

Cryptography Based Privacy Preserving Data Transmission in Hybrid Wireless Networks

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Abstract

Distributed Three-hop Routing protocol (DTR) is used for data transmission in Hybrid wireless network. DTR split a data into segments and transmits the segment in a distributed manner. It uses at most two hops in ad-hoc transmission mode and one hop in cellular transmission mode. However, the selection of trust nodes for data transmission is complicated in DTR which in turn creates security issues. This paper proposes a TEEN APTEEN SPEED (TAS) protocol for trust node selection. TAS protocol allocates a threshold value to each node in a network. Based on the threshold value, a trust node is selected for efficient data transmission in Hybrid Wireless Network. The threshold value is also to maintain security in the network in order that unauthorized spoofing nodes can't enter the network. Furthermore, this paper implements overhearing technique in which the sending node share the content with one or more other nodes before data transmission with the intention that failure node can be discovered and replaced.

Index Terms – Hybrid wireless networks, Cryptography, Trust node, Overhearing.

I. INTRODUCTION

Hybrid wireless network combine mobile ad-hoc network and infrastructure wireless network. It is to be an enhanced network structure for the next generation network. According to the environment condition, it can choose base station transmission mode or mobile ad-hoc transmission mode. The mobile ad-hoc network is an infrastructure-less network. The devices in a mobile ad-hoc network can move in any direction and the link between the devices can changed frequently. In this network, the data is transmitted from source to destination in a multi-hop manner through intermediate nodes. In an infrastructure wireless network (e.g. Cellular network), each device communicates with other device through base stations. Each cell in a cellular network has a base station. These base stations are connected via wire or fiber or wirelessly through switching centers.

If the region has no communication infrastructure or the existing infrastructure, communication between nodes are difficult or inconvenient to use. In this situation hybrid wireless network may still be able to communicate through the construction of an ad-hoc network. In such a network, each mobile node operates as a host and also as a router. Forwarding packets to other mobile nodes in the network may not be within direct wireless transmission range. Each node participates in an ad-hoc routing and infrastructure routing, for this distributed three hop routing protocol is used. It allows to discovering a “Three-hop” path to any other node through the network is introduced in this work. The first two hops in ad-hoc networking is sometimes called infrastructure-less networking, since the mobile nodes in the network dynamically create routing among themselves to form their own network. The third hop is created in infrastructure networking. Most Wi-Fi networks function in an infrastructure mode. Devices in this network communicate through a single access point, which is generally the wireless router. For example, consider the two laptops are placed next to each other, each connected to the same wireless network. Even the two laptops are placed next to each other, they're not communicating directly in infrastructure network. Some possible uses of hybrid wireless network consist of students using laptop, computers to participate in an interactive lecture, business associates and sharing information during a meeting, soldiers communicate information about the situation awareness on the emergency disaster relief and personnel coordinating efforts after a hurricane or earthquake.

Spread Code is generally used for secured data transmission in wireless communication as a way to measure the quality of wireless connections. In wired networks, the existence of a wired path between the sender and receiver are determining the correct reception of a message. But in wireless networks, path loss is a major problem. The wireless communication network has to take a lot of environmental parameters to report background noise and interfering strength of other simultaneous transmission. SINR attempts to generate a demonstration of this aspect. So the TAS protocol is

implemented to maintain the details about the sender and receiver and the communication media in the network. This is implemented through overhearing concept. This TAS implements grouping of nodes depending on the threshold value so that the communication will be easy. In overhearing, the data is transferred to many nearby nodes in a cluster. The cluster is a grouping of nodes, which contain cluster head and gateway. So the basic idea is to separately learn unknown and possibly random mobility parameters and to group the mobile node with similar mobility pattern to the same cluster. The nodes in a cluster can then interchangeably share their resources for load balancing and overhead reduction, aiming to achieve scalable and efficient routing.

In TAS protocol, a secured code called threshold value is used. The nodal contact probabilities are updating with the help of threshold value, it established to converge the true contacts probabilities. Subsequently, a set of functions are devised to form clusters and choose entrance nodes based on nodal contact probabilities. Finally gateway nodes exchange the network information and perform routing. The result show that it is achieve higher delivery ratio and considerably lower overhead and end-to-end delay when compared to non-clustering counterpart.

