A Comparative Study on Distributing Three-hop Routing Protocols for Increasing Capacity of Hybrid Wireless Networks

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ABSTRACT

Hybrid Wireless networks combining the advantages of mobile ad-hoc networks and wireless networks has been increased attention due to their high performance. In now days, wireless sensor networks applications are used in various technologies for reducing the cost of manufacturing portable wireless sensor nodes. As sensors are spread in large area and huge in number, the occurrences of faults in the network are also find. Hence to find out the fault node and to replace the fault node an algorithm is proposed. A hybrid wireless network combination of a mobile ad-hoc network and an infrastructure wireless network and finally enhances the capacity of a wide area wireless network. Distributed Three-hop Routing (i.e. DTR) Data Routing Protocol that improves the features of hybrid wireless networks in the data transmission process. Wireless devices like smart-phones, tablets and laptops, have both a transportation interface and an ad-hoc interface. As the amount of such diplomacy has been growing sharply in recent years, a hybrid communication arrangement will be broadly used in the close to future. Because of its small hop path length with a short physical distance in each step, it alleviates noise and neighbor interference and avoids the adverse effect of route breakdown during data transmission. 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. This paper represents Distributed Three-hop Routing protocol (DTR) for hybrid wireless networks. This takes advantage of the wireless networks where DTR divides message data stream into each segments and transmits these segments in a distributed manner.

Furthermore, sending segments to a number of base stations simultaneously increases throughput and makes full use of widespread base stations. In addition, DTR significantly reduces overhead due to short path lengths and the elimination of route discovery and maintenance.

Keywords— Hybrid wireless networks, Routing algorithm, Multipath Routing Protocol, Congestion control algorithm, System Architecture, Module description, Input design & Output design

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 combination of a mobile ad-hoc network and an infrastructure wireless network and finally enhances the capacity of a wide area wireless network. Routing protocol is an important component that affects the strength of a wireless network in data transmission. Routing path in hybrid wireless networks combination of the cellular Transmission Mode (BSTransmission Mode) in Ad-Hoc transmission mode and infrastructure wireless networks the in mobile ad-hoc networks. The below subsection will give information
about Algorithm used in Distributed Three-hop Routing Protocol are: In the hybrid WSN, node of energy consumption is important for every sensor node because it extends hybrid WSN life. The Wireless sensor network is a collection of all sensors which spread over huge geographic area. As sensors are spread in large area and huge in number, the occurrences of faults in the network are also find. Hence to find out the fault node and to replace the fault node an algorithm is proposed. Noise interference and neighbor interference during the multi-hop transmission process cause a high data drop rate. Long routing paths increase the probability of the occurrence of path breakdown due to the highly dynamic nature of wireless ad-hoc networks. These problems become an obstacle in achieving high throughput capacity and scalability in hybrid wireless networks. Considering the widespread BSes, the mobile nodes have a high probability often countering a BS while moving. Taking advantage of this feature, we propose a Distributed Three-hop Data Routing protocol (DTR). In DTR, as shown in a source node divides a message stream in to a number of segments. Each segment is sent to a neighbour mobile node. Based on the QoS requirement, these mobile relay nodes choose between direct transmissions or relay transmission to the BS. In relay transmission, a segment is forwarded to another mobile node with higher capacity to a BS than the current node. In direct transmission, a segment is directly forwarded to a BS. In the infrastructure, the segments are rearranged in their original order and sent to the destination. The number of routing hops in DTR is confined to three, including at most two hops in the ad-hoc transmission mode and one hop in the cellular transmission mode. To overcome the above mentioned shortcomings, DTR tries to limit the number of hops. The first hop forwarding distributes the segments of a message in different directions to fully utilize there sources, and the possible second hop forwarding ensures the high capacity of the forwarder. DTR also has a congestion control algorithm to balance the traffic load between the nearby BSes in order to avoid traffic congestion at BSes. Using self-adaptive and distributed routing with high speed and shortpath ad-hoc transmission, DTR significantly increases the throughput capacity and scalability of hybrid wireless networks by overcoming the three shortcomings of the previous routing algorithms. It has the following features:

- Low overhead. In an Infrastructure network, nodes communicate with each other through base stations (BSes). Because of the long distance one-hop transmission between BSes and mobile nodes, the infrastructure wireless networks can provide higher message transmission reliability and channel access efficiency, but suffer from higher power consumption on mobile nodes and the single point of failure problem. A hybrid wireless network synergistically combines an infrastructure wireless network and a mobile adhoc network to leverage their advantages and overcome their shortcomings, and finally increases the throughput capacity of a wide-area wireless network. A routing protocol is a critical component that affects the throughput capacity of a wireless network in data transmission. Most current routing protocols in hybrid wireless networks simply combine the cellular transmission mode (i.e. BS transmission mode) in infrastructure wireless networks and the ad-hoc transmission mode in mobile ad-hoc networks. That is the protocols use the multi-hop routing to forward a message to the mobile gateway nodes that are closest to the BSes or have the highest bandwidth to the BSes. This paper proposes different algorithm to increase the lifetime of a hybrid wireless sensor networks when some of the sensor nodes fail down using the algorithm can result in some replacements of sensor nodes and used routing path. Thus, the algorithm enhances the hybrid WSN lifetime and reduces the change of the sensor nodes.

