similar as those within theprevious routing algorithms. Itreceives packets from the communications protocol layer and routes it to thedestination node, wherever distributed multipath routing protocol forwards the packet to theTCP layer. The data routing method in distributed multipath routing protocol are often divided intotwo steps: transmission from a supply node to the primary BS anddownlink from the ultimate BS to the data's destination. The modules used here are

- Message segmenting
- Selecting the nodes
- Uplink
- Downlink

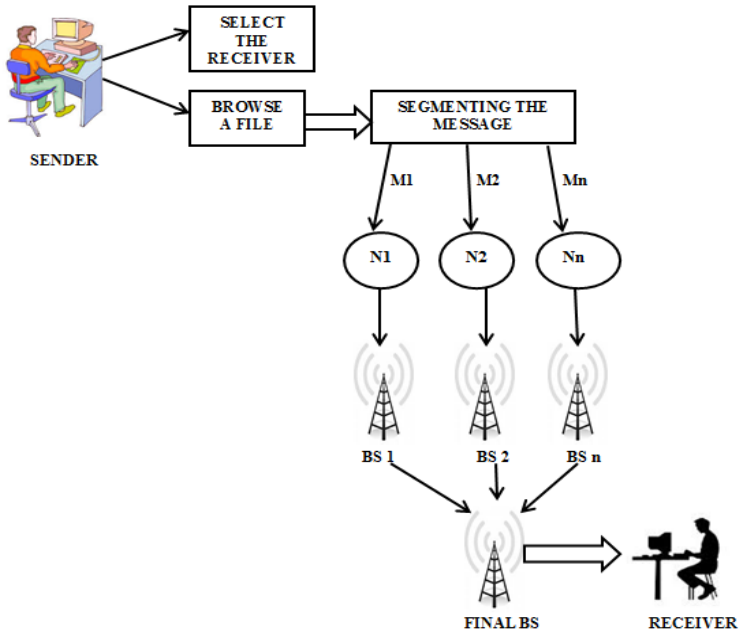

Fig .1 System Architecture

B. *Message Segmenting*

The senders (source node) browse the file and choose the file/data to transmit. After browsing the file it chooses the destination ip address. Once the destination IP address is selected, the files is splitted into multiple segments and send he segment to different nodes based upon on the capacity (bandwidth/queue size) which is shown in fig.2.

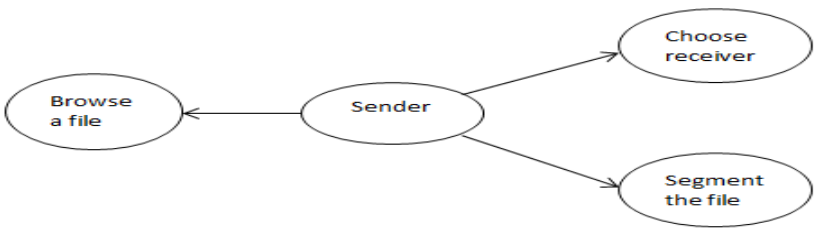

Fig.2 Message Segmenting

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C. *Selecting the Nodes*

Once the messages are segmented the source node chooses the neighbor node based on the capacity. It transmits the data to neighbor only if the neighbor node has higher capacity than the source node. If neighbor node doesn't have higher capacity, then it returns the segment back to the source node or else it directly transmits the data. During this transmission source node chooses direct transmission or relay transmission to transmit the data to final destination.

D. *Uplink Data Routing*

A long routing path can cause high overhead, hot spotsand low responsibleness. Thus, Distributed multipath routing protocol which is shown in fig.3 tries to use more paths. It uses one hop to forward the sections of amessage during a distributed manner and uses another hopto find high-capacity forwarder for high prime performancerouting. As a result, Distributed multipath routing protocol limits the issuesof long-path multi-hop routing within the ad-hoc networks. Specifically, within the transmission routing, a supply node at the startdivides its message stream into variety of segments,then transmits the segments to its neighbor nodes. Theneighbor nodes forward segments to BSes, which willforward the segments to the BS wherever the destinationresides.Different applications could have totally different QoS needs, such as potency, throughput, and routing speed. We tend to use a bandwidth metricto replicate node capability in turnout and quick knowledgeforwarding. The metric is that the ratio of a node's channelbandwidth to its message queue size.

