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EFFICIENT ROUTING WITH PREDICTION AND RELAY (PER) ALGORITHM WITH MOBILE AD HOC NETWORKS

[a]N.R.Sathis Kumar M.E., [b]T.Nirmalraj
AP/ECE, Department of Electronics and Communication Engineering,
Agni College of Technology , Thalambur

e-mail: [a]sathiskumar.ece@act.edu.in, [b]nirmalraj.ece@act.edu.in

Abstract

Accurate prediction of path duration increases the performance of a routing protocol. Path duration is the minimum link residual life along the path to the destination consisting of individual links. Path duration is a design parameter that evaluates the performance of a mobile ad hoc network (MANET) which can be used to calculate the route expiry time parameter for routes in "on demand" routing protocol. The existing routing protocols developed for MANET based on the principle of Least Remaining Distance (LRD). The LRD forwarding technique is similar to the shortest path. The parameters used for this model such as node density, transmission range, velocity of nodes and number of hops. The proposed routing protocol is based on the prediction of future contacts taking advantage of nodes mobility history using Predict and relay (PER) method. It determine the probability distribution of future node contact time and selects a suitable next-hop in order to get better the end-to-end delivery probability.

Keywords: MANET, LRD, PER, Time related Markov model, prediction, routing

I. Introduction

Mobile ad-hoc network (MANET) is a infrastructure less network connected by wireless. All the device in a MANET is free to move independently in any direction and therefore change its links to other devices frequently. All must forward traffic unrelated to its own use. The most important challenge in building a MANET is equipping each device to constantly maintain the information required to right route traffic. Such networks may operate by themselves or may be connected to the larger Internet.

MANET is a type of wireless network that regularly has a routable networking environment on the top of a link layer ad hoc network. The growths of laptops and 802.11/Wi-Fi wireless networking have made MANETs a popular research topic since the mid 1990s. A number of academic papers estimate protocols and their ability by assuming or varying degrees of mobility within the enclosed space, regularly with all nodes within a few hops of each other. The altered protocols are evaluated based on the compute such as the packet drop rate end-to-end packet delays, network throughput etc.

II. RELATED WORK

Mobility pattern have been used to derive traffic and mobility prediction models in the study of various problems in cellular systems, such as handoff, location management, paging, registration, calling time, traffic load. The proposed mobility framework is called Reference Point Group Mobility (RPGM) model. In this model, mobile hosts are organized by groups according to their logical relationship. The impact of mobility on: (a) network topology connectivity and; (b) routing protocols. By proper selection of check points, one can easily model many realistic situations, where a group must reach predefined destinations within the given time of intervals to accomplish its task.[1]

Mobile hosts and wireless networking hardware are widely available and extensive work has been done recently in integrating these elements into traditional networks such as the Internet. The protocols presented here are explicitly designed for use in the wireless environment of ad hoc network. There are no periodic router advertisements in the protocol. Instead, when a host needs a route to another host, protocols dynamically determines one based on cached information and on the results of a route discovery protocol. The dynamic source routing protocol offers a number of potential advantages over conventional routing protocols such as distance vector in an ad hoc network.[2]

Novel approach to understand the effect of mobility on protocol performance. It uses statistical analysis (of simulation data) to obtain detailed statistics of link and path duration including their Probability Density Functions (PDFs). The future model is to estimate the MANET routing protocol using a “test-suite" of mobility models, with the purpose of extent some mobility characteristics like spatial dependence, geographic restrictions, etc. These models included the Random Waypoint (RW), Reference Point Group Mobility (RPGM), Freeway (FW) and Manhattan (MH). Moreover, they also proposed a reason for why mobility impacts performance. Mobility impacts the connectivity graph which in turn impacts the protocol performance. [3]

Mobile nodes (MNs) that will eventually utilize the given protocol. There are two types of mobility models used in the simulation of networks such as traces and synthetic models. Traces provide exact information, particularly when they involve a large number of participants and a suitably long observation period. Synthetic mobility models that have been proposed for the performance evaluation of ad hoc network protocols. A mobility model imitates the action of real mobile nodes. The RPGM model group paths are chosen, along with the proper initial locations for various groups, many different mobility applications may be represented with the RPGM model. The RPGM model classified into three applications such as In-place Mobility, Overlap Mobility Model, and Convention Mobility Model. [4]

A Mobile Ad hoc Network is a collection of wireless nodes communicating with each other in the absence of any infrastructure. Classrooms, battlefields and disaster relief activities are a few scenarios where MANET can be used. MANET research is gaining ground due to the ubiquity of small, inexpensive wireless communicating devices. These simulations have several parameters including the mobility model and the communicating traffic pattern. In this model, we focus on impact of mobility models on the performance of MANET routing protocols. [7]

Routing is difficult in MANET since mobility might cause radio links to split often. When any connection of a path breaks, this path needs to be either repair by finding another connection if any or replaced with a newly found path. This rerouting operation costs the scarce radio resource and battery power while rerouting delay may affect quality of service (QoS) for applications and degrade the network performance. To reduce rerouting operation, selecting an optimal path in such networks should consider path reliability more than some metrics used in wired networks such as path cost and QoS etc. The location stability is measured in terms of the period of time that a link has existed. [10]

III. PROBLEM STATEMENT

Mobile ad hoc networks (MANETS) have numerous real world applications including emergency search and rescue, defence, and surveillance to mention few. Although fixed or static ad hoc networks (for example, metro Wi-Fi mesh network) have gained momentum in the business community, there are numerous challenges that need to be addressed by the research community, before the deployment of MANETs becomes practical. One such challenge is the design and development of routing techniques that can adapt to the highly unpredictable topological changes that occur due to mobility of nodes in a MANET.