II. RELATED WORK

In order to increase the capacity of hybrid wireless networks, various routing methods with different features have been proposed. One group of routing methods integrate the ad-hoc transmission mode and the cellular transmission mode. Do users al built a Poisson Boolean model to study how a BS increases the capacity of a MANET. Lin et al. proposed a Multi hop Cellular Network and derived its throughput. Hsieh et al. investigated a hybrid IEEE 802.11 network architecture with both a distributed coordination function and a point coordination function. Luo et al. proposed a unified cellular and ad-hoc network architecture for wireless communication. Cho et al. studied the impact of concurrent transmission in a downlink direction (i.e. from BSes to mobile nodes) on the system capacity of a hybrid wireless network. In a node initially communicates with other nodes using an ad-hoc transmission mode, and switches to a cellular transmission mode when its performance is better than the ad-hoc transmission. The above methods are only used to assist intra-cell ad-hoc transmission rather than inter-cell transmission. In inter-cell transmission, a message is forwarded via the ad-hoc interface to the gateway mobile node that is closest to or has the highest uplink transmission bandwidth to a BS. The gateway mobile node then forwards the message to the BS using the cellular interface. However, most of these routing protocols simply combine routing schemes in ad-hoc networks and infrastructure networks, hence inherit the drawbacks of the ad-hoc transmission mode as explained previously. DTR is similar to the Two-hop transmission protocol in terms of the elimination of route maintenance and the limited number of hops in routing. In two-hop, when a node’s bandwidth to a BS is larger than that of each neighbor, it directly sends a message to the BS. Otherwise, it chooses a neighbor with a higher channel and sends a message to it, which further forwards the
message to the BS. DTR is different from Two-hop in three aspects. First, Two-hop only considers the node transmission within a single cell, while DTR can also deal with inter-cell transmission, which is more challenging and more common than intra-cell communication in the real world. Second, DTR uses distributed transmission involving multiple cells, which makes full use of system resources and dynamically balances the traffic load between neighboring cells. In contrast, Two-hop employs single-path transmission. There are other methods proposed to improve routing performance in hybrid wireless networks. 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 used to reduce the cost. B. Bengfort et al proposed a Efficient resource allocation in hybrid wireless networks which is used to increase the performance. B. Liu et al proposed Capacity Of a Wireless Ad Hoc Network With Infrastructure is used to find that the different capacity scaling behaviors. D. M. Shila et al proposed a Throughput and Delay Analysis of Hybrid Wireless Networks with Multi- Hop Uplinks which establish bounds on capacity.

III. DISTRIBUTED THREE-HOP ROUTING PROTOCOL

3.1 Assumption and Overview

Since BSes are connected with a wired backbone, we assume that there are no bandwidth and power constraints on transmissions between BSes. We use intermediate nodes to denote relay nodes that function as gateways connecting an infrastructure wireless network and a mobile ad-hoc network. We assume every mobile node is dual-mode; that is, it has ad-hoc network interface such as a WLAN radio interface and infrastructure network interface such as a 3G cellular interface.

3.2 Uplink Data Routing

A long routing path will lead to high overhead, hotspots and low reliability. Thus, DTR tries to limit the path length. It uses one hop to forward the segments of a message in a distributed manner and uses another hop to find high-capacity forwarder for high performance routing. As a result, DTR limits the path length of uplink routing to two hops in order to avoid the problems of long-path multi-hop routing in the ad-hoc networks. Specifically, in the uplink routing, a source node initially divides its message stream into a number of segments, then transmits the segments to its neighbour nodes. The neighbour nodes forward segments to BSes, which will forward the segments to the BS where the destination resides. Different applications could have totally different QoS needs, such as potency, throughput, and routing speed. We tend to use a bandwidth metric to replicate node capability in turn out t and quick knowledge forwarding. The metric is that the ratio of a node’s channel bandwidth to its message queue size.