II. EXISTING WORK

The Base stations (BS) are connected by means of a wired backbone, so that there are no power constraints and bandwidth during transmission among BS. The intermediate nodes are used to indicate relay nodes that function as gateways connecting an infrastructure wireless network and mobile ad hoc network. DTR aims to shift the routing burden from the ad hoc network to the infrastructure network by taking advantage of widespread base stations in a hybrid wireless network. Rather than using one multi-hop path to forward a message to one BS, DTR uses at most two hops to relay the segments of a message to different BS in a distributed manner, and relies on BS to combine the segments. When a source node wants to convey a message stream to a destination node, it partition the message stream into a number of partial streams called segments and spread each segment to a neighbor node. Upon receiving a segment from the source node, a neighbor node decides among direct transmission and relay transmission based on the QoS requirement of the application. The neighbor nodes promote these segments in a distributed manner to nearby BS. Relying on the infrastructure network routing, the BS

further transmit the segment to the BS where the destination node resides.

The final BS reorganizes the segments into the original order and forwards the segments to the destination. It uses the cellular IP transmission method to launch segments to the destination if the destination moves to another BS during segment transmission. DTR works on the Internet layer. It receives packets from the TCP layer and routes it to the destination node, where DTR forwards the packet to the TCP layer. The data routing process in DTR can be divided into two processes: uplink from a source node to the first BS and downlink from the final BS to the data's destination. In uplink process, 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 divides its message stream into a number of segments, then transmits the segments to its neighbor nodes. The neighbor nodes promote segments to BS, which will forward the segments to the BS where the destination resides. In this work, throughput and routing speed are taken as a QoS requirement. The bandwidth/queue metric is to reflect node capacity in throughput and fast data forwarding. A larger bandwidth/queue value means higher throughput and message forwarding speed, and vice versa. When selecting neighbors for data forwarding, a node needs the capacity information of its neighbors. Also, a selected neighbor should have sufficient storage space for a segment. To find the capacity and storage space of its neighbors, each node periodically interactions its current information with its neighbors. If a node's capacity and storage space are changed, it again sends its current information to the segment forwarder. After that, the segment forwarder will select the highest capacity nodes in its neighbors based on the updated information. That is, after a neighbor node receives a segment from the source, it uses either direct transmission or relay transmission. If the capacity of each of its neighbors is no greater than itself, relay node utilize direct transmission. If not, it uses relay transmission. In direct transmission, the relay nodes pass on the segment to a BS if it is in a BS's region. Or else, it stores the segment while moving until it goes into a BS's region. In relay transmission, relay node chooses its highest-capacity neighbor as the second relay node based on the QoS requirement. The second relay node will use direct transmission to forward the segment directly to a BS.

As a result, the number of transmission hops in the ad-hoc network component is confined to no more than two. The small number of hops helps to increase the capacity of the network and reduce channel contention in ad-hoc transmission. The purpose of the second hop selection is to find a higher capacity node as the message forwarder in order to improve the performance of the QoS requirement.

If a source node has the highest capacity in its region, the segments will be forwarded back to the source node according to the DTR protocol. The source node then forwards the segments to the BS directly due to the three-hop limit. This case occurs only when the source node is the highest capacity node within its two-hop neighborhood. Since the data transmission rate of the ad hoc interface is more than 10 times faster than the cellular interface example 3G and GSM. Thus, the transmission delay for sending the data back and forth in the ad-hoc transmission is negligible in the total routing latency. 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). However, the destination BS recorded in the home BS may not be the most up-to-date destination BS since destination mobile nodes switch between the coverage regions of different BS during data transmission to them. For instance, data is transmitted to BS Bi that has the data's destination, but the destination has moved to the range of BS Bj before the data arrives at BS Bi. To deal with this problem, the Cellular IP protocol is used for tracking node locations. With this protocol, a BS has a home agent and a foreign agent. The foreign agent keeps track of mobile nodes moving into the ranges of other BS. The home agent intercepts in-coming segments, reconstructs the original data, and re-routes it to the foreign agent, which then forwards the data to the destination mobile node. After the destination BS receives the segments of a message, it rearranges the segments into the original message and then sends it to the destination mobile node. DTR specifies the segment structure format for rearrange message. Each segment contains eight fields, including: (1) source node IP address; (2) destination node IP address; (3) message sequence number; (4) segment sequence number; (5) QoS indication number; (6) data; (7) length of the data; and (8) checksum.

III. PROPOSED WORK

A. Establishing the Network

The first step of network establishment is forming the cluster. The cluster is the group of

similar nodes formed in order to make the data transmission easier. Each cluster will have Cluster Head, Gateway and other nodes. The first criterion in wireless medium was to discover the available routes and establish them before transmitting. The network consists of n nodes in which two nodes must be source and destination others will be used for data transmission. The path selection for data transmission is based on the availability of the nodes in the area using the ad-hoc on demand distance vector routing algorithm. Using the Ad-hoc on Demand Distance Vector routing protocol, the routes are created on demand as needed.