Wireless ad hoc networks have been used for emerging wireless applications, such as sensor networks for wildlife tracking and MANETs operating in challenging environments, wireless links are short-lived and end-to-end connectivity turns out to be sporadic. Such phenomena are prevalent in disruption tolerant networks (DTNs), where the connection between nodes in the network changes over time, and the communication suffers from frequent disruptions, making the network partially connected

IV. PREDICT AND RELAY ROUTING ALGORITHM

The proposed model will propose predict and relay (PER) which is an efficient routing algorithm for DTNs that relies on predicting future contact times. The model used to predict the probability distribution of the time contact is time-homogenous semi-Markov process(TH-SMP). The algorithm is based on two Observations: first observation is that nodes in a network that do not move randomly. Instead of that it moves around a set of well-visited landmark points. Second observation is that node mobility performance is semi-deterministic and might be predict once there is enough mobility history information.

The time-homogeneous semi-Markov process model that describes node mobility as transitions between landmarks. It extend to handle the situation where we believe the change time between two landmarks. Simulation results show that this method raises the delivery ratio and reduces in delivery latency compared to other traditional DTN routing schemes

V. PERFORMANCE EVALUATION

The average path duration is computed by altering the each parameter that path duration depends on. The set of independent parameters that decide path duration include transmission range, maximum velocity, number of hops and node density.

The simulation results imply that the shortest path routing tends to the selection of longer but small number of hops such that information flows from the source to destination quickly. Longer links imply that the neighbour which is far from the source and closer to the circumference of transmission circle is selected as relay node. Thus it is proven that the routing protocols choose paths with higher duration in order to improve the network performance.

Parameter	**Values**
Number of Nodes	10 to 30
Simulation Area	1000 x 1000
Packet Size	256bits
Mac Type	802.11
Simulation Time	120s
Routing Protocol	AODV
Transmission Range	250m
Maximum Velocity	30m/s

Table1: Simulation Parameter for NS-2

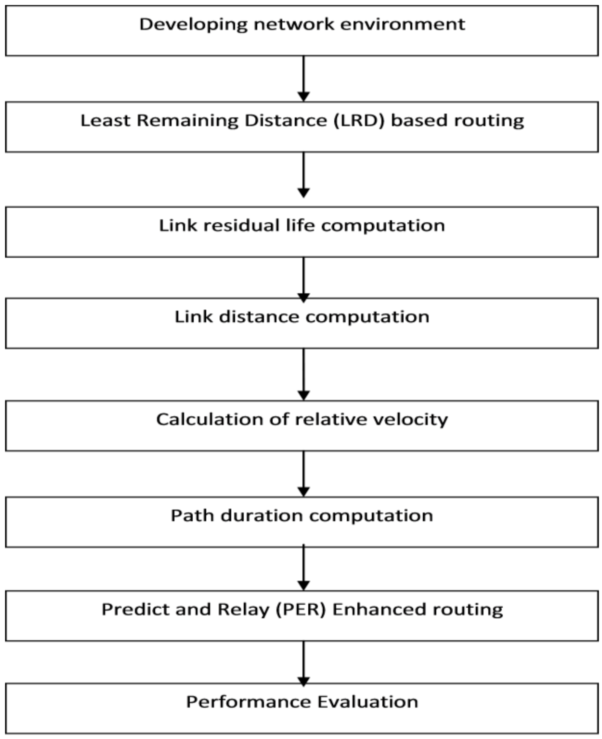

Figure 1 : System Architecture

VI. CONCLUSION & FUTURE WORK

The enhanced system with Predict and Relay scheme provides an efficient routing scheme in DTNs. It introduces a time homogeneous semi-Markov process model to predict the future contacts of two specified nodes at a specified time. With this model, a node can select a proper neighbour as the next hop to forward the message. It also defines three different prediction functions to assist in choosing the proper neighbour for message delivery. Simulation results show that our approach raises the delivery ratio, as well as reduces the delivery latency, compared to other traditional DTN routing protocols.

Future work can also focus on mobility model dependent factors that contribute to average path duration. Inclusion of specific mobility models makes the random nature of node movement partially predictable, which in turn, will contribute to the prediction of average path duration. The complexity in computing the average path duration could also be reduced so that it will be useful for networks with resource constraints.

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