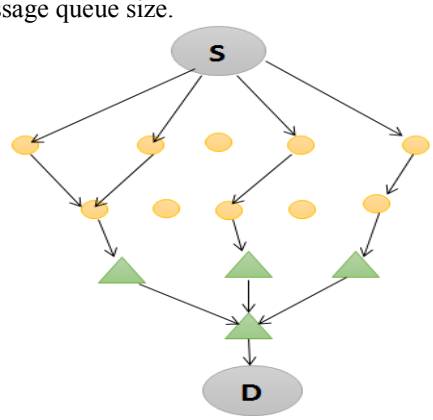

Fig. 3. Data Transmission through Multiple Paths

Algorithm for node selection and message forwarding

```
ChooseRelay ( ) {
Query storage size and QoS requirement information from neighbors
foreach neighbor n do
ifn.cache.size>segment.length&&n.b/q>this.b/q then
Add n to R = {r1 ,….rm }in a descending order of b/q
end if
end for
Return R
}
Transmission ( ) {
ifit is a source node then
R=ChooseRelay ( );
Send segments to {r1 ,….. rm} in R
else
ifthis.b/q <=b/q of all neighborsthen
//direct transmission
ifwithin the range of a BS then
end if
```

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else
//relay transmission
$node_i$=getHighestCapability(ChooseRelay( ))
Send a segment to $node_i$
end if
end if
}

E. *Downlink Data Routing and Data Reconstruction*

The message stream of a mobile node is divided into many segments. Once a BS receives a segment, it has to forward the segment to the final BS, where the destination node resides. We have a tendency to use the mobile IP protocol to modify BSes to know the destination BS. After the destination BS receives all the segment of a message, it rearranges the segments into the initial message and so sends it to the destination mobile node.

A significant issue is guaranteeing that the segments area unit combined within the correct order. For this purpose, Distributed multipath routing protocol specifies the phase structure format. Every segment contains eight fields, including:

(1) Source node IP address(denoted by S)
(2) Destination IP address(denoted by D)
(3) Message sequence num(denotedby m)
(4) Segment sequence num (denoted by s)
(5) QoS indication num (denoted by q)
(6) Data
(7)Length of the data
(8) Check sum

The role of the source IP address field is to tell the destination node wherever the message comes from. The destination IP address field indicates the destination node, and is employed to find the source BS. Once sending out a message stream to a destination, a source node may transport another message stream to an equivalent destination node. The message sequence num differentiates the different message streams initiated by an equivalent source node. The segment sequence num is employed to seek outthe correct transmission sequence of the segments for transmission to a destination node. The information is that the actual information that a supply node needs to transmit to a destination node. The length field specifies the lengthof the Distributed multipath routing protocol segment together with the header in bytes. The checksum is employed by the receiver node to ascertain whether or notthe received knowledge has errors. The QoS indication variety isused to indicate the QoS demand of the appliance.

Algorithm for segment reordering

ifreceives a segment (S,D,m,s,q) then
ifthere is no cache pool with message sequence number equals m then
Create a cache pool n + 1 for the stream m
else
ifs == i then
Send out segment (S, D, m, s, q) to D
i++
else
Add segment (S,D ,m, s) into cache pool m
end if
end if
end if

IV.CONGESTION CONTROL ALGORITHM

When too many packets are transmitted through a network, congestion occurs. At very high traffic, performance collapses completely, and almost no packets are delivered. Compared to the previous routing algorithms

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in hybrid wireless networks, Distributed multipath routing protocol will distribute traffic load among mobile nodes additional equally. The cause of congestion is bursty nature of traffic .When part of the network no longer can cope a sudden increase of traffic, congestion builds upon. Other factors, such as lack ofbandwidth, ill-configuration and slow routers can also bring up congestion.

We tend to propose a congestion management algorithm to avoid overloading BSes in transmission. The congestion algorithm reduces the traffic among the nodes and base station. If suppose one node say mi get overloaded its traffic is distributed among different node say mj. Likewise, all nodes are gently balanced and transmit the data from source to destination node.

After the neighboring BSes receive the segments, they further forward the segments to the destination BS,which forwards the segments to the destination node. In this approach, the serious traffic from mobile nodes can be distributed among neighboring BSes quickly. Next, we tend to discuss a way to handle the case once the destination BS is full. If a BS has not received confirmation from the destination BS throughout a precise time period when it sends out a section, it assumes that the destination BS is full. Then, it sends the section to gently loaded neighboring BSes of the destination BS from its routing table. If an attempted neighboring BS doesn't respond throughout a certain period, it is conjointly thought of as full.Then, BS keeps attempting alternative neighboringBSes tillfinding gently loaded BSes.

V. CONCLUSIONAND FUTURE WORK

In multi path routing protocol, a source node divide a message stream into segments and transmits them to its mobile neighbors, which further forward the segments to their destination through a transportation network. There is no limit for routing, and always arranges for high capacity nodes to forward data. Unlike most existing routing protocols, these produce extensively lower overhead by eliminating route discovery and maintenance. In addition, its individual characteristics of path length, short-distance transmission, and balanced load distribution provide high routing reliability and efficiency. It also increases the throughput capability of the system. The congestion control algorithm is used to avoid load traffic in BS in the case of unbalanced traffic distributions in networks. In future any other algorithm will be used to improve the efficiency of the hybrid wireless network and also enhance the security.

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