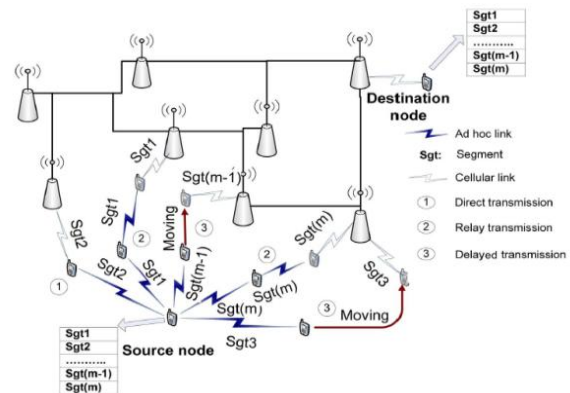


Fig: Data transmission process

B. Threshold Distribution

Threshold value distribution is done using TEEN, APTEEN and SPEED protocol. Based on the threshold value, trust node can be selected also malicious node can be ignored.

a. Threshold-sensitive Energy Efficient sensor Network protocol (TEEN)

It is a reactive protocol proposed for time-critical applications. The main objective of this technique is to generate the threshold value to each node in the network. After generate the threshold value, the node is arranged in a hierarchical clustering scheme in which some nodes act as a 1st level and 2nd level cluster heads. After forming the cluster head, the nodes get the data for transmission. Once the data is received the cluster head broadcasts the data to this cluster member.

b. Adaptive Threshold-sensitive Energy Efficient sensor Network protocol (ATEEN)

APTEEN is a hybrid routing protocol proposed for both time periodic data collection and

critical events. The main objective is to maintain the statistical information. In this APTEEN technique, the threshold value of each node in the cluster will be communicated with other cluster. Each cluster will have an APTEEN values.

c. SPEED Protocol

SPEED is a stateless protocol which provides real time communication by maintaining desired delivery speed across the network. SPEED protocol is to find geographic location. In this protocol whenever source nodes are transmits a packet, the next hop neighbor is acknowledged using Stateless Non deterministic Geographic Forwarding (SNGF). The SNGF identifies a node as next hop neighbor, if it belongs to adjacent set of nodes, lies within the range of destination area and having speed larger than certain desired speed.

C. Overhearing Technique

The path selection, maintenance and data transmission is consecutive process which happens in split seconds in real time transmission. Hence the path allocated priory is used for data transmission. The first path allocated formerly is used for data transmission. The data is transferred through the highlighted path. But the transmission path may be unsuccessful some times. At that moment second path is selected for data transmission. It takes more time to find the second path. In order to deal with these overhearing is used. The overhearing is the concept in which the sending nodes allocate data to more than one node in a network. If the node failure occurs in a network, that can be substituted by other alive node.

D. Three hop Routing

Three hops are used for data transmission in a network. Two hops at mobile ad-hoc network and one hop at infrastructure network. The usage of this combination will improve the reliability. In this technique, the network is silent until a connection is needed. The other nodes forwarded this message, and documentation the node that they heard it from, creating an explosion of temporary routes is back to the needed node. When a node receives such a message, it will send the message backwards through a temporary route to the requesting node. The deprived node then begins using the route that is the least number of hops through other nodes. Idle entries in the routing tables are recycled after a time.

IV. CONCLUSION

Distributed Three-hop Routing protocol integrates the features of infrastructure and ad-hoc network in the data transmission process. In Distributed Three-hop Routing, source node divides a message stream into segments and transmit them to its mobile neighbors and it further forward the segments to their destination via an infrastructure network. Distributed Three-hop Routing limits the routing path length to three, and always arranges for high capacity nodes to forward data. Distributed Three-hop Routing produces significantly lower overhead by eliminating route discovery and maintenance. TAS protocol is implemented in this work which distributes a threshold value to each and every node in a network for the selection of trust nodes. In addition, Overhearing technique is applied to find out and change the failure node in the network. . It has the characteristics of short path length, short-distance transmission, and balanced load distribution provides high routing reliability with high efficiency and also include congestion control algorithm which can avoid load congestion in Bs in the case of unbalanced traffic distributions in networks. Besides the data transmission in hybrid wireless network is highly secure and more efficient.

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