Algorithm for node selection and message forwarding
Choose Relay ( ) {
Query storage size and QoS requirement information from neighbors
Foreach neighbor n do
  if n.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 ( ) {
If it is a source node then
  R=ChooseRelay ( );
  Send segments to {r1 ,….. rm} in R
else
  if this.b/q<=b/q of all neighbors then
    //direct transmission
  end if
If within the range of a BS then
end if
3.3 Downlink Data Routing and Data Reconstruction

As mentioned above, the message stream of a source node is divided into several segments. After a BS receives a segment, it needs to forward the segment to the BS, where the destination node resides (i.e., the destination BS). In a hybrid wireless network, each BS periodically emits beacon signals to locate the mobile nodes in its range. When a mobile node mi moves away from its home BS, the BS where mi currently resides detects mi and sends its IP address to the home BS of mi. 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 out the 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 length of the Distributed multipath routing protocol segment together with the header in bytes. The checksum is employed by the receiver node to ascertain whether or not other received knowledge has errors.

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 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 of bandwidth, ill-configuration and slow routers can also bring up congestion.

V. SYSTEM ARCHITECTURE

6.1 Load-Balancing:

Interflow packet order is natively preserved by setting slicing threshold to the delay upper bound at Any two packets in the same flow slice can not be disordered as they are dispatched to the same switching path where processing is guaranteed; and two packets in the same flow but different flow slices will be in order at departure, as the earlier packet will have depart from before the latter packet arrives. Due to the fewer number of active flow slices, the only additional overhead in the hash table, can be kept rather small, and placed on-chip to provide ultra fast access speed. This table size depends only on system line rate and will stay unchanged even if scales to more than thousand external ports, thus guarantees system scalability.

6.2 Wireless Network:

We consider the Multistage Multi-plane Clos-network based switch by Chao et al. It is constructed of five stages of switch modules with top-level architecture similar to a external input/output ports. The first and last stages Clos are composed of input de multiplexers and output multiplexers, respectively, having similar internal structures as those in PPS. Stages 2-4 of M2Clos are constructed by parallel switching planes; however, each plane is no longer formed by a basic switch, but by a three-stage Clos Network to support large port count. Inside each Clos Network, the first stage is composed by k identical Input Modules. A wireless network is any type of computer network that uses wireless data connections for connecting network nodes. Wireless networking is a method by which homes.

6.3 DTR:

Through lay-aside Buffer Management module, all packets are virtually queued at the output according to the flow group and the priority class in a hierarchical manner. The output scheduler fetches packets to the output line using information provided by. Packets in the same
flow will be virtually buffered in the same queue and scheduled in discipline. Hence, intra flow packet departure orders holds their arriving orders at the multiplexer. Central-stage parallel switches adopt an output queued model. By Theorem, we derive packet delay bound at first stage. We then study delay at second stage switches. Define native packet delay at stage of an be delay experienced at stage \( m \) on the condition that all the preceding stages immediately send all arrival packets out without delay.

**Advantages of different algorithm are as follows:**

- The main aim for Quality of Service (QoS) is to reduce failure of a sensor node.
- In order to increase the capacity of hybrid wireless networks, various routing methods with different features are implemented.
- Wireless sensor can be replaced in case of failure by using algorithm.

### VII. INPUT DESIGN AND OUTPUT DESIGN

#### 7.1 INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy.

#### 7.2 OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user.

**Efficient and intelligent output design improves the system’s relationship to help user decision making.**

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should I dentify the specific output that is needed to meet the requirements.
2. Select methods for presenting information.
3. Create document, report, or other formats that contain information produced by the system. The output form of an information system should accomplish one or more of the following objectives.
   - Convey information about past activities, current status or projections of the
   - Future.
   - Signal important events, opportunities, problems, or warnings.
   - Trigger an action.
   - Confirm an action.

### VIII. CONCLUSION

Hybrid wireless networks have been getting increasing concentration in recent years. A hybrid wireless network combining a transportation wireless network and a mobile ad-hoc network leverages their compensation to increase the throughput capacity of the system. Though, current hybrid wireless networks simply unite the direction-finding protocols in the two types of networks for data communication, which prevents them from achieving elevated scheme capability. This paper shows...
different approach of wireless sensor recovery in related work. The congestion control algorithm is used to avoid load traffic in BS in the case of unbalanced traffic distributions in networks. DTR also has a congestion control algorithm to avoid load blocking in BSes in the case of disturbed traffic distributions in networks. Conjectural analysis and reproduction consequences show that DTR can considerably advance the throughput capacity and scalability of hybrid wireless networks due to its high scalability, efficiency, and reliability and low overhead. We will propose a recovery and replacement algorithm which is a combination of genetic algorithm and grade diffusion algorithm.

REFERENCES